



- **Diseases are classified as being:**

- **Congenital.**
- **Acquired:**

Inflammatory	Body defense systems are disturbed thus external pathogens start to invade the host resulting mainly in cardinal signs of inflammation (warmth, swelling, tenderness, redness).
Neoplastic	There is overgrowth of cells (can be benign or malignant).
Metabolic	System diseases such as diabetes and hypertension are good examples. Remember that $\text{Glucose} + \text{O}_2 = \text{ATP (energy)} + \text{CO}_2 + \text{water}$. If this process does not function normally, energy cannot be provided to cells and they will die.
Traumatic	Commonest cause of death especially in young people (road traffic accidents).
Degenerative	Natural process of aging.

- **Emergency Medical triage:**

- It is simply a method of selection of patients (who must be treated first; priority?). This systems depends on medical needs of patients (NOT first come first served 😊).
- **According to this system, patients are classified as the following:**
 - ✓ **Emergency:** this patient must be seen immediately because vital organs are affected and patient is in a life-threatening situation. Initial management of such patients is always (ABC: Airway, Breathing and Circulation).
 - ✓ **Urgent:** seen after emergency cases (usually within 1 hour).
 - ✓ **Stable:** this patient has symptoms but with stable vital signs. In Bahrain (especially SMC), they will be admitted to A, B or C room in Emergency Department to be examined.
 - ✓ **Not urgent:** this patient is kept to the last.

- **How are you going to grade a disease?**

A	Asymptomatic phase (example: incubation period of an infection or slowly-growing tumor which is not producing symptoms yet).
B	Disease process starts to damage organ systems and thus producing symptoms.
C	Compensatory phase of the disease. The function of organ systems will be maintained.
D	Decompensated phase as disease process continues and this will result in (heart failure, renal failure... etc).
E	End of life 😊

- **Bedside teaching:**

- **Patient: unconscious patient with neck collar who had road-traffic accident and he is now intubated and monitored by:**
 - ✓ **ECG → 3 leads →**
 - Red: goes to the right shoulder.
 - Yellow: goes to the left shoulder.
 - Green: ground.
 - ✓ **Pulse oximetry:** 100% Oxygen saturation. Heart rate = 66 beats/minute.
 - ✓ **Pressure cuff:** 95/53 mmHg.
 - ✓ **Continuous urine drainage by Foley's catheter.**
 - ✓ **If patient remains unconscious for longer duration → nasogastric tube will be inserted to maintain nutrition.**



- If an unconscious patient presents to A/E do the following:

• Check level of consciousness (How?)

✓ Glasgow Coma Score:

- ❖ Minimum score = 3
- ❖ Maximum Score = 15
- ❖ Patient with a score ≤ 8 is considered to be unconscious.

TABLE 38-2		
Glasgow Coma Scale		
BEHAVIOR	RESPONSE	SCORE
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place, and person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No response	1
Best motor response	Obeys commands	6
	Moves to localized pain	5
	Flexion withdrawal from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
	No response	1
Total score:	<i>Best response</i>	15
	<i>Comatose client</i>	8 or less
	<i>Totally unresponsive</i>	3

✓ AVPU grading:

- ❖ *A*: patient is Alert and oriented.
- ❖ *V*: patient responds to Verbal commands but confused.
- ❖ *P*: patient responds to Painful stimulation.
 - Press with your knuckles on the chest bone.
 - Press on patient's nail bed.
 - Press on patient's glabella.
- ❖ *U*: Unconscious.

		ADULT BEHAVIOR
A	ALERT	Eyes open spontaneously. Appears aware of and responsive to the environment. Follows commands eyes track peoples and objects.
V	VOICE	Eye do not open spontaneously but open to verbal stimuli. Able to respond in some meaningful way when spoken to.
P	PAIN	Does not respond to questions but moves or cries out in response to painful stimuli such as pinching the skin or earlobe.
U	UNRESPONSIVE	Patient does not respond to any stimuli.



