

# Post Op Pyrexia

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# Outlines

- ❖ Introduction
- ❖ Predisposing factors
- ❖ Pathophysiology
- ❖ Differentials
- ❖ Evaluation
- ❖ Treatment
- ❖ Conclusion

# Objectives

- At the end of this seminar each student will be able to:
  - Define post operative pyrexia
  - Identify the main causes of post operative pyrexia
  - Enumerate the signs and symptoms of each cause of post op
  - Identify the diagnostic criteria of each cause of post op
  - Explain the treatment of each cause of post op

# PYREXIA (FEVER) :

## ➤ Definition & pathogenesis:

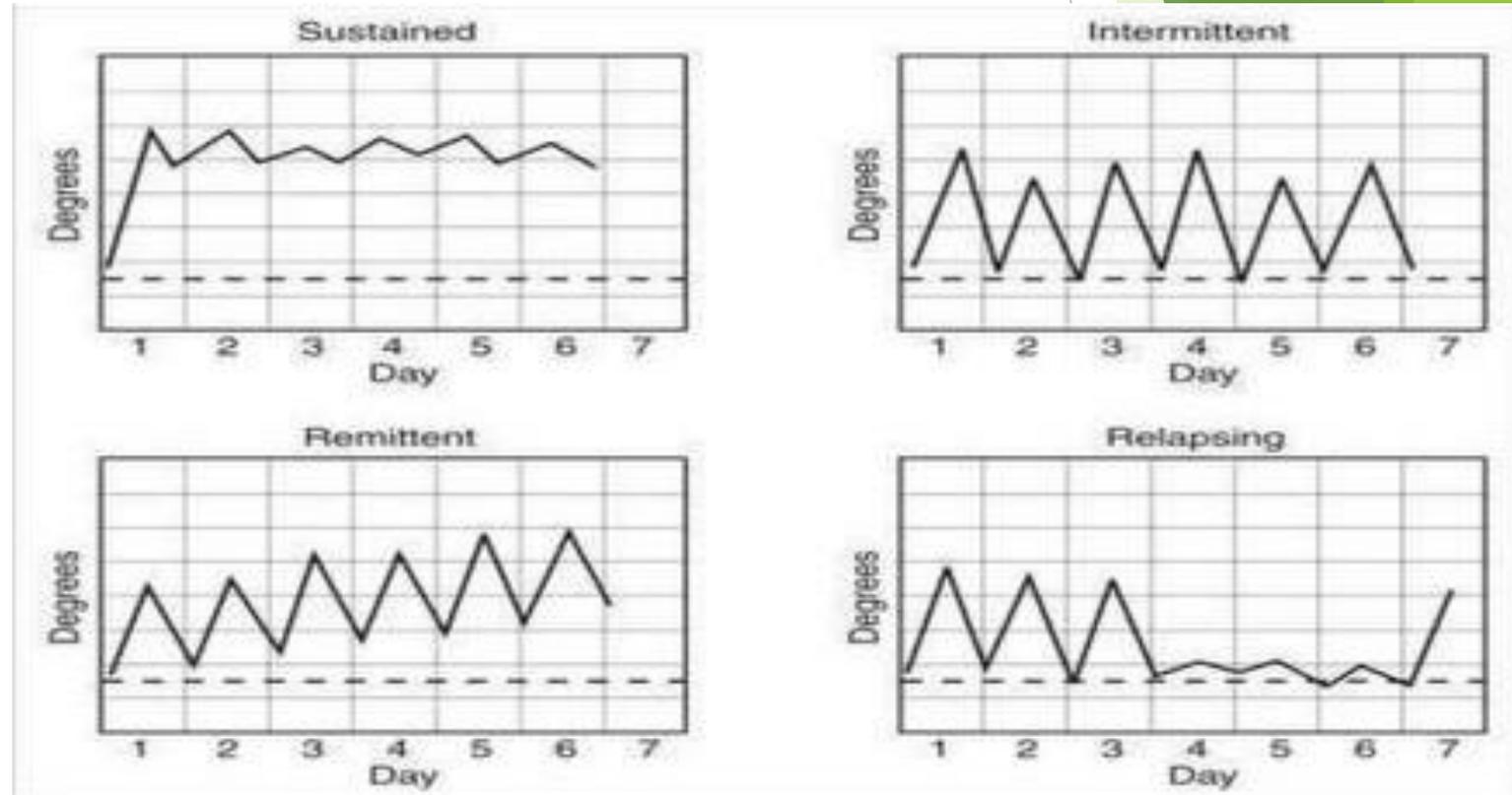
- Is an elevation of body temperature typically greater than 37.3 degrees Celsius
- Represent 40-50% of post op complication whatever the underlining cause
- Infection is regularly the suspected cause, other conditions must be considered when approaching the surgical patient with pyrexia
- It may also be an indicator of a severe and life threatening underlying pathology.

## ➤ **Manifestation of cytokine release/response:**

1. By monocyte, macrophages, endothelial cells
2. IL-1, IL-6, TNF-alpha, IFN-gamma
3. Act on the hypothalamic endothelium
4. Stimulate produce of PGE2 & cAMP release
5. cAMP acts as neurotransmitter & raises the “set-point” => heat conservation & production

