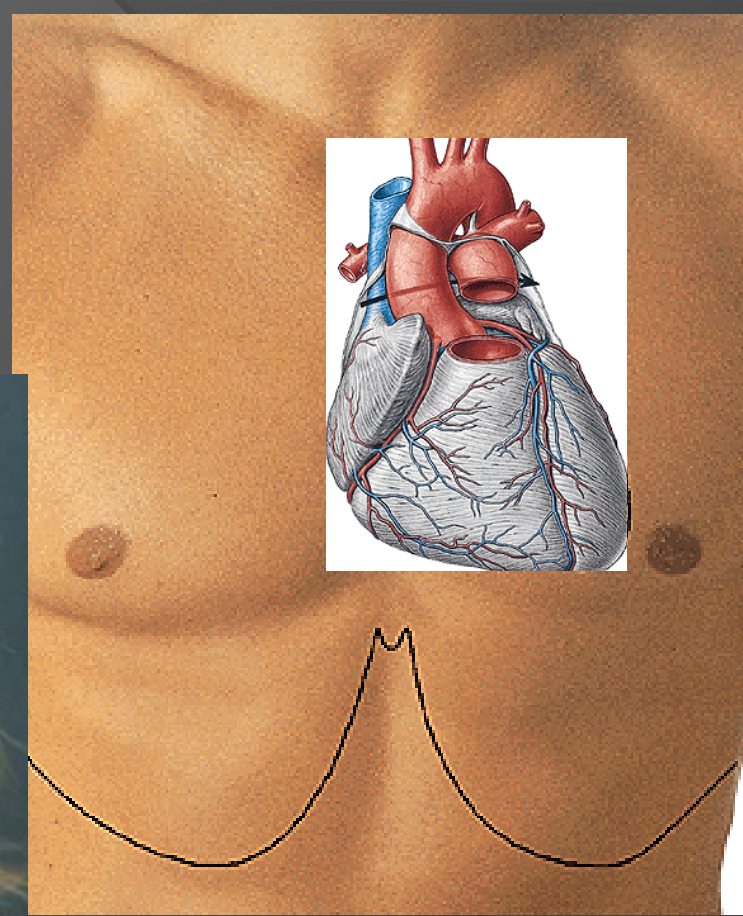


# PRE-OP A&P IN PT WITH CARDIAC DISEASES AND



Dr: Al- anesi ,Abdulkareem  
Pediatrician

# Topics

- **Introduction**
  - GA and Heart performance
  - special cardiac risk factors
- **Pre-op cardiac assessment & preparation**
  1. **Assessment of overall status**
  2. **Cardiac surgery**
  3. **Non-cardiac surgery in Pt with cardiac diseases**
    - congenital heart diseases (CHD)
    - Heart failure (CHF)
  4. **SBE prophylaxis**
- **Post-operative care**



# Introduction

All **anesthetic agents** can affect the normal cardiovascular system profoundly and adversely.

- 1- The sinus node, conduction system, **myocardial** contractility all can be depressed by general anesthetics.
- 2- These drugs alter both **preload** and **after load** by relaxing vascular smooth-muscle tone.
- 3- General anesthetics also attenuate hypoxic **pulmonary** vasoconstriction and thereby impair ventilation perfusion matching.

# Special **cardiac risks** for op /GA

- **Functional** shortage especially heart failure ,  
conductive abnormalities, HTn,
- **Structural** defects (depends of its functional  
implication and its interaction to GA agent and  
operation stress)
- **Cardiac surgery** or catheterization
- Risk of **SBE** and need for SBE prophylaxis.
- Variable effects of some **syndromes** that may involve  
difficult ETI, or presence of autism and other  
behavioral-communicative disorders.
- Inadequate pro-op **preparation e.g.1**: Prolonged pre-op  
fasting without IVF support □ hypovolemia  
**e.g.2**: The alkalotic, hypokalemic, hypercalcemic, hypotensive,  
dilated, digoxin-bound myocardium **fibrillates with ease**.