- **CPR:** if the patient is unconscious, has no pulse and he is not breathing (arrested!).
 - ✓ Pulse: check carotid pulse along the anterior border of SCM muscle at the level of thyroid cartilage.
 - ✓ Breathing is checked by (look, listen, feel):
 - ❖ Look for chest wall movements.
 - ❖ Listen to breathing sounds.
 - ❖ Feel for air.
 - **If patient is unconscious but alive (not arrested): think about the causes**
 - ✓ Myocardial Infarction (MI): hypoperfusion of the brain will result in hypoxia (O₂ level is checked by: pulse oximetry or ABG in which a blood sample will be obtained from radial artery).
 - ✓ Airway obstruction, no O₂ in the air or lung diseases (PE, COPD, asthma... etc).
 - ✓ Carbon monoxide (CO) poisoning: color of patient's blood will be bright red! Therefore, pulse oximetry is not reliable in measuring level of O₂ in this case. This situation is similar to methemoglobinemia (patient will be cyanotic). Wrong reading with oximetry also occurs when there is red nail polish → attach it to ear lobule.
 - ✓ Brain diseases: for which you have to investigate further with CT/MRI of the head.
 - ✓ Hypoglycemia: how to treat it?
 - ❖ *Adults:* IV 50% dextrose (50 ml).
 - ❖ *Pediatrics:* IV 10% dextrose (5 ml/ kg).
 - If an IV line cannot be established → IM glucagon.*
 - ✓ Extreme temperatures: heat stroke or hypothermia.
 - ✓ Vasovagal attack: but in this case, patient usually regains consciousness quickly once he becomes in the supine position.
 - ✓ Drugs: narcotics (over-dose). This is rapidly diagnosed clinically (because blood and urine toxicology results will take longer time to be available). check the pupils (finding: bilateral pinpoint pupils). Your antidote is naloxone (it is rapid and short-acting. t_{1/2} = 30 minutes).
-

- **Neck collar (cervical collar):**

- It is a medical device used to support a person's neck (especially when there is a trauma or neck injury). This prevents spinal cord injury which can result in paralysis or death.
- Neck collar only stabilizes the top seven vertebrae (C1-C7).
- **Measure the distance between patient's angle of mandible to his shoulder by your fingers** and adjust neck collar accordingly (neck collar is placed under jaw-thrust method which stabilizes the neck of the patient).



- **Oropharyngeal airway:**

- It is a medical device called an airway adjunct used to maintain or open a patient's airway. It does this by preventing the tongue from covering the epiglottis, which could prevent the patient from breathing.
- **Measure the distance from angle of patient's mouth to his ear lobule.** Make sure there are no foreign bodies before placing it. If the unconscious patient has a gag reflex, oropharyngeal airway will not be used. Instead, you will use nasopharyngeal airway.





- Nasopharyngeal airway:

- It is a tube which is designed to be inserted into the nasal passageway to secure an open airway. The purpose of the flared end is to prevent the device from becoming lost inside the patient's nose.
- **To select length of the tube:** measure the distance from patient's nose to his ear lobule.
- **To select diameter of the tube:** it is approximately equal to the size of the tip of patient's little finger.
- **It is contraindicated to insert nasopharyngeal tube when patient has fracture of ethmoid bone (how to know?):**
 - ✓ Leakage of CSF from the nose.
 - ✓ Black eyes.

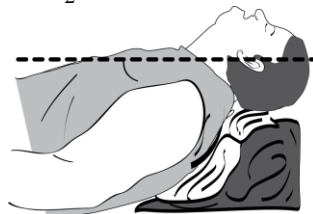


- What are the definitive airways?

- Endotracheal tube with inflated balloon.
- Cuff tracheostomy tube.

- Endotracheal intubation:

- **Crash intubation:** no paralyzing drug is used. This is applied when patient is arrested.
- **Rapid sequence intubation:** intubation of the trachea with the help of a paralyzing drug (this process must be completed within 3 minutes only):
 - ✓ Prepare your equipments.
 - ✓ Pre-treat with drugs:
 - ❖ Fentanyl 1.5 µg/kg (adults).
 - ❖ Lidocaine.
 - ❖ Atropin.
 - ✓ Position (sniffing position).
 - ✓ Pre-oxygenation: 100% O₂ before administrating paralyzing drugs thus you have more time to intubate the patient before he enters a state of respiratory arrest.
 - ✓ Paralyzing drugs.
 - ✓ Placement of the tube.
 - ✓ Position of the tube which has to be above trachea bifurcation and confirmed by:
 - ❖ Vapor in the tube.
 - ❖ Auscultation of the chest and epigastrium.
 - ❖ CO₂ detector.



- Laryngeal mask airway:

- It is a medical device which keeps a patient's airway open during anesthesia or unconsciousness. It is a type of supraglottic airway.
- Placement of laryngeal mask airway does not require the use of paralyzing drugs.
- Notice that it does not protect the airway 100% because some secretion can pass from the sides.





