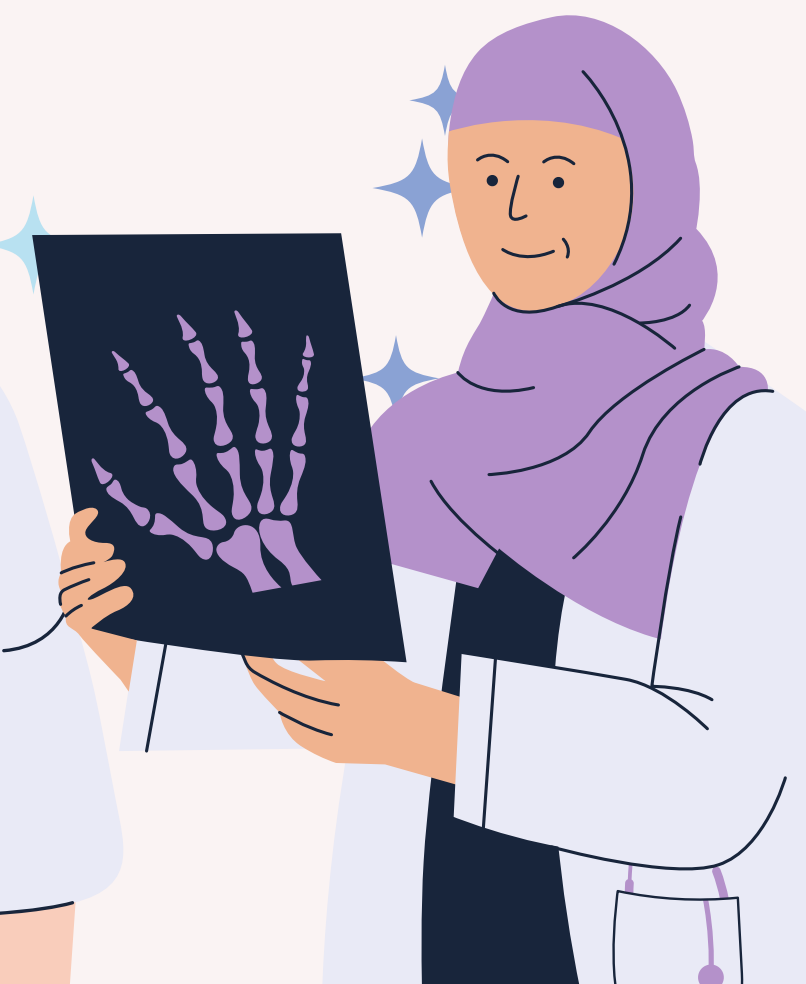
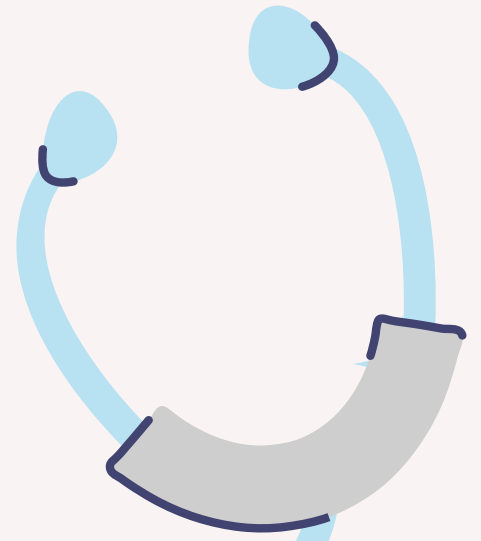
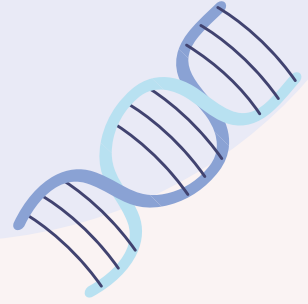


# **Perioperative care**

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**Hamza Alhusami**  
**Randa Alzughair**  
**Lujain alrtail**  
**Hadeel Tarawneh**

# Introduction

- **The main goal of preoperative assessment is to improve the outcome of surgery and anaesthesia.**
- **Consultation by an anaesthetist is essential for the medical assessment of a patient prior to anaesthesia for surgery or any other procedure to ensure that the patient is in optimal condition for the procedure.**
- **Clinical history & examination based assessment has to be carried out initially followed by the appropriate investigations where indicated.**