# Pre-operative Assessment



- **H**istory and **E**xamination :
  - 1- general Hx for the Pt. complaints
  - 2- relevant Hx :
    - S/S if **cardiac performance** (preload/congestion , pump action , postload/circulatory shortage )
    - **co-morbidities** and **complications**
    - **Type of surgery** :1- Emergency 2- Elective (CURATIVE, PALLITIVE )
- **Ped. cardiologist consultation** with direct communication with op. team
- **Lab, investigations** :
  - routine tests including CXR ,
  - relevant test : ECG, ECHO, cath!! etc .....accordingly

# The Golden rule

Complete and accurate pre-operative **judgment** of cardiac disease and its patho-physiological implication will lead to **predictable** intraoperative and post-operative course and thus **appropriate** management plan

Adequacy of **resuscitation**, rather than **severity** of illness at presentation, appears to influence postoperative **outcome**

# ambulatory surgical ?facilities

- Current use of cardiac medications,
- prolonged QT syndrome and
- residual cardiac disease

all disqualify a child from having procedures performed at freestanding ambulatory surgical facilities.



# CARDIAC SURGERY



# Preoperative Care of the Pediatric **Cardiac Surgical** Patient

- The Crucial point in this process is the continued **communication** among medical, surgical, and nursing disciplines.
- Optimal preoperative care involves (a) initial **stabilization**, airway management, and establishment of vascular access;

# Preoperative Care of the Pediatric Cardiac Surgical Patient

- (b) A complete and thorough non invasive delineation of the **anatomic** defect(s);
- (c) Resuscitation with evaluation and treatment of **secondary organ** dysfunction, particularly the brain, kidneys, and liver...
- (d) Preparation for cardiac **catheterization** if necessary.
- (e) **surgical** management when cardiac, pulmonary, renal, and central nervous systems are optimized.

# HEART FAILURE

# Table 70A.1. Signs of heart failure or low cardiac output states

- **Signs**

- Cool extremities/poor perfusion
- Oliguria and other end-organ failure
- Tachycardia
- Hypotension
- Acidosis
- Cardiomegaly
- Pleural effusions

**Monitor and measure**

- Heart rate, blood pressure, intracardiac pressure
- Extremity temperature, central temperature
- Urine output
- Mixed venous oxygen saturation
- Arterial blood gas pH and lactate
- Laboratory measures of end-organ function
- Echocardiography

# Ten intensive care **strategies** to diagnose and support low cardiac output states

- 1) Know the cardiac **anatomy** in detail and its **physiologic consequences**.
- 2) Understand the specialized considerations of the **newborn** and implications of reparative rather than palliative surgery.
- 3) Diversify personnel to include **expertise** in neonatal and adult congenital heart disease.
- 4) Monitor(invasive ), measure, and image the heart to rule out **residual** disease as a cause of postoperative hemodynamic instability or low cardiac output.

# Ten intensive care strategies to diagnose and support low cardiac output states

- 5) Maintain aortic **perfusion** and improve the contractile state.
- 6) Optimize **preload** (including a trial shunting).
- 7) Reduce **after load**.
- 8) Control **heart** rate, rhythm, and synchrony.
- 9) Optimize **heart-lung** interactions.
- 10) Provide **mechanical** support when needed.