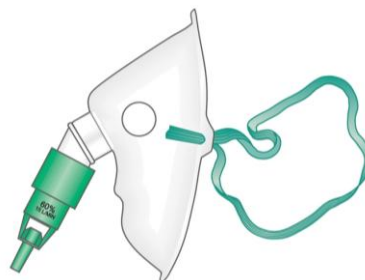
- A manometer is connected to oxygen source and both of them are connected to a bottle containing water or normal saline which humidifies oxygen which will be inhaled by the patient.
- What is the difference between minute volume and tidal volume?
 - **Minute volume:** it is the amount of air which is breathed in 1 minute and is equal to = tidal volume x respiratory rate = 6 L.
 - **Tidal volume (t_v):** it is the amount of air in 1 breath (around 500 ml).
- Suppose that a patient presents to A/E with hypoxia, confusion but he is still conscious:
 - **Mild hypoxia:**
 - ✓ You can use nasal cannula (with the manometer set on 2-4 L). Nasal cannula increases oxygen saturation maximally 30%.
 - ✓ You might also use simple face mask (rebreathing): when it is fixed tightly and connected to oxygen source with a manometer set on 6 L, it can increase oxygen saturation maximally by 50%.



- **Severe hypoxia (pneumonia, PE, trauma or fractures to the chest wall):** use non-rebreather face mask which corrects oxygen saturation rapidly. Later, patient might be shifted to other simple methods of oxygen delivery. Up to 10 L of oxygen can be given when using non-rebreather face mask.



- **Venturi mask:**
 - ✓ Normally, our respiratory center is stimulated through:
 - ❖ \uparrow CO₂
 - ❖ \uparrow H⁺
 - ❖ \downarrow O₂
 - ✓ In patients with COPD, continuous CO₂ retention develops resistance in the respiratory center. Therefore, it depends on hypoxia for ventilation. When 100% oxygen is given to these patients, There will be no hypoxia and respiratory center will realize that the patient does not need to breath anymore!





- **In an unconscious patient:**

- always presume that his airway might be blocked or has cervical spine injury (C3-C7) until you confirm that by CT-scan.
- Remember that epiglottis closes the laryngeal inlet when you swallow. Therefore, this mechanism prevents aspiration.
- In an unconscious patient, the tongue slides backward causing obstruction of the airway (by the action of gravity).

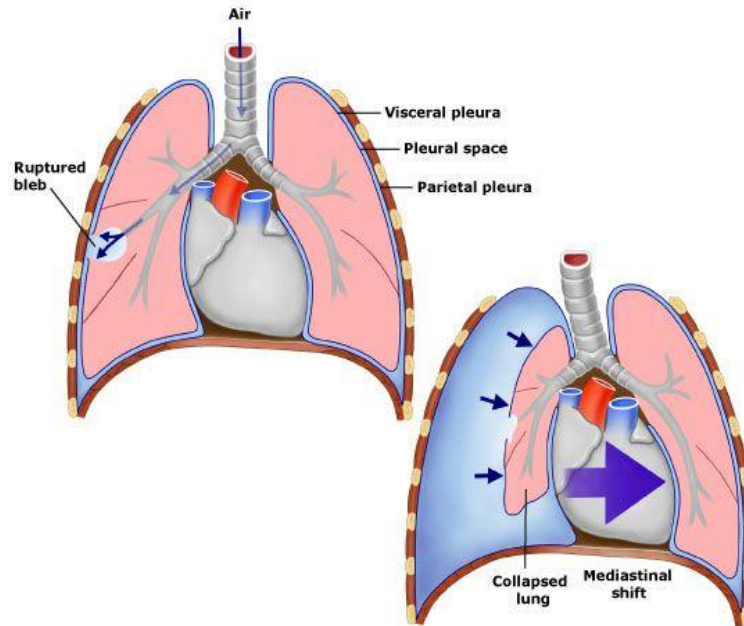
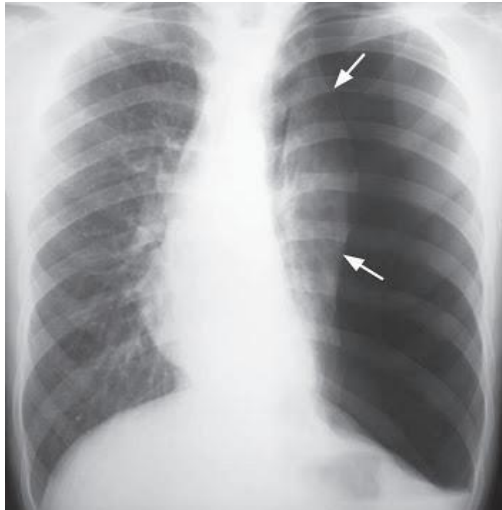
- **What are the most important steps which must be considered when managing a patient who presents to A/E with trauma?**

- Determine what is the immediate life-threatening problem.
- ABC (Airway, Breathing, Circulation)
- Head-to-toe examination.