# Objectives of pre-operative assessment

1. Identify potential anaesthetic difficulties.

2. Identify existing medical conditions.

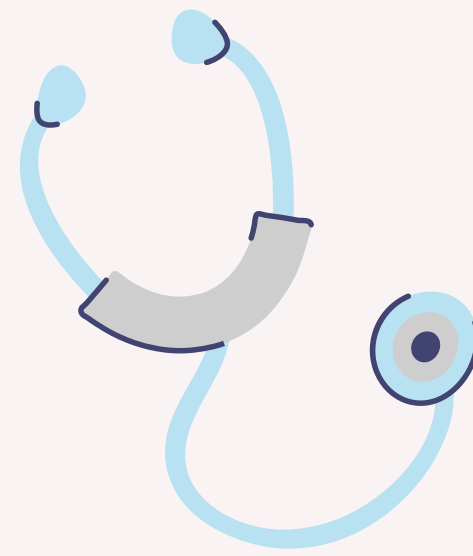
3. Improve safety by assessing and quantifying risk.

4. Allowing planning of peri-operative care.

5. Provide opportunity for explanation and discussion to allay fear and anxiety



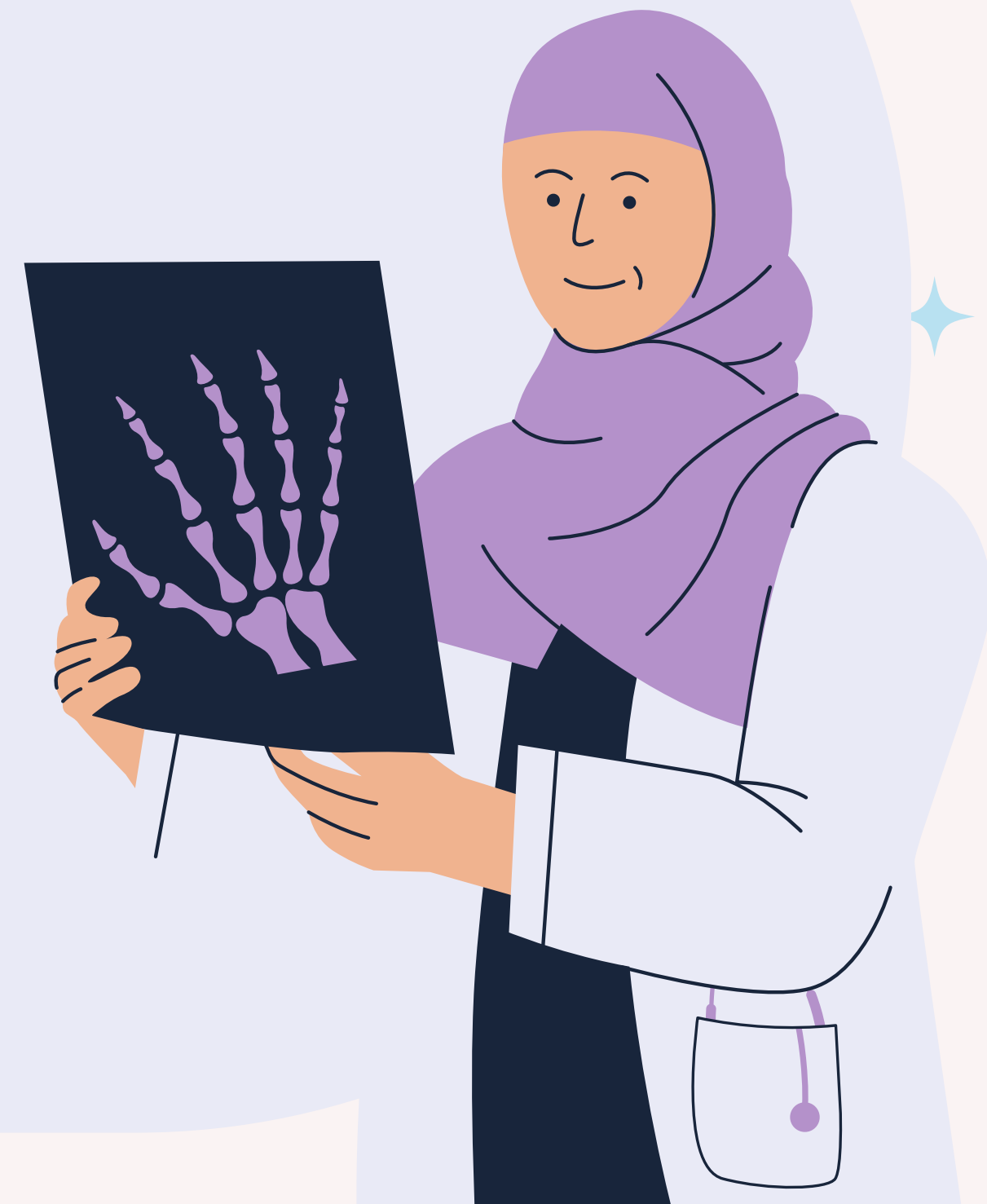
# The goal



- The goal of the evaluation of the healthy patient is:
- To detect unrecognized disease and risk factors that may increase the risk of surgery above baseline
- To propose strategies to reduce this risk

# Preoperative Evaluation

- History and physical exam
- Blood tests: CBC, chemistries
- EKG
- Cardiac stress test
- Chest x-ray
- Pulmonary function tests



# Age

- Much of the risk associated with age is due to increasing numbers of comorbidities (as cognitive or functional impairment, malnutrition, and frailty).
- Age should not be used as the sole criterion to guide preoperative testing or to withhold a surgical procedure.





## • Past medical & surgical Hx

- 
- 
- Many diseases have direct effect on general and anesthetic treatment and outcome
  - Any previous operation or bleeding tendency
  - Any previous reaction to anaesthetic agent



## • Drugs & allergic Hx

- interaction with anesthesia
- (MAOI
- Related with sudden withdrawal steroids)
- Drugs for HTN, IHD to be continued over perioperative period
- Anticoagulant drugs (aspirin, warfarin)
- HRT

## • Family history

- Malignant Hyperthermia
- Pseudo cholinesterase deficiency
- Bleeding disorders



## • Social history

Smoking:

- Short term :  
Increased myocardial oxygen demand and decreased oxygen delivery
- Long term:  
decreased immune function and decreased clearance



# Physical examination

- Includes a full physical examination
- Don't rely on the ex. of others. Surgical signs may change and others may miss imp pathology
- "What mind doesn't know, eyes cant see"
- No step is omitted and added advantage of familiarizing what is normal so that abnormalities can be more recognised

# Physical examination

- **General Ex. Including vitals.**
- **Cardiac ex. (JVP, HS)**
- **Respiratory Ex. (trachea, accessory ms, percussion, auscultation)**
- **Abdominal Ex.**
- **CNS**
- **Musculoskeletal system**
- **Peripheral vasculature**
- **Local Ex**
- **Body orifice**



# **Emergency** **physical** **examination**



- **The routine examination must be altered to fit the circumstances.**
- **A,B,C.D,E**
- **Secondary survey( head to toe)**
- **When a number of emergencies present at same time-Triage**