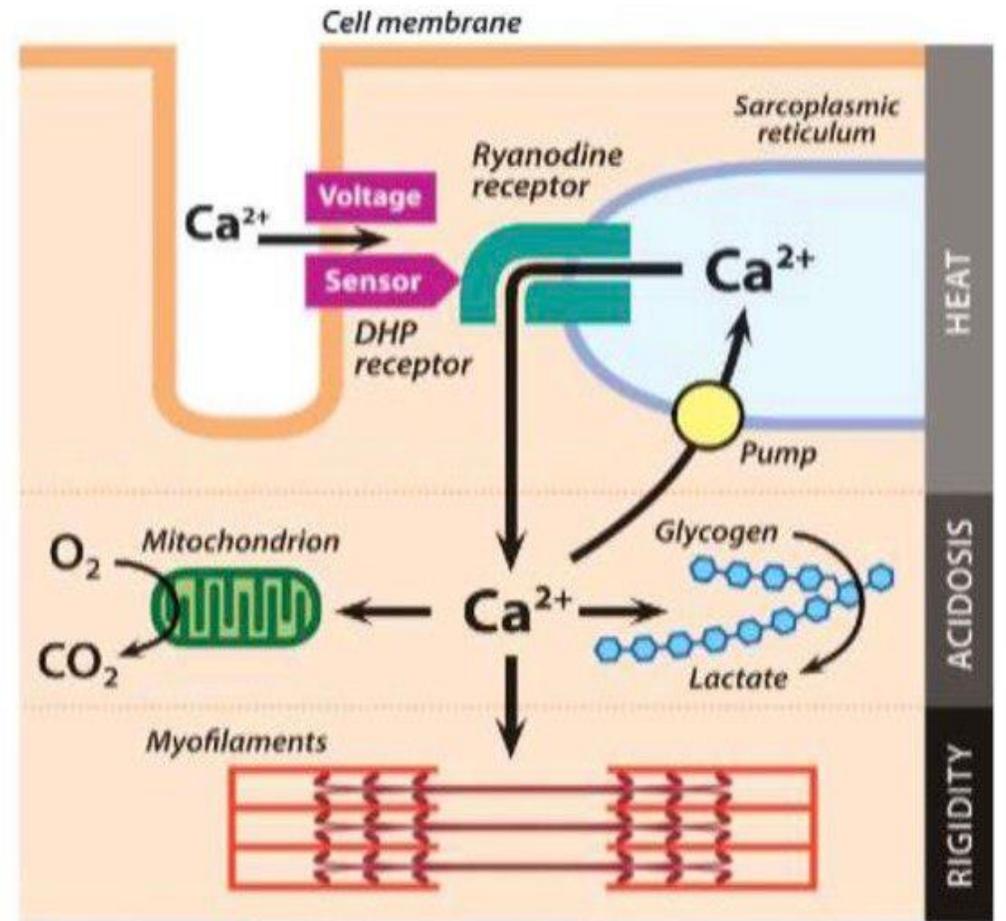
## ➤ Type of fever :

1. Continuous (sustained)
2. Intermittent
3. Remittent
4. Relapsing



# Malignant Hyperthermia

Is a life threatening inherited disorder due to reaction to certain drugs used for anesthesia (halothane) or muscle relaxant (succinylcholine)



# Malignant Hyperthermia

## Signs and Symptoms :

- Temperature >40C (104F ).
- Tachycardia and tachypnea.
- Hypercalcemia and hyperkalemia.
- Acidosis.
- Muscle rigidity.
- Myoglobinuria and multiple organ failure.

## Management :

**Prevent** it by a family history prior operation

➤ **IV DANTROLENE** : antidote decreases the loss of Ca from SR in the skeletal muscle and restore the metabolism to the normal.

➤ **100% oxygen**

➤ **Cooling blankets**

## ➤ Measurement:

we use **Thermometer** to measure body temperature

## ➤ Ways to Take a Temperature:

1. Rectal: The thermometer is placed in the rectum
2. Oral: The thermometer is placed in the mouth under the tongue.
3. Axillary: The thermometer is placed in the armpit.
4. Tympanic: The thermometer is placed in the ear.
5. Temporal artery: The thermometer scans the surface of the forehead.

# POST OPERATIVE FEVER

## ➤ DEFINITION :

- Fever above 38°C (100.4°F) is common in the first few days after major surgery
- either due to the underlying surgery process or post operative complication

## ➤ Classifications :

The most common classification or system they use for complications is **TIMING**

### ➤ The Five “W” & timing of each:

1. **Wind** (POD#1) atelectasis, pneumonia, aspiration
2. **Water** (POD#3) UTI
3. **Wound** (POD#5) wound infection
4. **Walking** (POD#7to #10) DVT
5. **Wonder-drug** (any time)

# ATELECTASIS

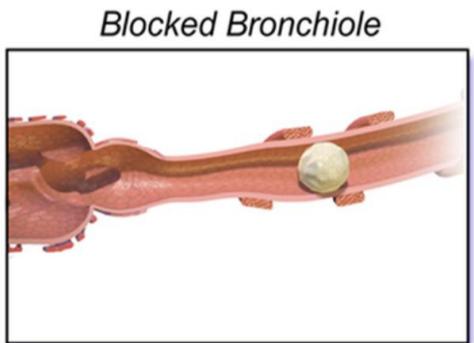
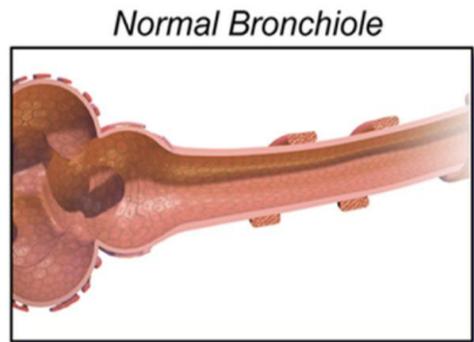
**Atelectasis is often used as an explanation for otherwise unexplained postoperative fever. Both atelectasis and fever occur frequently after surgery, but their concurrence is probably coincidental rather than causal.**

- is a complete or partial collapse of the entire lung or area (lobe) of the lung. It occurs when the tiny air sacs (alveoli) within the lung become deflated or possibly filled with alveolar fluid. can make breathing difficult
-

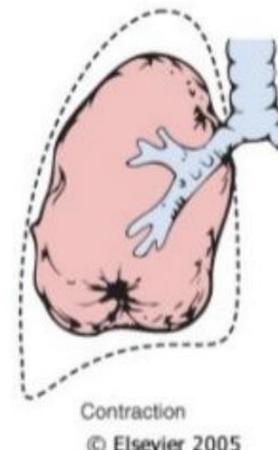
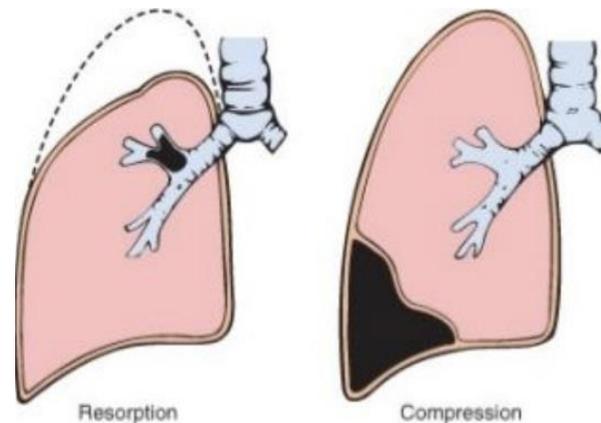
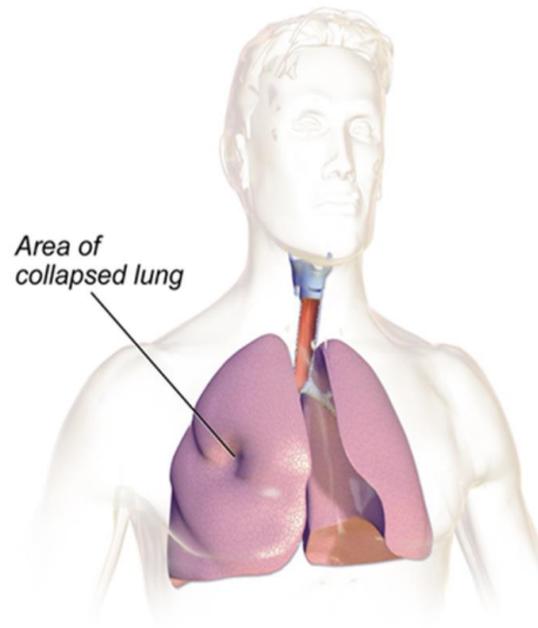
## ➤ **Atelectasis can be caused by a variety of things, including:**