- **What are the 4 life-threatening conditions of the chest?**

- **Tension pneumothorax:**

- ✓ In which there is injury to the lung but not pleura or chest wall (closed space). Therefore, air is going to accumulate in pleural space producing positive pressure which compresses the diaphragm and shifts the mediastinum towards the opposite side of the lesion.



- ✓ **Why do patients with tension pneumothorax have hypotension?**

- ❖ Heart will be compressed by the pressure of the air thus its refilling is prevented during diastole.
- ❖ Positive pressure in the chest prevents venous return.

- ✓ **Physical examination of a patient presenting with pneumothorax shows:**

- ❖ *Inspection:* chest wall movement normal or decreased (side of lesion).
- ❖ *Palpation:* tactile fremitus and vocal resonance are decreased. shifted trachea (opposite side of the lesion).
- ❖ *Percussion:* hyper-resonance.
- ❖ *Auscultation:* decreased breath sounds.

- ✓ **How to manage such patients?**

- ❖ *Immediate action:* insert a needle in 2nd ICS of mid-clavicular line.
- ❖ Then, placement of chest tube in 5th ICS of mid-axillary line.



- **Hemothorax:**

- ✓ Causes: traumatic injury (most common).. Other contributing causes: lung infections (tuberculosis), lung/pleural cancer, pulmonary embolism and defects in blood clotting.
- ✓ Management: similar to that mentioned for tension pneumothorax. Patient usually needs blood transfusion and to be placed on IV ringer lactate.

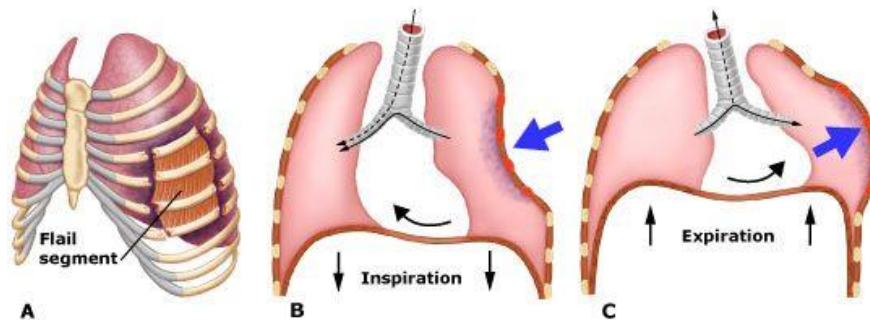


- **Open pneumothorax:**

- ✓ Remember that you must not close chest wound completely otherwise you will convert open pneumothorax to tension pneumothorax which is more serious and fatal.

- **Flail chest:**

- ✓ It refers to the type of injury which follows a blunt trauma to the chest. It happens when three or more ribs are each broken in more than one place, causing a segment of bone to detach from the chest wall.
- ✓ It is diagnosed clinically by paradoxical breathing (uneven chest rise when breathing).
- ✓ Investigations: CXR and ABG (hypoxia and hypercarbia).
- ✓ Treatment:
 - ❖ An oxygen mask will be applied to assist with breathing.
 - ❖ Medications will be given to help relieving the pain.



- **CXR:**

- **What appears white in x-ray (4 C's)?**

- ✓ Calcium.
- ✓ Clot.
- ✓ Contrast.
- ✓ Cellular (tumor).