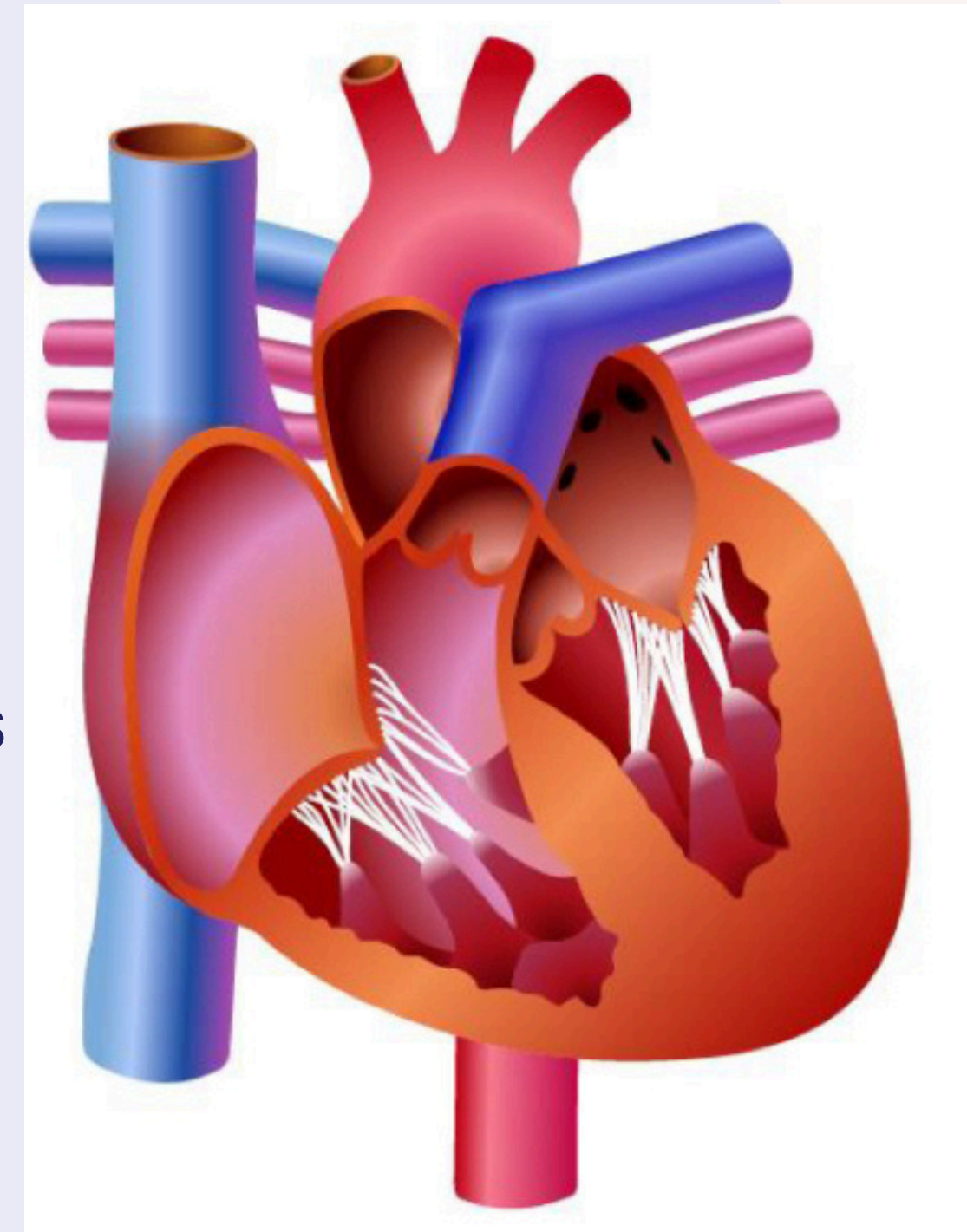




# Preoperative evaluation

## Cardiovascular assessment

- History and physical exam  
Acute coronary syndrome or acute heart failure  
Treat or stabilize ACS or HF prior to surgery
- EKG  
Usually done prior to surgery  
Not absolutely necessary in completely healthy patients
- If no evidence of ACS or HF → proceed to surgery  
No stress testing or other cardiac testing indicated
- One exception: elective vascular surgery





# Preoperative evaluation

## Elective vascular surgery

- AAA repair
- Femoral-popliteal bypass
- Carotid endarterectomy
- Surgery can be safely delayed
- Pre-operative stress test sometimes indicated
  1. Only if patient functionally limited
  2. Only if patient has risk factors
  3. Only if abnormal result with change management