Bidirectional  
Glenn shunt

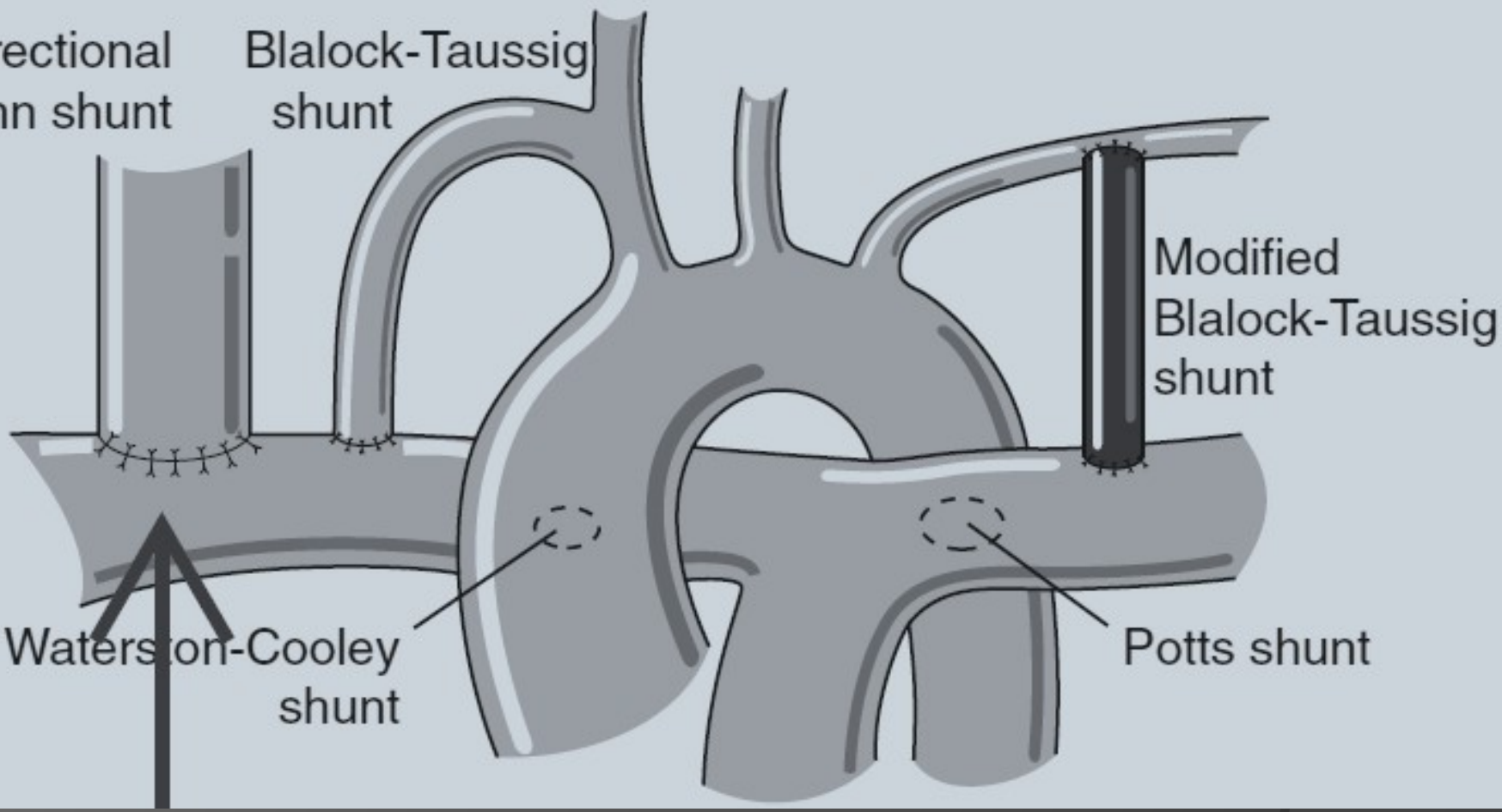
Blalock-Taussig  
shunt

Modified  
Blalock-Taussig  
shunt

Waterston-Cooley  
shunt

Potts shunt

# CONGENITAL HEART DISEASE



# Review CHD headlines

- **General** assessment and preparations
- Recognizing **innocent** murmurs
- Evaluation of **pathological** murmurs
- Full orientation about anatomical **defects** and its implication on cardiac **performance** with subsequent **complications**



# Heart Murmur – **Innocent**

1- **Innocent** murmurs through childhood(75% to 90%) most of these children will **not** require a cardiology consultation.

A).Still's murmur.

B).pulmonary murmur.

C). supraclavicular bruit..

# Heart Murmur – **pathological**

## Congenital heart disease

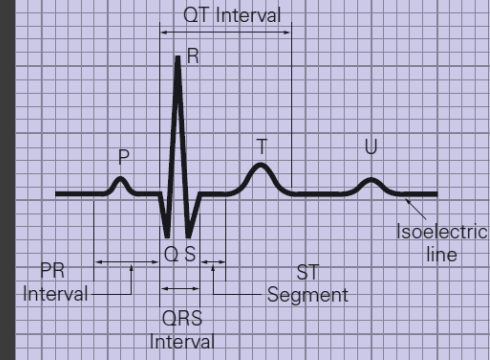
- **routine evaluation** : CHD (whether repaired or not) should have a cardiac evaluation within 1 year before surgery, even if asymptomatic.
- Current use of cardiac **medication**.
- **co-morbidities:e.g.** prolonged QT syndrome and residual cardiac disease
- may require **SBE** prophylaxis

# Some **implications** of CHD

- **R**  $\square$  **L** shunt: risk of hypoxemia , polycythemia and embolic phenomenon
- Long-term **L**  $\square$  **R** shunt : pul. HTn, shunt reversal (E.S = in-operable)
- **Ebstein** anomaly : risk of arrhythmia
- Pulmonary **hypertension** : risk of some anesthetic drugs
- **Duct-dependent** CHD : sudden collapse, emergency use of PGE2 infusion
- Etc .....