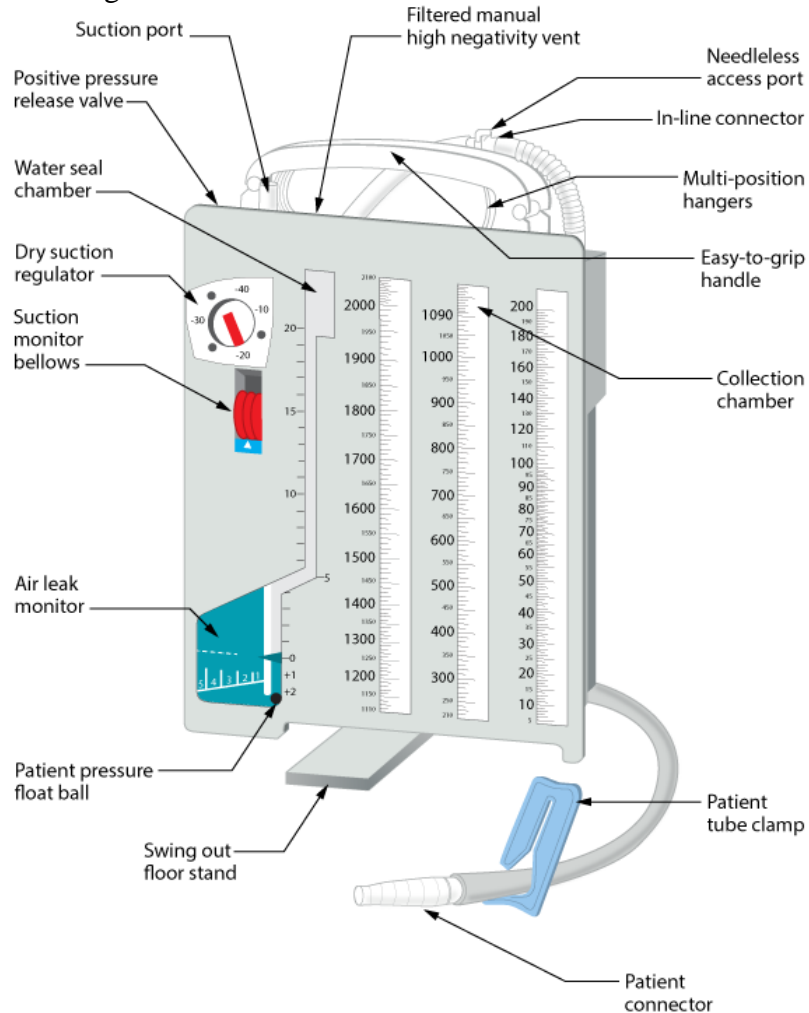
- **What should you comment on when reading a chest x-ray?**

- ✓ Heart and mediastinum.
- ✓ Lung fields.
- ✓ Diaphragm.
- ✓ Ribs (1st and 2nd rib fractures are very serious because they are fixed and related to brachial plexus and subclavian artery).
- ✓ Soft tissue of the chest wall.
- ✓ Other bones (clavicle and vertebrae).
- ✓ Presence of foreign bodies and tubes.



- **Chest tube:**

- **A chest tube is used to remove:**
 - ✓ Air: pneumothorax.
 - ✓ Fluid: hemothorax (and sometimes effusion).
- **Complications:**
 - ✓ Infection.
 - ✓ Hemorrhage.
 - ✓ Damage to other surrounding structures.
- **Precautions:**
 - ✓ It must be placed under water-seal and along the upper border of the rib to avoid damage to the neurovascular bundle.



- **Urolithiasis:**

- **Causes:**
 - ✓ Calcium oxalate (most common: 75% of cases).
 - ✓ Magnesium-ammonium-phosphate (15%): seen in UTI with urea-splitting bacteria (Proteus). Notice that it may cause staghorn calculi.





✓ Uric acid stones (15%).

✓ Cystine stones (< 1%).

Notice that uric acid and cystine stones are radiolucent (cannot be seen on x-ray).

• **Risk factors:**

✓ Poor fluid intake especially for those who live in areas with hot climate.

✓ Conditions in which there is increased level of calcium:

- ❖ Multiple myeloma.
- ❖ Hyperparathyroidism.
- ❖ Osteolytic lesions.
- ❖ Sarcoidosis.

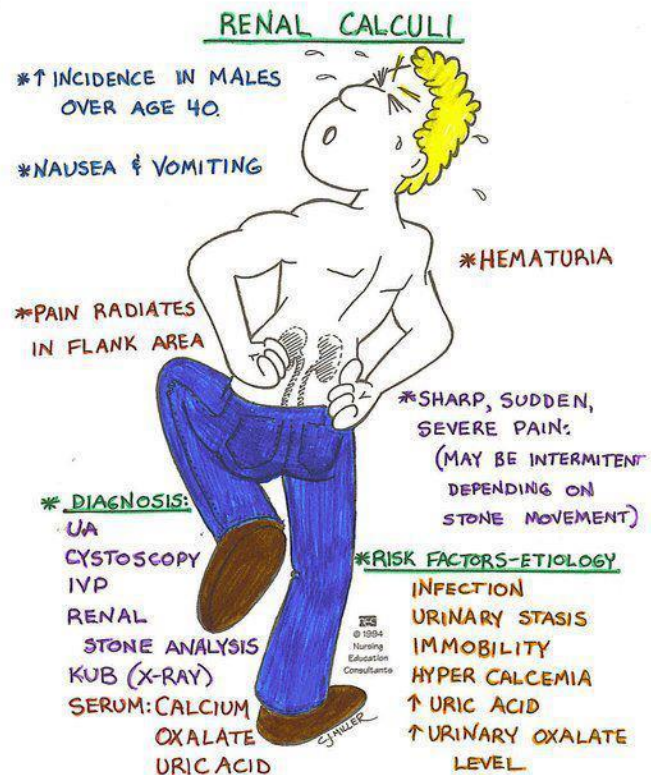
✓ Past history of urolithiasis or positive history among family members.