1. Obstruction of an airway by mucus, a foreign object, or a tumor
2. Pressure on the lung from outside from a pleural effusion (fluid around the lung) or a pneumothorax (collapsed lung)
3. Weakness of the muscles that control breathing
4. General anesthesia
5. Atelectasis can also occur after surgery, as the effects of anesthesia can cause the airways to collapse. In most cases, atelectasis is not a serious condition and can be treated with deep breathing exercises and chest physiotherapy. However, in some cases, it may be necessary to use a bronchoscope to clear a blockage or to insert a chest tube to drain fluid around the lung.

- The two main types of atelectasis are obstructive (also called resorptive) and nonobstructive.
  1. Obstructive atelectasis happens when something physically blocks airway.
  2. Types of nonobstructive atelectasis include: contraction or compressive



## Atelectasis



## Atelectasis

1. **Resorption atelectasis** = complete obstruction of an airway → *resorption* of the oxygen trapped in the dependent alveoli, without impairment of blood flow through the affected alveolar walls.
2. **Compression atelectasis** results whenever the pleural cavity is partially or completely filled by fluid exudate, tumor, blood, or air.
3. **Contraction atelectasis** occurs when local or generalized fibrotic changes in the lung or pleura prevent full expansion.

➤ **Symptoms of atelectasis can vary depending on the severity of the condition. Some people may have no symptoms at all, while others may experience:**

1. Shortness of breath
2. Rapid breathing
3. Chest pain
4. Cough
5. Wheezing
6. Decreased oxygen levels in the blood

# Risk factors

## **Factors that make you more likely to develop atelectasis include:**

1. Older age
2. Confinement to bed with infrequent changes of position
3. Lung disease, such as asthma, COPD, bronchiectasis or cystic fibrosis
4. Recent abdominal or chest surgery
5. Recent general anesthesia
6. Weak breathing (respiratory) muscles due to muscular dystrophy, spinal cord injury or another neuromuscular condition
7. Medications that may cause shallow breathing
8. Smoking

# Complications

A small area of atelectasis, especially in an adult, usually is treatable. The following complications may result from atelectasis:

1. Low blood oxygen (hypoxemia): Atelectasis makes it more difficult for your lungs to get oxygen to the air sacs (alveoli).
2. Pneumonia: risk for pneumonia continues until the atelectasis goes away. Mucus in a collapsed lung may lead to infection.
3. Respiratory failure: Loss of a lobe or a whole lung, particularly in an infant or in someone with lung disease, can be life-threatening.

# Diagnosis:

## ➤ Clinical Manifestations:

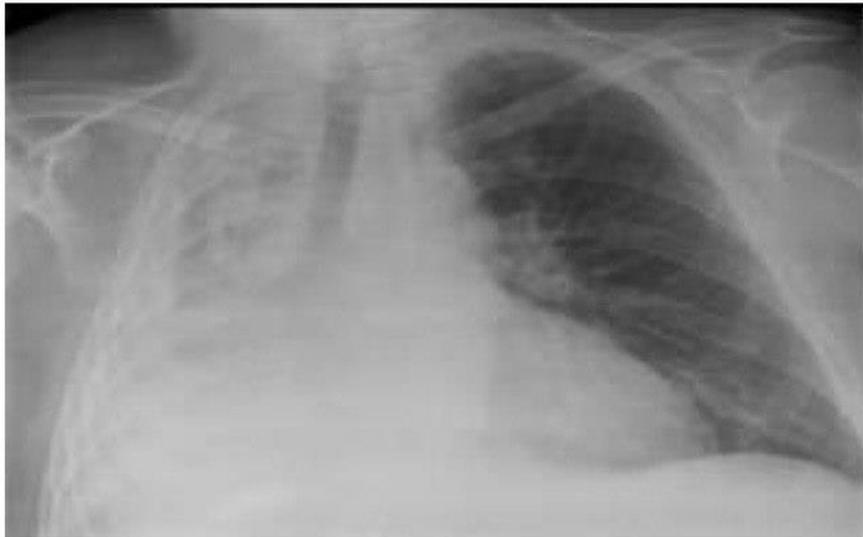
1. fever
2. Dyspnea tachycardia and Tachypnea
3. pleural pain, and central cyanosis

## ➤ Physical examination:

1. dullness
2. decreased breath sound

# CXR (Chest radiography):

1. OPACITY of affected area and compensatory translucency
2. Mediastinal and tracheal deviation TOWARD affected site
3. Ipsilateral hemidiaphragmatic elevation



For chest X-ray: atelectasis of the right lower lobe.