# **SPECIAL CONDITIONS**

# Prolonged QT Syndrome



1. increased risk for **V.tac** (Torsades de pointes) either congenital genetic mutations or the effects of drugs or metabolic abnormalities on the ion channels responsible for repolarization.
2. so be vigilant and prepare suitable **anti-arrhythmic** drugs for intra-operative and post-operative period .
3. ensure that serum levels of potassium, calcium, and magnesium are normal.
4. **avoid** drugs that prolong QT interval

# Drugs that prolong QT interval

Dopamine, Droperidol, Ephedrine, Epinephrine  
Erythromycin, Felbamate, Flecainide, Foscarnet  
Fosphenytoin, Gemifloxacin, Granisetron, Halofantrine  
Haloperidol, Isoproterenol, Isradipine, Levalbuterol  
Levofloxacin, Lithium, Metaproterenol, Methadone  
Methylphenidate, Milodrine, Moxifloxacin, Nicardipine  
Norepinephrine, Octreotide, Ofloxacin, Ondansetron  
Pentamidine, Phenylephrine, Pimozide, Procainamide  
Pseudoephedrine, Quetiapine, Quinidine, Risperidone  
Salmeterol, Sotalol, Tacrolimus, Telithromycin  
Terbutaline, Thioridazine, Tizanidine, Venlafaxine  
Ziprasidone



# Williams Syndrome

Williams syndrome is a **constellation of** dysmorphic facies, intellectual disability, growth deficiency, neonatal hypercalcemia, genitourinary anomalies, and congenital heart disease.



The principal **cardiac** manifestation is supralvalvular **aortic stenosis**, which is often progressive. Pulmonary arterial obstruction is seen in 80% of cases.

**Other** end-organ manifestations include epilepsy, persistent hypercalcemia, hypothyroidism, renovascular hypertension, and proteinuria.

**Sudden death** is estimated to occur in at least 3% of patients with Williams syndrome; many deaths occur during the perioperative period (myocardial ischemia, decreased cardiac output, and ventricular dysrhythmias (Holter monitor)).



# Williams Syndrome - preparations

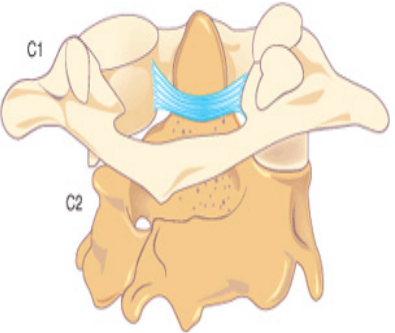
- Full **evaluation** for heart function (including outflow tract) and co-morbidities in other systems .
- High risk **consent** .
- Anesthetic induction must be performed with great care, **avoiding** extremes in heart rate and blood pressure.