• **What are the narrowest points or urinary system where stone impaction can occur?**

- ✓ Ureteropelvic junction.
- ✓ Pelvic brim.
- ✓ Iliac crossing.
- ✓ Uretrovesical junction.
- ✓ Vesicle orifice.

• **Clinical features:**

- ✓ Severe, sudden onset of colicky pain which begins in the flank and may radiate to the groin.
- ✓ Nausea and vomiting.
- ✓ Gross or microhematuria (detected by urinalysis).
- ✓ Fever (?)



• **Diagnosis:**

✓ Urinalysis and urine culture:

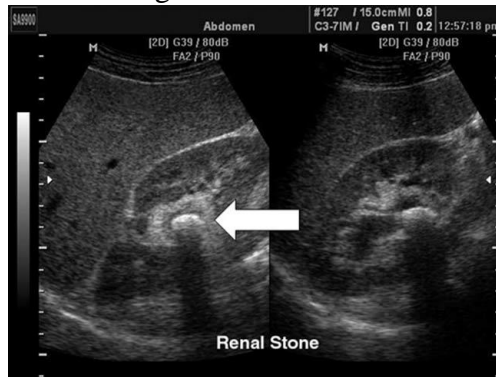
- ❖ Some patients will have RBCs in the urine.
- ❖ Presence of ↑WBCs or bacteria suggest UTI.



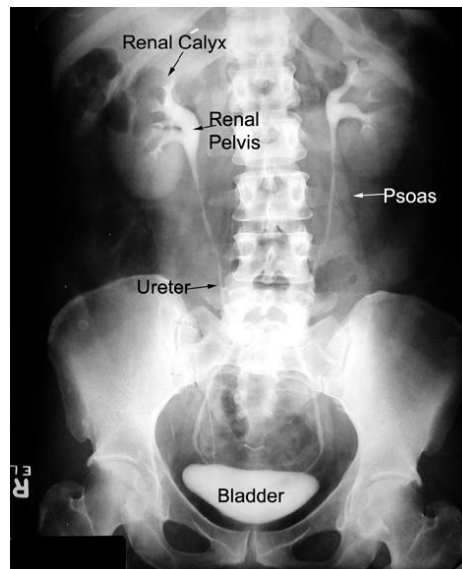
- ✓ Plain abdominal film (KUB: Kidney, Ureter, Bladder): only radiopaque stones which are around 5 mm in size will be seen. In such films, ureters pass along tips of transverse processes → sacroiliac joints to ischial spines → ending in urinary bladder near pubic tubercle.



- ✓ Renal ultrasound: it is useful in patients who should avoid radiation (such as pregnancy women).
- ✓ Non-contrast CT-scan (most accurate):
 - ❖ Useful in diagnosing small stones (95% sensitivity).
 - ❖ Also diagnosing hydronephrosis, hydroureter and perinephric stranding.



- ✓ Intravenous Pyelogram (IVP: not usually used):
 - ❖ It is an x-ray which provides pictures of the kidneys, ureters, bladder and urethra. It shows the size, shape and position of urinary tract and it can evaluate the collecting system inside the kidneys.
 - ❖ A contrast material is injected into a vein in patient's arm. A series of x-ray pictures in then taken at timed intervals.