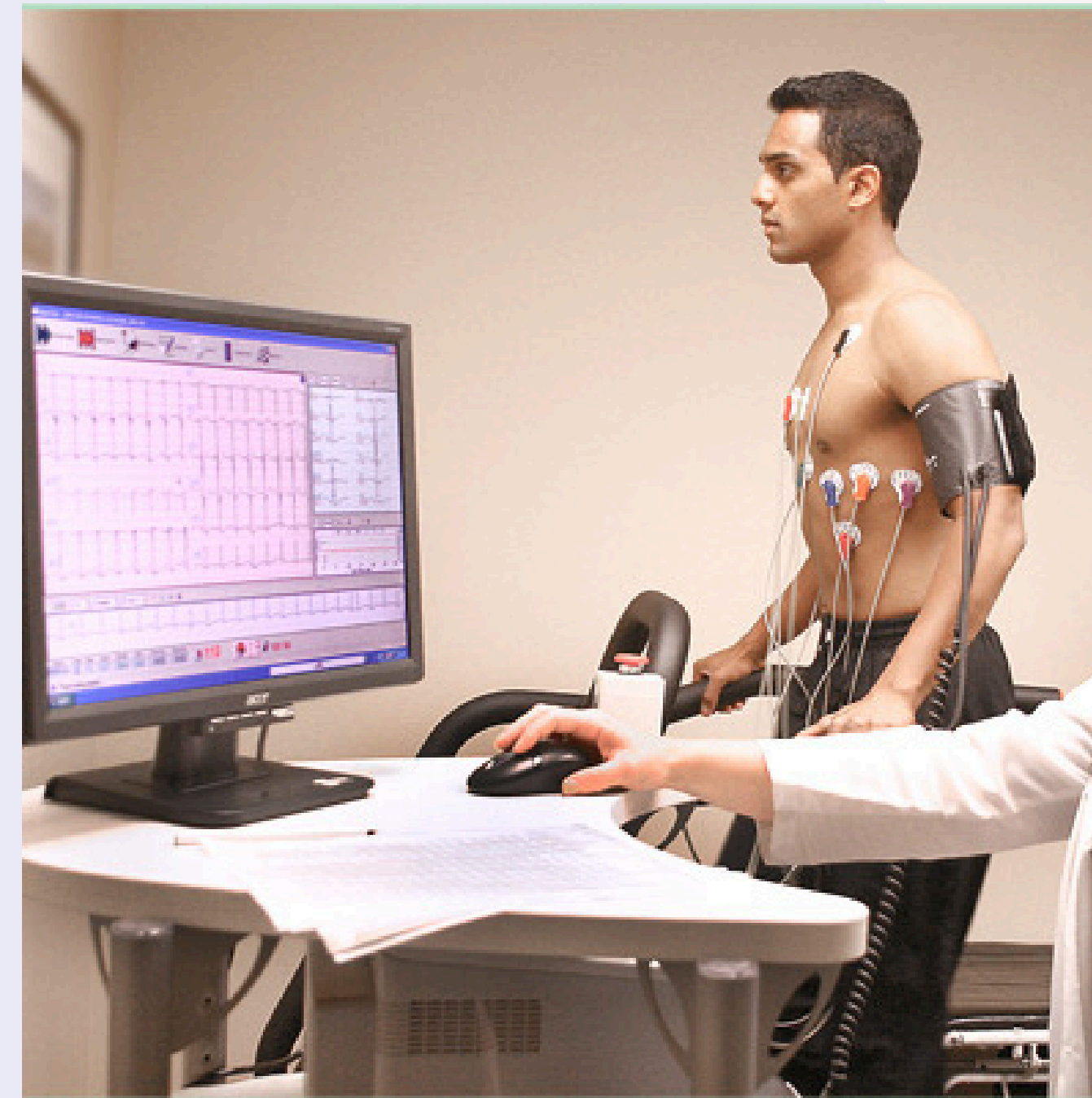




# Preoperative evaluation

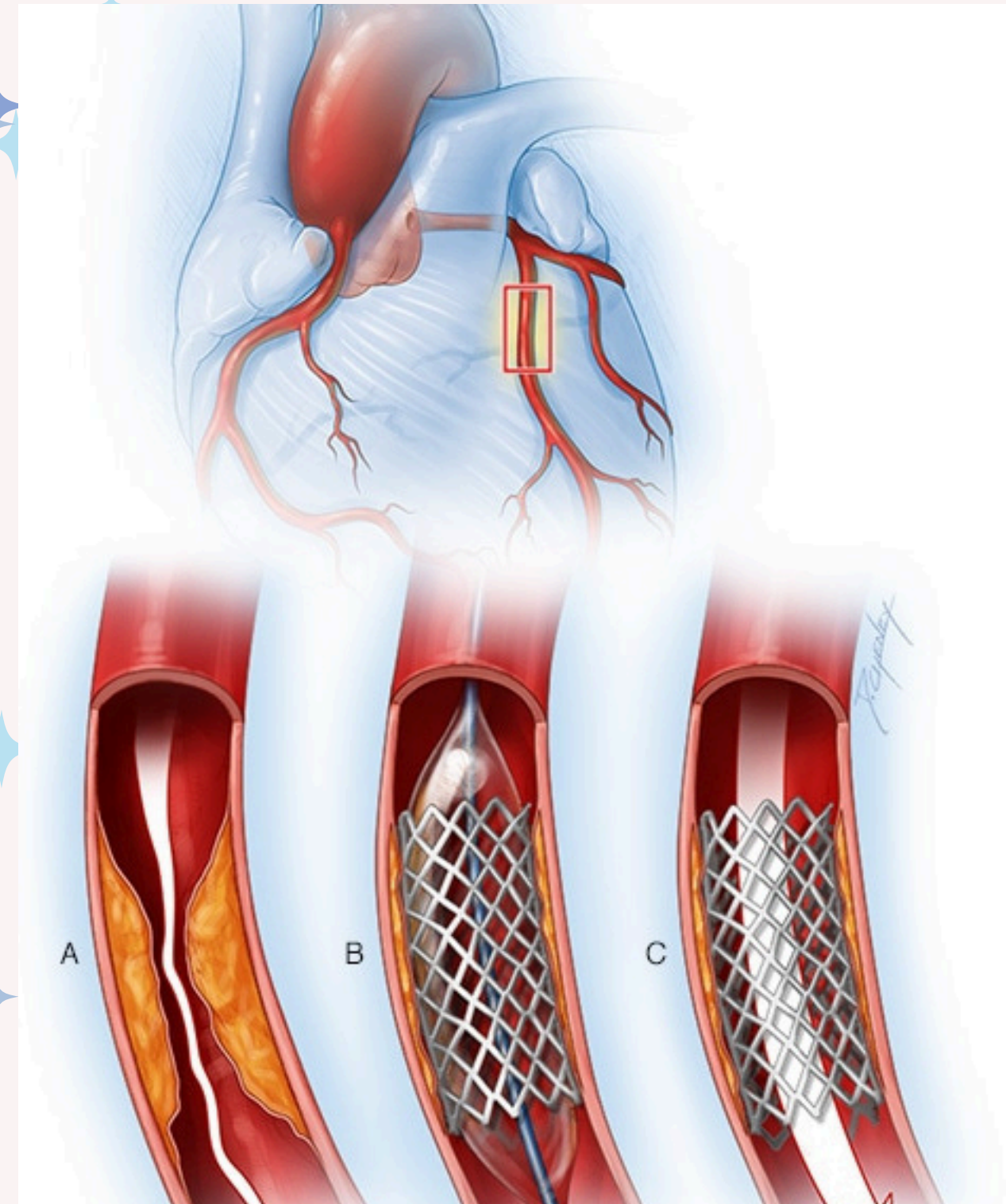
## Stress test

- Major decision in elective surgery: stress test?
- May identify critical coronary disease
- In theory, revascularization may reduce risk of post-op MI
- Little data showing benefit of revascularization before surgery
- Stress test only indicated before elective vascular surgery in select patients