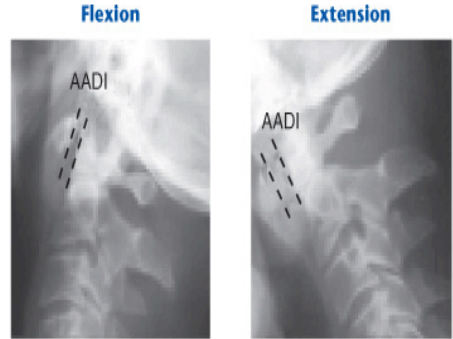
# DOWN SYNDROME



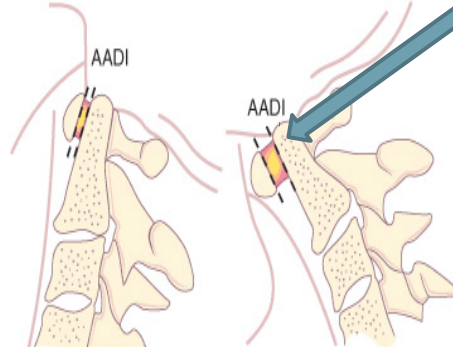
- 40-50% associated **CHD**, often requiring **surgical correction**. As well as the need for **SBE** prophylaxis.
- increased risk of **OSAS** and **Pul.** **Hypertension** and Pulmonary vascular disease results from these lesions,
- **Difficult ETI** due to : mid-face hypoplasia, smaller trachea(ETT must 1-2smaller size than peers) , OSAS, and risk of cervical spine subluxation (neck-protection strategies )



**Figure 62-9.** Relationship of the arch of C1 and odontoid process of C2. (Hata T, Todd MM. *Cervical spine considerations when anesthetizing patients with Down syndrome.* Anesthesiology. 2005;102:680-685. Reprinted by permission of Lippincott Williams & Wilkins.)



XR in Pt younger than 3 years ??



**Figure 62-10.** Increased distance (subluxation) between C1 and odontoid in Down syndrome. (Hata T, Todd MM. *Cervical spine considerations when anesthetizing patients with Down syndrome.* Anesthesiology. 2005;102:680-685. Reprinted by permission of Lippincott Williams & Wilkins.)

atlantodens interval of **greater than 5 mm** (usually maximal in the flexion view), then the child **should be referred** for orthopedic or neuro-surgical consultation before elective surgery



# **SUBACUTE BACTERIAL ENDOCARDITIS PROPHYLAXIS**

**Antibiotic prophylaxis to prevent bacterial endocarditis has long been recommended For children who have congenital heart disease and are undergoing any procedure in which the patient is at risk for transient bacteremia .**

# SUBACUTE BACTERIAL ENDOCARDITIS PROPHYLAXIS

**Oral** endotracheal intubation by itself is not an indication for SBE prophylaxis, but **nasotracheal** intubation requires it.

Patients with **hemodynamically insignificant** lesions such as bicuspid aortic valve , mitral valve prolapse no longer require prophylaxis for any procedure.

# SUBACUTE BACTERIAL ENDOCARDITIS PROPHYLAXIS

Patients with congenital heart disease repaired with prosthetic material require prophylaxis only for the first **6 months** after repair, after which endothelialization has occurred. Such is the case for VSD as well as ASD repairs as long as no residual defect is present.

Patients with prosthetic valves or those palliated with shunts or conduits **require** prophylaxis.



## BOX 7-4

### CARDIAC CONDITIONS FOR WHICH ANTIBIOTIC PROPHYLAXIS IS RECOMMENDED FOR DENTAL, RESPIRATORY TRACT, INFECTED SKIN, SKIN STRUCTURES, OR MUSCULOSKELETAL TISSUE PROCEDURES

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- Prosthetic cardiac valve
- Previous bacterial endocarditis
- Congenital heart disease (CHD)—Limited to the following conditions\*
  - Unrepaired cyanotic defect, including palliative shunts and conduits
  - Completely repaired CHD with prosthetic material/device (placed by surgery or catheterization), during first 6 months after procedure<sup>†</sup>
  - Repaired CHD with residual defects at or adjacent to the site of prosthetic patch or device (which inhibit endothelialization)
  - Cardiac transplantation patients who develop cardiac valvulopathy

\*Conditions associated with the highest risk of adverse outcome from endocarditis.

<sup>†</sup>Endothelialization process of prosthetic material occurs within 6 months after the procedure.