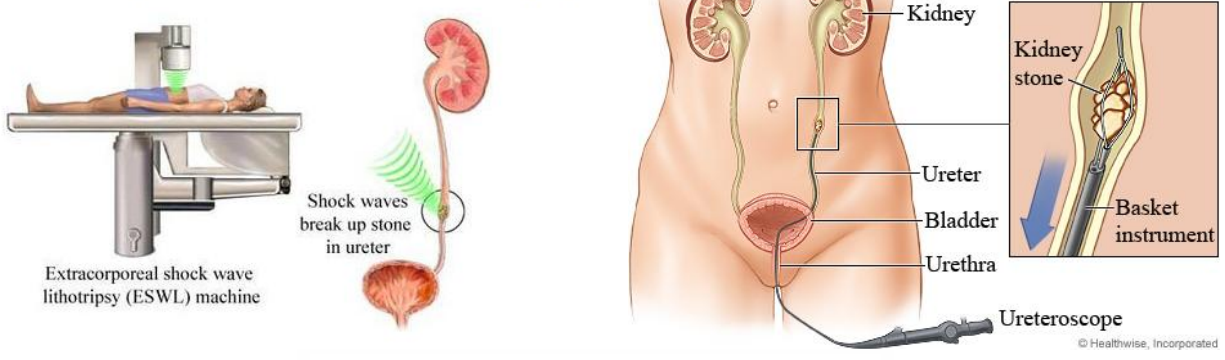
- **Management:**

- ✓ Analgesia: you might use
 - ❖ NSAID's.
 - ❖ Opiates.
- ✓ IV or PO (oral) hydration.
- ✓ For stones which are unlikely to pass by themselves:
 - ❖ *Extracorporeal Shockwave Lithotripsy (ESWL):* effective for stones visible on plain abdominal films.
 - ❖ *Ureteroscopy with stones extraction:* for ureteral stones and small renal stones.

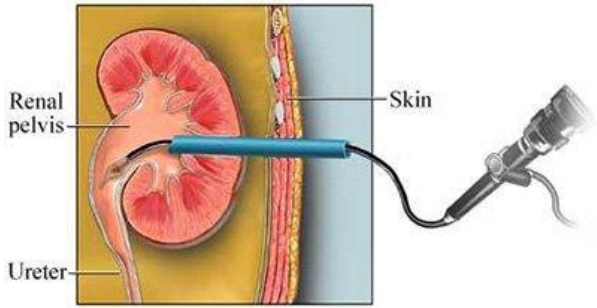


❖ *Percutaneous nephrolithotomy*: establishes a tract from the skin to the collecting system. It is used when stones are too large or too hard for lithotripsy.

Extracorporeal Shockwave Lithotripsy



Percutaneous Nephrolithotomy



-
- **There are mainly 4 causes for generalized edema:**
 - Heart disease (congestive heart failure).
 - Liver disease (cirrhosis).
 - Kidney disease (nephrotic syndrome).
 - ↓ albumin.
 - **What are your differentials for localized edema (limb swelling)?**
 - **Acute venous obstruction** (DVT: discussed in vascular notes): those who are at risk
 - ✓ History of malignancy.
 - ✓ Obese.
 - ✓ Elderly (immobilization).
 - ✓ Pregnant females.
 - ✓ Those with sepsis.
 - **Lymphedema** (discussed in vascular notes): these patients are more prone to get infections.
 - **Cellulitis:**
 - ✓ Definition: it is a bacterial infection of the skin showing the cardinal signs of inflammation (swelling, pain, redness and warmth). Skin on lower legs is most commonly affected.
 - ✓ Causes: occurs when bacteria (most commonly Streptococcus and Staphylococcus) enter through a crack in the skin.
 - ✓ Risk factors:
 - ❖ Injury to the skin or skin disorders (example: eczema): forming an entry point for bacteria.
 - ❖ Weakened immune system (diabetes, AIDS... etc): ↑ risk for infections.
 - ❖ Lymphedema or past history of cellulitis.





- ✓ Investigations (mostly it is a clinical diagnosis):
 - ❖ CBC and differentials.
 - ❖ D-dimer (to exclude DVT).
 - ❖ Biochemistry and LFTs (to assess general health of the patient).
 - ❖ Wound culture (if a wound is present).

- Acute abdomen (appendicitis and cholecystitis are discussed in other notes; only acute pancreatitis will be discussed here):

• **Surgical causes of abdominal pain:**

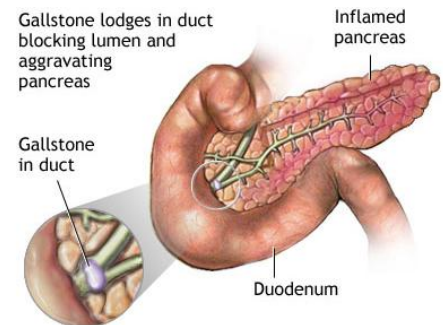
Right Upper Quadrant (RUQ)	<ul style="list-style-type: none"> • Perforated duodenal ulcer. • Acute cholecystitis. • Hepatic abscess. • Retrocecal appendicitis. • Appendicitis in a pregnant woman (displaced appendix due to distended uterus).
Right Lower Quadrant (RLQ)	<ul style="list-style-type: none"> • Appendicitis. • Cecal diverticulitis. • Meckle's diverticulitis. • Intussusception. • Ovarian pathology.
Left Upper Quadrant (LUQ)	<ul style="list-style-type: none"> • Splenic rupture. • Splenic abscess.
Left Lower Quadrant (LLQ)	<ul style="list-style-type: none"> • Sigmoid diverticulitis. • Volvulus. • Ovarian pathology.