# Treatment for atelectasis

- The treatment for atelectasis will depend on the cause of the condition. If the atelectasis is caused by a blockage of an airway, the doctor may try to clear the blockage using a bronchoscope. If the atelectasis is caused by pressure on the lung from outside, the doctor may need to drain the fluid or air that is causing the pressure.
- In some cases, atelectasis may resolve on its own with deep breathing exercises and chest physiotherapy. However, if the atelectasis is severe or does not resolve with these measures, the doctor may need to hospitalize the patient and provide supplemental oxygen.
- **Pre op :**
  - 1- no smoking
  - 2- treatment of pulmonary disease
- **Post op :**
  - 1- control pain
  - 2- physiotherapy
  - 3- incentive spirometry



Incentive spirometry

# Pneumonia

- ▶ **Definition:** pneumonia is a lung infection that can cause a fever, cough and trouble breathing. The lung infection is caused by a variety of different organisms especially bacteria.
- ▶ **Types:**
  - ▶ 1-Hospital acquired pneumonia
  - ▶ a- ventilator associated pneumonia
  - ▶ 2- Aspiration pneumonia

- ▶ **Epidemiology:**
- ▶ #3 cause for post operative complications after Surgical site infection(SSI) & Urinary tract infections(UTI).<sup>(1)</sup>
- ▶ #1 cause for post operative morbidity and mortality. <sup>(1)</sup>
- ▶ **Timing of fever:** Acute ( (2-3) days after procedure )



- ▶ 1. Kazaure HS, Martin M, Yoon JK, Wren SM. Long-term results of a postoperative pneumonia prevention program for the inpatient surgical ward. *JAMA Surg.* 2014;149(9):914–918. doi: 10.1001/jamasurg.2014.1216. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]

# Ventilator-Associated pneumonia (VAP)

## ▶ Risk factors:

### ▶ Patient Characteristics:

▶ advanced age ( $\geq 60$  years) <sup>(1)</sup>

▶ male gender <sup>(2)</sup>

▶ Increased Mechanical Ventilation Time and Prolonged Length of Hospital Stay

▶ Disorders of Consciousness

▶ Invasive Operations

▶ Smoking

## ▶ Causing organism:

▶ Gram-negative bacilli and Staphylococcus aureus

▶ <sup>(1)</sup>:Ding C., Zhang Y., Yang Z., Wang J., Jin A., Wang W., et al. (2017). Incidence, temporal trend and factors associated with ventilator-associated pneumonia in mainland China: a systematic review and meta-analysis. *BMC Infect Dis.* 17:468. 10.1186/s12879-017-2566-2567 [[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]

▶ Liu Y., Di Y., Fu S. (2017). Risk factors for ventilator-associated pneumonia among patients undergoing major oncological surgery for head and neck cancer. *Front. Med.* 11 239–246. 10.1007/s11684-017-0509-8 [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]

▶ **Signs and symptoms:**

- ▶ Dyspnea
- ▶ Fever
- ▶ Tachypnea
- ▶ Purulent secretions
- ▶ Reduced tidal volume

▶ **Diagnosis:**

- ▶ 1-Chest imaging
  - ▶ chest x-ray (CXR)
  - ▶ computed tomography (CT) scans
- ▶ 2-Respiratory tract sample

▶ **Treatment:**

- ▶ Empirical antibiotic therapy
- ▶ Organism specific antibiotics

# Aspiration pneumonia

## ▶ Risk factors:

- ▶ Disorders of the upper gastrointestinal tract
- ▶ Reduced consciousness
- ▶ Mechanical disruption of the glottic closure
- ▶ Pharyngeal anesthesia and prolonged vomiting.

## ▶ Signs and symptoms:

- ▶ Fever
- ▶ Sputum with an unpleasant smell
- ▶ CT scan showing evidence of pulmonary necrosis with lung abscess and/or an empyema
- ▶ Gram stain of specimens that show the characteristic morphologic features of anaerobic bacteria in large numbers

## ▶ Diagnosis:

- ▶ 1-Clinical features
- ▶ 2-Imaging:
  - ▶ chest x-ray (CXR)
  - ▶ computed tomography (CT) scans

## ▶ Treatment:

- ▶ tracheal suction to clear fluids and particulate matter that may cause obstruction
- ▶ anaerobic bacteria present in aspiration pneumonia and parenteral therapy is required, [ampicillin-sulbactam (1.5 to 3 g IV every 6 hours) as first-line therapy]

- UTI
- CATHETER \_ RELATED BLOOD STERN INFECTION  
(CRBSI )
- ANASTOMOTIC LEAK /INTRA\_ABDOMINAL LEAK



# CATHETER-RELATED URINARY TRACT INFECTION

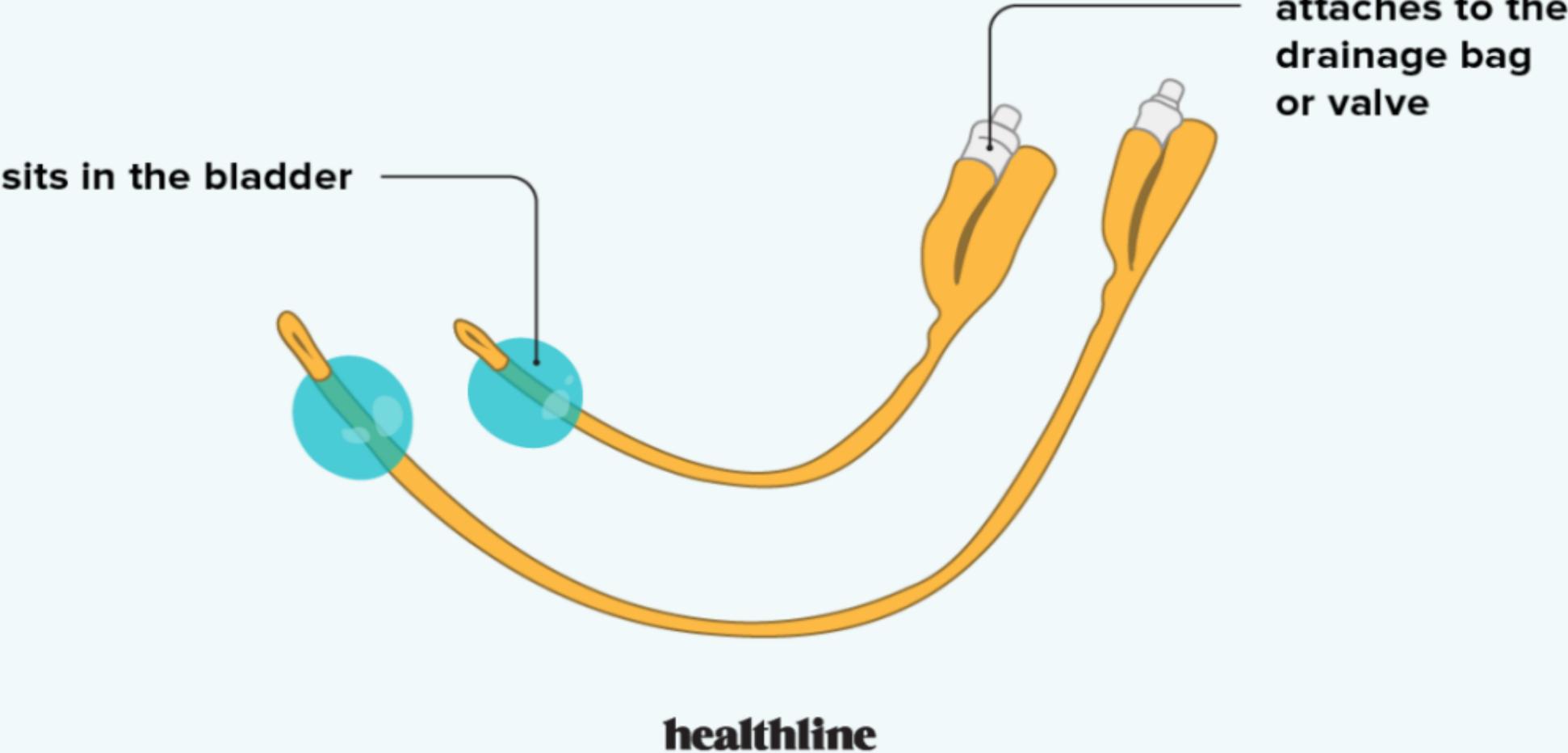
**Urinary tract infection ( UTI)** hcihw metsys yraniru ni trap yna ni noitcefni na si :  
arhteru dna,sreteru,reddalb, yendik) edulcni)