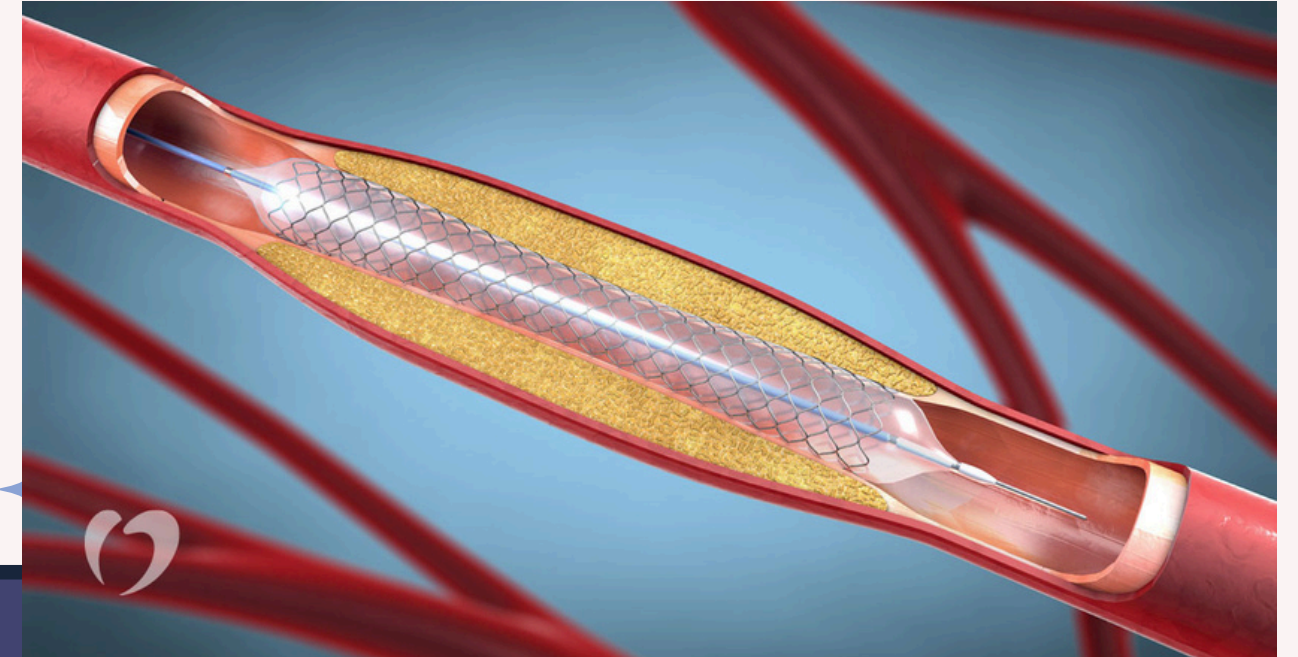
# Coronary stents

- Dual antiplatelet therapy (DAPT) after implantation  
(Aspirin plus clopidogrel/ticagrelor/prasugrel)
  - Reduces risk of stent thrombosis
  - Recommended DAPT duration: 6 to 12 months
  - After 6 to 12 months: lifelong aspirin (81mg)



# Preoperative evaluation

## Cardiovascular assessment



### Recent (< 6 months) coronary drug-eluting stent implantation

- Dual antiplatelet therapy recommended for 6 months
- Discontinuation of DAPT associated with stent thrombosis
- Consider delay surgery or perform on DAPT