• **Acute pancreatitis:**

- ✓ Definition: acute inflammation of the pancreas due to parenchymal autodigestion by pancreatic enzymes.

✓ Causes of acute pancreatitis (PANCREATITIS):

- ❖ *P*: Posterior perforation of peptic ulcer.
- ❖ *A*: Alcohol (40%).
- ❖ *N*: Neoplasm (causing obstruction of pancreatic duct).
- ❖ *C*: Cholelithiasis (40%).
- ❖ *R*: Renal disease (ESRD).
- ❖ *E*: ERCP.
- ❖ *A*: Anorexia (malnutrition).
- ❖ *T*: Trauma.
- ❖ *I*: Infections.
- ❖ *T*: Toxins (drugs MEDVIPS: Methyldopa/Metronidazole; Estrogen; Didanosine; Valproic acid; Isoniazid; Pentamidine and Sulfonamides).
- ❖ *I*: Incineration (burn).
- ❖ *S*: Surgery/Scorpion bite.

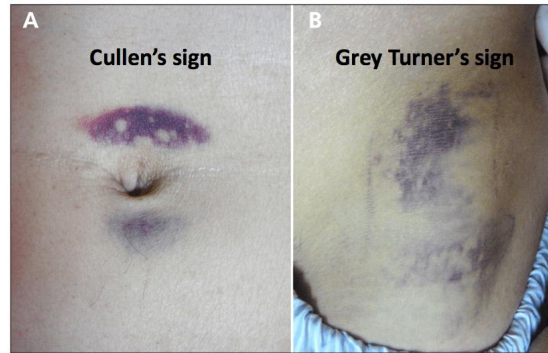


✓ Signs and symptoms:

- ❖ Severe, constant epigastric pain which radiates to the back (why?) → because pancreas is a retroperitoneal organ which is innervated by the celiac plexus. This pain is aggravated by fatty food and relieved by leaning forward.
- ❖ Nausea and vomiting.
- ❖ Low-grade fever.
- ❖ Tachycardia and tachypnea.
- ❖ Tenderness of upper abdomen.



- ❖ *Severe hemorrhagic pancreatitis*: Cullen's sign (bluish discoloration of periumbilical area) and Turner's sign (bluish discoloration of the flank).



✓ Diagnosis:

❖ *Laboratory:*

- ↑ lipase: which is more specific than amylase for pancreatitis.
- ↑ amylase: not specific because it is also found in salivary glands, small intestine, ovaries, testes and skeletal muscles. A level three times higher than the upper border of the normal range is suggestive of pancreatitis.

❖ *Abdominal imaging:*

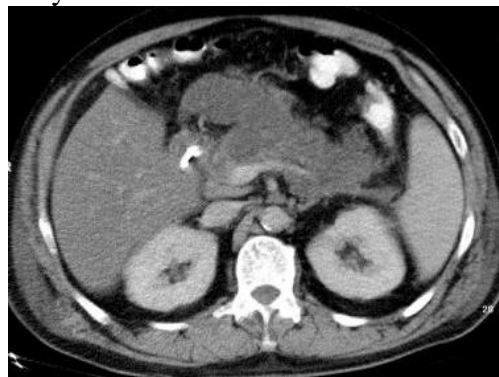
➤ Abdominal X-ray:

- Sentinel loop sign: it is a sign seen on a radiograph which indicates localized ileus from nearby inflammation.
- Colon cutoff sign: gaseous distention seen in proximal colon and associated with narrowing of the splenic flexure in cases of acute pancreatitis.



➤ Ultrasound but CT-scan is the diagnostic test of choice which shows:

- Degree of pancreatitis.
- Complications of pancreatitis: abscess, necrosis or pseudocyst formation.





✓ Treatment:

- ❖ Bed rest.
- ❖ NPO.
- ❖ Analgesia: avoid using morphine as it causes spasm of sphincter of Oddi.
- ❖ Aggressive hydration with electrolyte monitoring.
- ❖ Antibiotics: if infection is identified.
- ❖ *Indications of surgery:*
 - Presence of complications: necrosis, hemorrhage or pseudocyst.
 - Correction of associated biliary disease (gallstone pancreatitis).