- 1- Are rheumatic heart diseases still an indication for SBE prophylaxis ??
- 2- Are Pts on LABP for RHD , still need EBE prophylaxis (if involved in previous indications )

## Key Points in Preoperative Care

- Pediatric cardiac intensive care has emerged as an important and necessary subspecialty.
- The complexity of heart disease and the expertise necessary to treat these patients require multidisciplinary training and collaborative, integrated care.
- Expertise is required for care of premature and full-term newborns, infants, and children, as well as rapidly growing numbers of adults with long-term survival and continuing need for care of their CHD.
- Reparative surgery in the newborn is the objective of advanced cardiovascular programs whenever feasible.
- Diagnosis is usually based in echocardiography and physical examination, with catheterization reserved usually for complex cases or interventional procedures.
- Adequate resuscitation of preoperative patients is essential to good outcomes.
- Balancing single-ventricle physiology and maintaining adequate cardiac output is important to achieving preoperative stabilization.
- Risk stratification and identification of biologic markers are maturing as useful tool sets to guide therapy and benchmarks for outcomes.
- Therapies for the future will target genetic factors and tailor treatments to the polymorphisms and individual inherited profiles of patients.
- Fetal diagnosis will increasingly continue to provide advanced knowledge, counseling, and therapeutic planning and eventually eliminate unanticipated postnatal circulatory collapse.

# **POST-OPERATIVE CARE**

# Assessment and supports

- Assessment: verify the **accuracy** of the preoperative diagnosis depending on intra-op findings and the **adequacy** of the surgical repair. And bulk of **supportive therapy** needed in post-op state.
- **Standard** post-op care: stabilization, supportive & symptomatic
- Cardiac **monitoring &** strategies to improve C.O.P.
- Search for special **anticipated** complications , ( e.g. arrhythmias, hypoperfusion.... ) and deal according previously constructed plan .
- Effects of cardiopulmonary bypass (**CPB**) in cardiac surgery which may include ; hypothermia, alkalosis, generalized SIR, platelets dysfunction and deficiency , ....

## Key Points post cardiac operation

- Know the anatomy and surgical procedure in detail.
- Search systematically for residual disease in the postoperative patient.
- Anticipate low cardiac output.
- Preserve right-to-left shunts for transient postoperative benefit in select patients.
- Optimize afterload reduction and avoid high doses of catecholamines.
- Appreciate heart-lung interactions and effects of positive-pressure breathing.
- Understand limitations and opportunities to manipulate single-ventricle physiology.
- Estimate the limit of cardiac reserve at the nadir of postoperative cardiac output.
- Embrace mechanical support of the circulation as a vital tool for bridge to recovery, bridge to transplantation as well as destination therapy.
- The management of the postoperative pediatric cardiac surgical patient requires a comprehensive understanding of the basic principles of oxygen delivery, cardiovascular physiology, and the anatomy and physiology of congenital heart disease.
- Signs and symptoms of low cardiac output syndrome should be treated aggressively, and diagnostic and therapeutic strategies should address both universal and lesion-specific problems.

# **Postoperative complications**

## **1- VENOUS THROMBOEMBOLISM**

**Although not as common as in adults, venous thrombo-embolism (VTE) occurs in children in the postoperative period, with the incidence increasing in adolescence.**

# Postoperative complications

## 1- VENOUS THROMBOEMBOLISM

- The primary care physician should be **alert** to symptoms of VTE, such as extremity pain, swelling, and discoloration, which may indicate deep-vein thrombosis and should be referred for immediate evaluation.
- Patients at highest **risk** are those who are immobilized after surgery and have at least 1 other risk factor. Risk factors for VTE are listed.

### **Box 63-2 Risk Factors for Venous Thromboembolism (VTE) in the Postoperative Period**

Immobility

Major lower extremity orthopedic surgery

Spinal cord injury

Major trauma or trauma to the lower extremities

Previous history of deep-vein thrombosis or VTE or pulmonary embolism

Pregnancy

Oral contraceptive use

Inflammatory bowel disease

Nephrotic syndrome

Burns

Obesity

Central venous catheter in the lower extremity

Known acquired or inherited thrombophilia

Acute infection



# Postoperative complications

## 1- VENOUS THROMBOEMBOLISM

Patients who develop VTE are at risk for pulmonary **embolism**, which has a mortality rate as high as 20%.

**Symptoms** of pulmonary embolism include dyspnea, chest pain, cough, hemoptysis, and fever. Patients at risk for VTE should receive prophylactic measures, which may include compression stockings or pneumatic sequential compression devices (or both) until ambulatory.

# Postoperative complications

## 1- VENOUS THROMBOEMBOLISM

- Patients with 3 or more risk factors may be **treated** with pharmacologic prophylaxis: subcutaneous heparin or low-molecular-weight heparin.

لكم خالص  
التحية و  
الاحترام