- Fever associated with placement of indwelling catheter for 48h or more tend to emerge that \*\*
- UTIs are the **most common hospital-acquired infection** and are associated with indwelling catheters 80%to 90% of cases.\*\*
- The most Common infectious causes is **Escherichia coli** but there are other microorganisms such as (klebsiella,enterobacter ,pseudomonas, and enterococcus)

\*\*\* Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. Am J Infect Control. 2008;36:309-32. [PubMed] \*\*\*Boev C, Kiss E. Hospital-Acquired Infections: Current Trends and Prevention. Crit Care Nurs Clin North Am. 2017 Mar;29(1):51-65. [PubMed]

# WHAT DOES A CATHETER LOOK LIKE?

What is a catheter and how does it work?

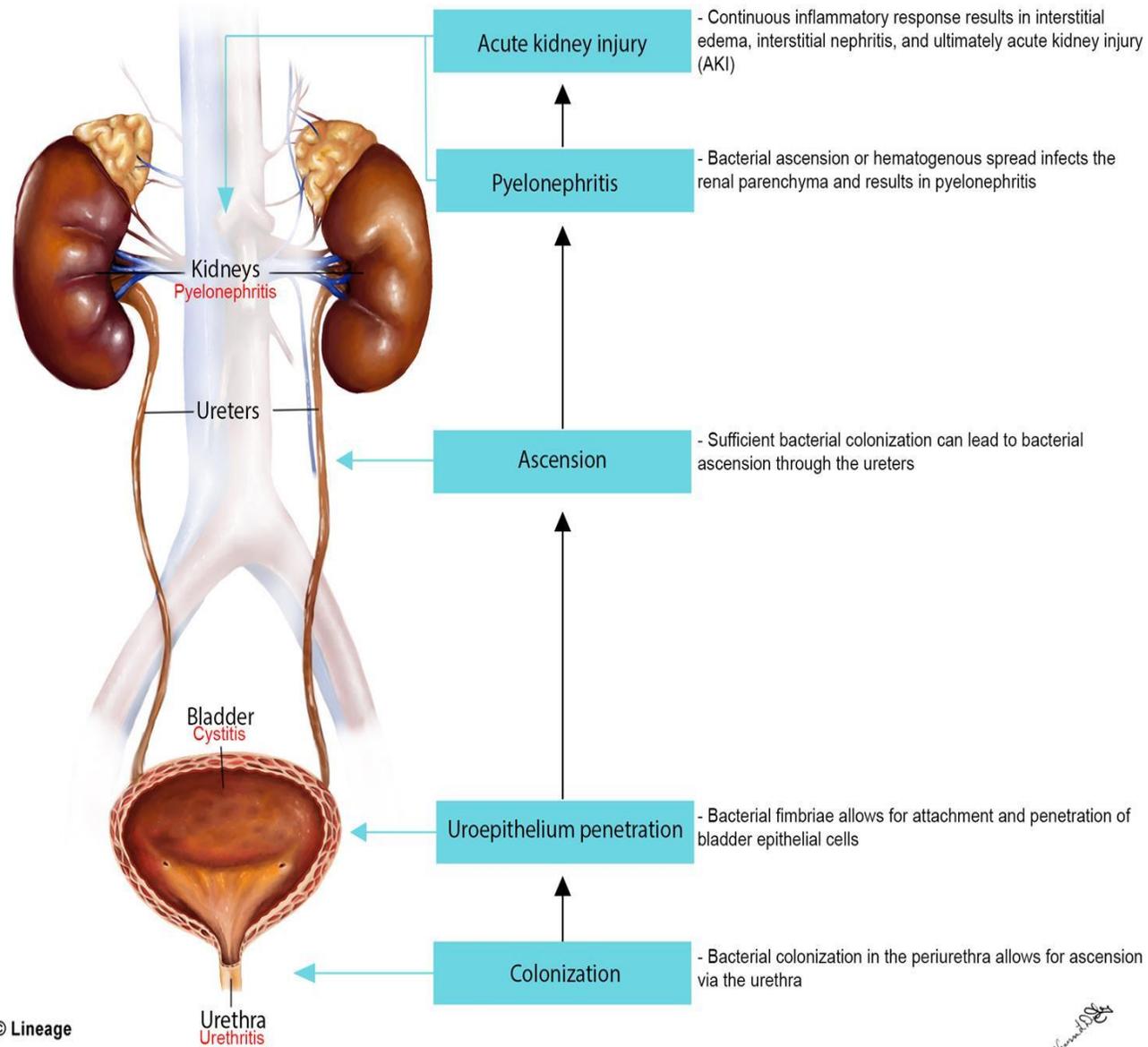


# URINARY TRACT INFECTION

## RISK FACTOR

1. Female gender (urethra shorter than in male )
2. Age more than 60 years.
3. History of previous UTI. (anatomical abnormality )
4. Significant comorbidities (renal failure ,uncontrolled diabetes mellitus).
5. Those with prostatic disease .
6. Those who received spinal anesthesia. (urinary retention )
7. Those undergone anorectal surgery.
8. Duration of catheterization (indwelling catheter) 80 %to 90 %  
of UTI cases