### Remote (> 6 months) coronary DES implantation

- Discontinue antiplatelet therapy prior to surgery
- Restart after surgery

### Special case: bare metal stents

- Lower risk of stent thrombosis
- May discontinue DAPT after 1 month

# Preoperative evaluation

## Cardiovascular assessment

- **Recent acute coronary syndrome**

- Delay surgery until 60days

Anterior ST-elevation Myocardial Infraction



- **Most cardiac conditions do not prohibit surgery**

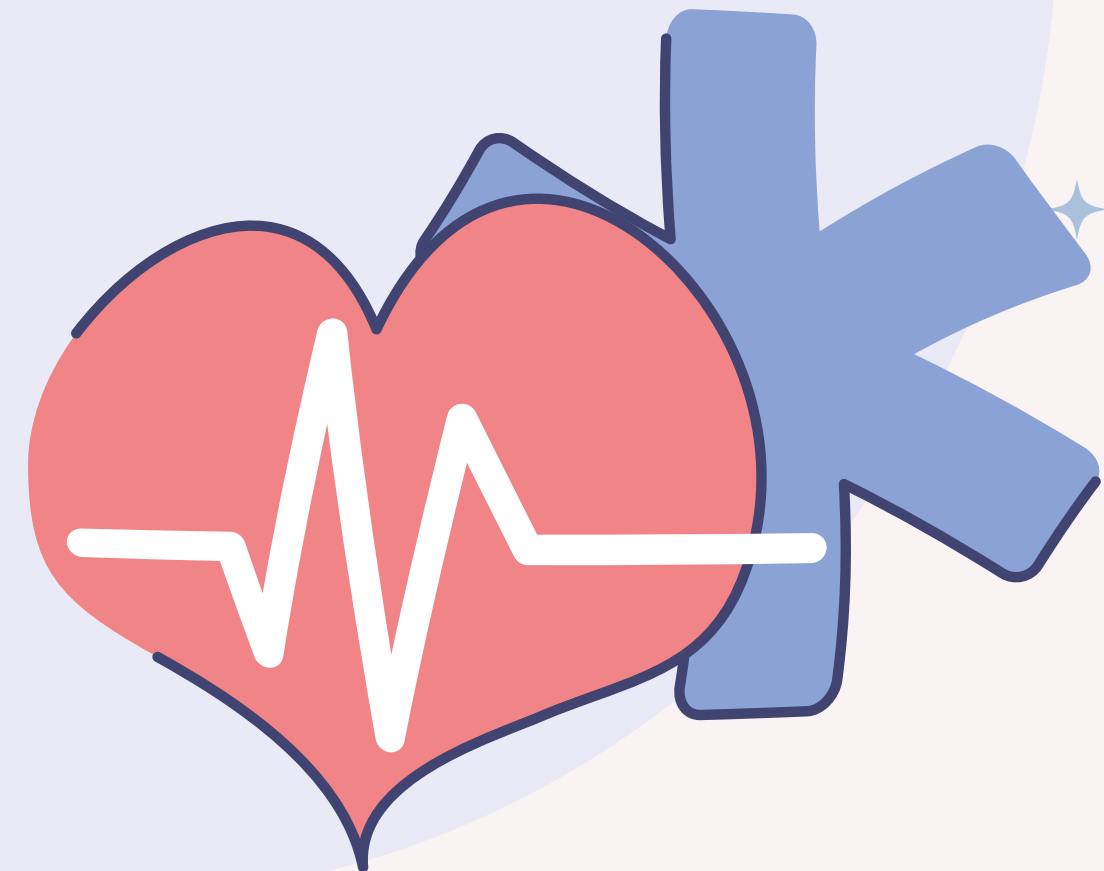
1. Coronary artery disease
2. Cardiomyopathy
3. Heart failure
4. Prior cardiac arrest