# Pathogenesis of Urinary Tract Infections



Ascending infection

# Patient may present with :

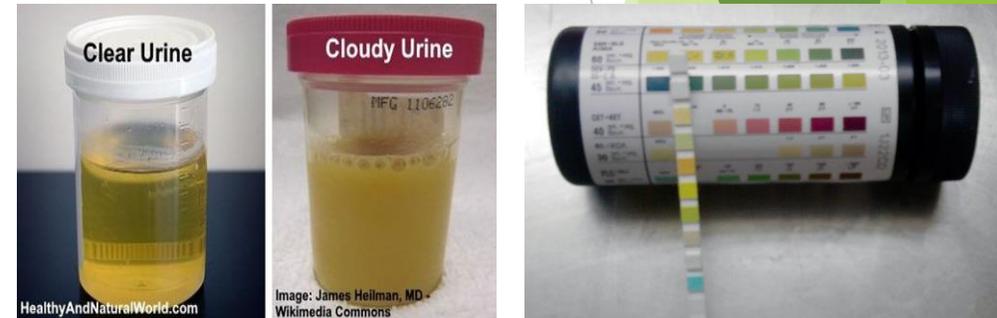
- Dysuria.
- Urgency
- pyrexia
- Abdominal and supra pubic tenderness.

Post operative urinary retention is extremely common after surgery in **lower abdomen , pelvis , perineum or groin**

## Investigation :

- ▶ Urine analysis:
  - i. Urine color and appearance.
  - ii. WBC indicate inflammation/infection > 10 cells/microl
  - iii. Nitrites refer to presence gram negative bacteria (E . Coli)
- ▶ Urine culture

▶ [\\*\\*https://www.uptodate.com/contents/catheter-associated-urinary-tract-infection-in-adults/abstract-text/22284373/pubmed](https://www.uptodate.com/contents/catheter-associated-urinary-tract-infection-in-adults/abstract-text/22284373/pubmed)



## Treatment:

- ▶ Involves adequate hydration( either po or iv )
- ▶ Ensure urin output more than 0.5 ml/kg/hour
- ▶ Proper bladder drainage and antibiotics depending on the sensitivity of the microorganisms.
- ▶ Antipyretics as Aspirin and paracetamol .

## How can I prevent post operative UTI?

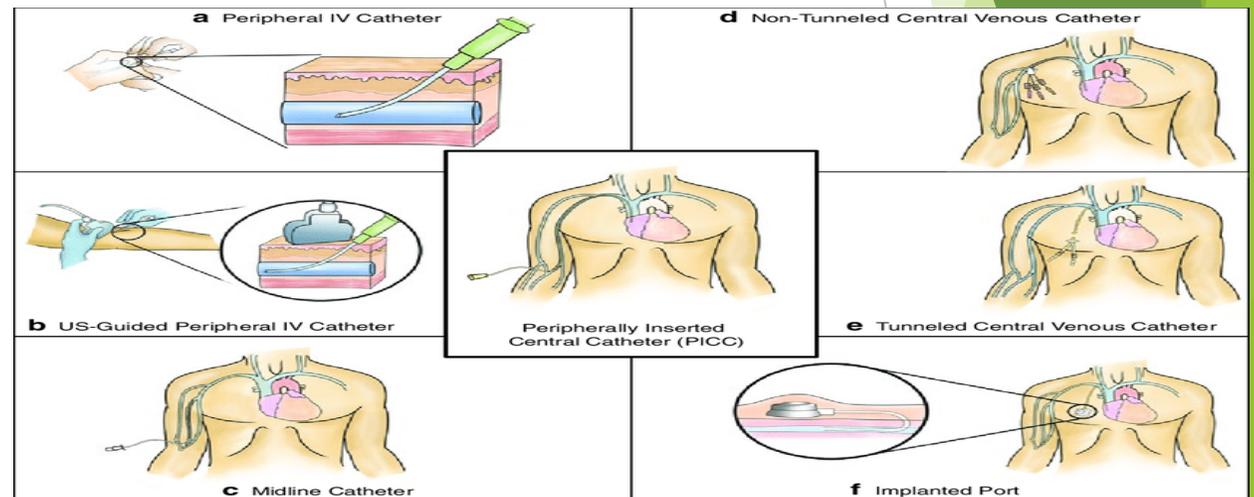
Multiple strategies have been demonstrated to reduce the incidence of UTI including :

- minimize of the use of indwelling catheter
  - Patient who no longer require catheterization should remove it
  - Patient who require extended catheterization should managed with intermittent catheterization
- 
- Prophylactic antibiotics have no clear benefit to reduce the risk of having UTI

# Catheter –related bloodstream infection (CRBSI )

- ▶ **Central venous catheter (CVCs) :**
- ▶ also known central venous line: is a catheter placed into a large vein and commonly placed internal jugular vein, subclavian vein and femoral vein (which most site of infection).

- ▶ **peripheral catheter :**  
most common site is the forearm, the back of hand or the antecubital fossa



## IV catheter infection :

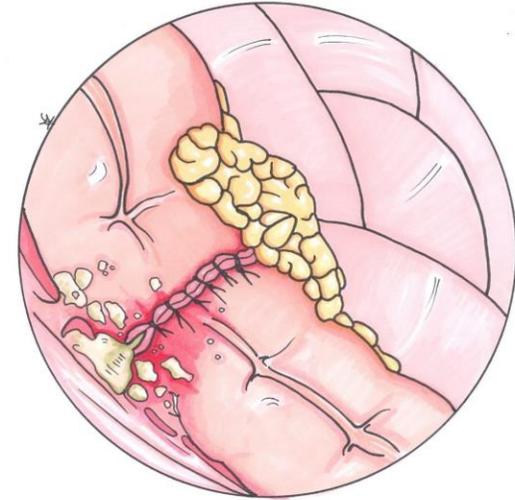
Is defined as the presence of Bacteraemia originating from Intravenous catheter . Diagnosis Should be considered only after other Causes of fever ruled out (diagnosis by exclusion)

- ❖ **The use of peripheral and central catheter puts patient at increase risk for bloodstream infections and insertion SSI such as thrombophlebitis ( inflammatory process that causes a blood clot to form and block one or more vein usually in leg ) .**
- ❖ **The goal should be source control and identification of offending organism through blood culture .**

- ❖ If the patient have fever, redness or tenderness at catheter site are unreliable for diagnosis instead we should take two set of blood culture.
- ❖ Coagulase –negative staphylococci G+ are the most commonly implicated pathogens. Therefore, empiric therapy should include vancomycin (or other antibiotics that treat methicillin-resistant staphylococci )

# Anastomotic leak/Intra- Abdominal Abscess

- abscess
- Anastomotic leakage



# ABSCESS

- An abscess may present with persistent abdominal pain, focal tenderness and a spiking fever. The patient may have a prolonged ileus. The patient will have a neutrophilic leukocytosis and may have positive blood cultures.
- The time lag between surgery and presentation can vary from 6week to 3 month. In appendectomy as example
- **The primary management of an intraabdominal abscess is drainage. In other situations, operative debridement and drainage are required**
- **Treatment** with broad spectrum antibiotic should be initiated after specimen for culture are obtained.

# ANASTOMOTIC LEAKS

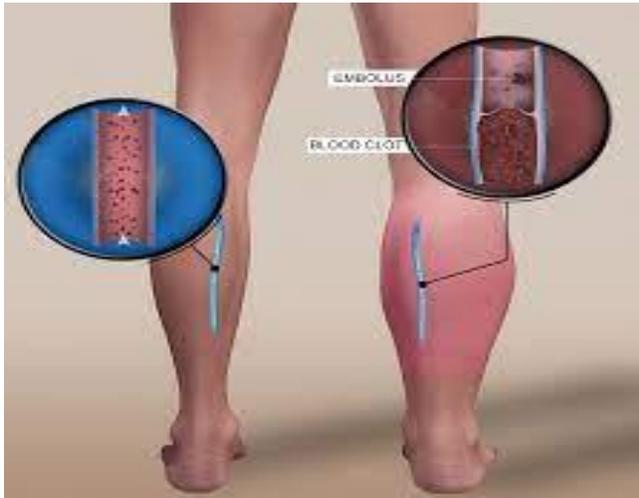
- ✓ are defined as a leak of luminal contents from a surgical join. They are the most important complication to recognize following gastrointestinal surgery.
- ✓ Early diagnosis and treatment of an anastomotic leak is key. Delay leading to the development of severe sepsis and progression to multi organ failure and death.
- ✓ On examination, patients may be pyrexial, tachycardic, and / or with signs of peritonitis

## Management:

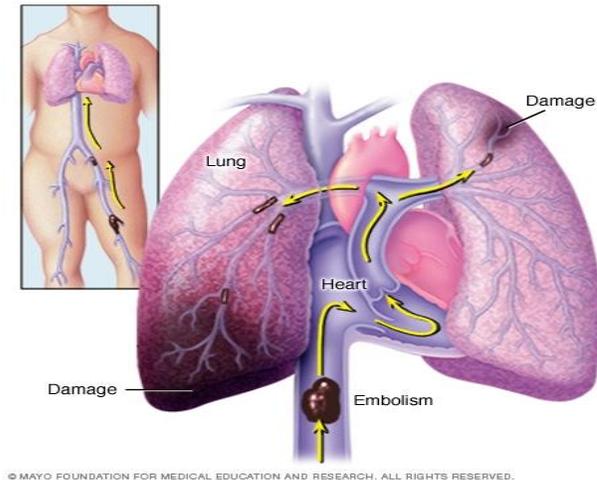
- ✓ Ensure the patient is nil by mouth (NBM) and start broad spectrum antibiotic cover (as per local guidelines). Start IV fluid therapy and insert a urinary catheter to enable monitoring of fluid balance, and potential surgical intervention if a major leak

# Venous Thromboembolism

the most common presentations of venous thrombosis are deep vein thrombosis (DVT) of the lower extremity and pulmonary embolism. . .



DVT



Pulmonary  
Embolism

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## VIRCHOW'S TRIAD

A major theory delineating the pathogenesis of venous thromboembolism (VTE), proposes that VTE occurs as a result of:

- Alterations in blood flow (ie, stasis)
- Vascular endothelial injury (ie, atherosclerosis )
- Alterations in the constituents of the blood (ie, inherited or acquired hypercoagulable state)

# DVT

- ▶ is a medical condition that occurs when a blood clot forms in a deep vein. These clots usually develop in the lower leg, thigh, or pelvis, but they can also occur in the arm.
- ▶ Mostly affect elderly, obese patients, history of previous DVT , usage of oral contraceptive pills.

# the risk factors that are considered causes of DVT:

- ▶ **Reduced blood flow:** Immobility (bed rest, general anesthesia, operations, stroke, long flights).
- ▶ **Increased venous pressure:** Mechanical compression or functional impairment leading to reduced flow in the veins (neoplasm, pregnancy, stenosis, or congenital anomaly which increases outflow resistance).
- ▶ **Mechanical injury to the vein:** Trauma, surgery, peripherally inserted venous catheters, previous DVT, intravenous drug abuse.
- ▶ **Increased blood viscosity:** Polycythaemia rubra vera, thrombocytosis, dehydration.
- ▶ **Anatomic variations** in venous anatomy can contribute to thrombosis.

# Clinical features

- ▶ Deep vein thrombosis can be **silent** , but typically symptoms and signs are as follow:
- ▶ -calf pain or tenderness, or both -swelling with pitting oedema
- ▶ -increased skin temp. and fever -superficial venous dilation
- ▶ -cyanosis can occur with severe obstruction

*when to suspect DVT post op???* :

1 to 2 weeks post operation , although symptoms may come earlier or later .



# How to prevent DVT

- ▶ *Active mobilization*
- ▶ *Anti- embolic stockings (by gently compressing your legs increasing the blood flow and prevent the veins from expanding wich stops blood pooling and forming clot)*
- ▶ *Low molecular weight heparin (enoxaparin)*



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ANTI-EMBOLISM STOCKINGS



COMPRESSION STOCKINGS

# How to diagnose DVT

## ❖ Diagnosis of DVT:

1. Duplex ultrasonography is the standard imaging test to diagnose DVT
2. A positive D-dimer test indicates DVT
3. Contrast venography
4. MRI and CT, both can show blood veins and clots.

# Treatment of DVT

- ▶ Anticoagulants (low molecular weight heparin and factor Xa inhibitors, including rivaroxaban)
- ▶ Thrombolytics (Streptokinase)
- ▶ Thromboectomy

# Pulmonary embolism(PE)

▶ **Pulmonary embolus** (PE) refers to obstruction of the pulmonary artery or one of its branches by material (eg, thrombus, tumor, air, or fat) that originated elsewhere in the body .

▶ **Risk factors :**

- DVT    - elderly    - smoking    - fractures    -malignancy

**Clinical features :**

- Mild dyspnea    - hemoptysis    - chest pain    - right HF

## Patients with PE can present acutely, subacutely, or chronically;

- ▶ • **Acute** - Patients with acute PE typically develop symptoms and signs immediately after obstruction of pulmonary vessels.
- ▶ • **Subacute** - Some patients with PE may also present subacutely within days or weeks following the initial event.
- ▶ • **Chronic** - Patients with chronic PE slowly develop symptoms of pulmonary hypertension over many years (ie, chronic thromboembolic pulmonary hypertension; CTEPH)

# How to diagnose PE

- ▶ Pulmonary emboli classically occur in the first 6 weeks post Op , but it may occur sooner or later .
- ▶ On physical examination the patient may be tachypneic , has raised JVP , tachycardia , cyanosis however lung infarction is uncommon .

## ▶ **Investigations :**

- CT pulmonary angiography
- Arterial blood gases
- Blood test
- ECG

## **Treatment :**

- anticoagulants
- thrombolytics (streptokinase )
- O<sub>2</sub>
- inferior vena cava filter



# Wound Infection [SSI]

By ; AwsBdour



Acute wounds in normal, healthy individuals heal through an orderly sequence of physiological events. Some individuals have one or more factors that contribute to impaired wound healing, which can lead to chronic nonhealing wounds and ulcers or can complicate the surgical course.

Introduction



**Surgical site infection** — Surgical site infection (SSI) is defined by the United States Centers for Disease Control and Prevention as infection related to an operative procedure that occurs at or near the surgical incision within 30 days of the procedure or within 90 days if prosthetic material is implanted at surgery . SSIs are often localized to the incision site but can also extend into deeper adjacent structures.

# Risk Factors

- ⌈ Risk factors associated with impaired wound healing leading to wound healing complications or chronic nonhealing wounds are listed in the following sections.

# Risk Factors

- smoking
- ☐ Aging
- ☐ Malnutrition
- ☐ Diabetes
- ☐ Vascular disease
- ☐ Immunosuppressive therapy
- ☐ infection

# Wound Classification

- ▮ **Surgical wound classification** — The degree of contamination of a surgical wound at the time of the operation is an important risk factor for infection and can be classified using the National Healthcare Safety Network (NHSN) wound class .

# Wound Classification

- -clean : an uninfected non inflamed operative wound where no viscera are opened , usually primary closures . e.g : hernial repair, thyroidectomy.
- -Clean contaminated: an uninfected non inflamed wound where a viscus is open . e.g: cholecystectomy, bowel resection or cesarian section .
- -Contaminated: where there is obvious spillage or inflammatory disease with no gross purulence . e.g : gangrenous appendix , colostomy .
- - Dirty : where there is gross contamination ( pus ) with large deep wound infection . e.g : gunshot , perforated bowel , acute cholecystitis , appendicitis .

# Clinical Features

- General infection effects that include ;
- Fever , malaise , vomiting, anorexia .
- The wound is swollen , red , painful , hot and tender .



SSI

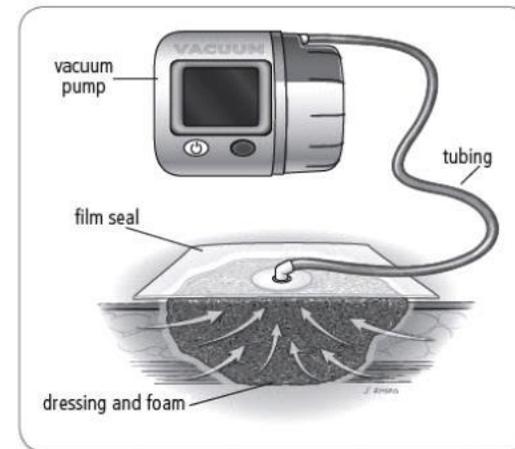
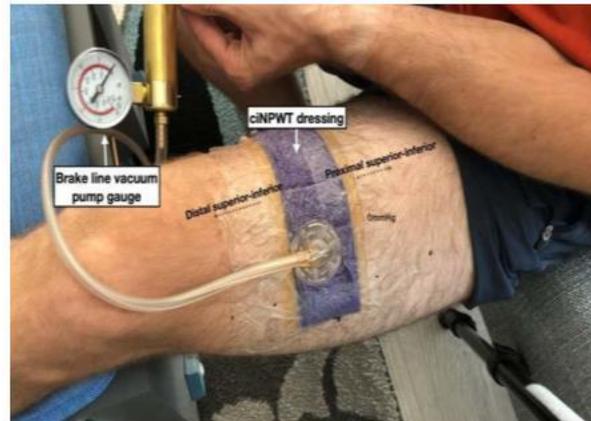


# Treatment and Prophylaxis

- In preantibiotic days, the haemolytic *Streptococcus* was feared most but now, as this is still usually penicillin sensitive, the principal causes of wound infection are the penicillin-resistant *Staphylococcus aureus*, together with *Streptococcus faecalis* and *Pseudomonas*.
- Prophylaxis ; antibiotic if indicated

# Treatment

- Drainage
- Antibiotics
- Negative pressure wound therapy



# Wounder Drug

- ⌈ Some anesthetic agents used during surgery can cause patients to develop a post op fever , as can blood products and any medication the patient could be allergic to .
- ⌈ Note that your patient could have a reaction to ANY medication given during their hospitalization, so keep this in mind ESPECIALLY when giving a new drug for the first time. It is always a good practice to keep a close eye on your patient when first-ever doses are given. If they start to have a reaction to something, you can stop the infusion (if it's being administered slowly)

# Wounder Drug

- Antimicrobial – vancomycin and beta lactams
- Anticonvulsant – phenytoin

The image features a white background with abstract geometric shapes in shades of green and dark blue. In the top left, there is a yellow semi-circle. In the top right, there are several overlapping green and dark blue shapes, including a large dark blue semi-circle and a large green semi-circle. At the bottom, there is a solid green horizontal bar. On the left side of this bar, there is a dark blue circle. On the right side, there is a green semi-circle.

Thank you

# References

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