# Cardiovascular system

- The contribution of cardiovascular disease to perioperative mortality in noncardiac surgery is significant
- In US, about 30% of patients undergoing surgery have significant coronary artery disease or other cardiac co morbid condition
- Much of the preoperative risk assessment and patient preparation centers on cardiovascular disease



# CARDIAC RISK INDICES

- Various assessment tools for stratification of the cardiovascular portion of anesthetic risk have been devised:
- **Goldman Cardiac Risk Index, 1977**
- **Detsky Modified Multifactorial Index. 1986**
- **Eagle's Criteria for Cardiac Assess, ent, 1989**
- **Revised Cardiac Risk Index**

# Goldman Risk Index

|    | Risk Factor                                             | Points |
|----|---------------------------------------------------------|--------|
| 1) | Presence of heart failure signs (ventricular gallop S3) | 11     |
| 2) | Recent Myocardial Infarction                            | 10     |
| 3) | Arrhythmia                                              | 7      |
| 4) | >5 Premature Ventricular Contraction / Minute           | 7      |
| 5) | Age >70 Years                                           | 5      |
| 6) | Emergency Operations                                    | 4      |
| 7) | Poor General Health Condition                           | 3      |
| 8) | Intrathoracic, Intraperitoneal Or Aortic Surgery        | 3      |
| 9) | Severe Aortic Stenosis                                  | 3      |

# Revised Cardiac Risk Index

|    | Clinical Variable                                | Points |
|----|--------------------------------------------------|--------|
| 1) | High Risk Surgery                                | 1      |
| 2) | History Of Ischemic Heart Disease                | 1      |
| 3) | History Of Congestive Heart Failure              | 1      |
| 4) | History Of Cerebrovascular Disease               | 1      |
| 5) | Insulin Treatment For Diabetes Mellitus          | 1      |
| 6) | Pre Operative Serum Creatinine Level > 2.0 mg/dl | 1      |

| Class | Points  | Risk Of Cardiac Complications | Problem Of Life Threatening Complications | Chances of Cardiac Death |
|-------|---------|-------------------------------|-------------------------------------------|--------------------------|
| 1     | 0 – 5   | 1%                            | 0.7%                                      | 0.2%                     |
| 2     | 6 – 12  | 7%                            | 5%                                        | 2%                       |
| 3     | 12 – 25 | 14%                           | 11%                                       | 2%                       |
| 4     | 26 - 53 | 78%                           | 22%                                       | 56%                      |

Each increment in points increases risk for postoperative myocardial morbidity



# Preoperative evaluation

## Pulmonary

### COPD

- Optimize prior to surgery
- No prohibitive level of pulmonary function

### Asthma, obstructive sleep apnea

- Optimize prior to surgery

### Cigarette smoking

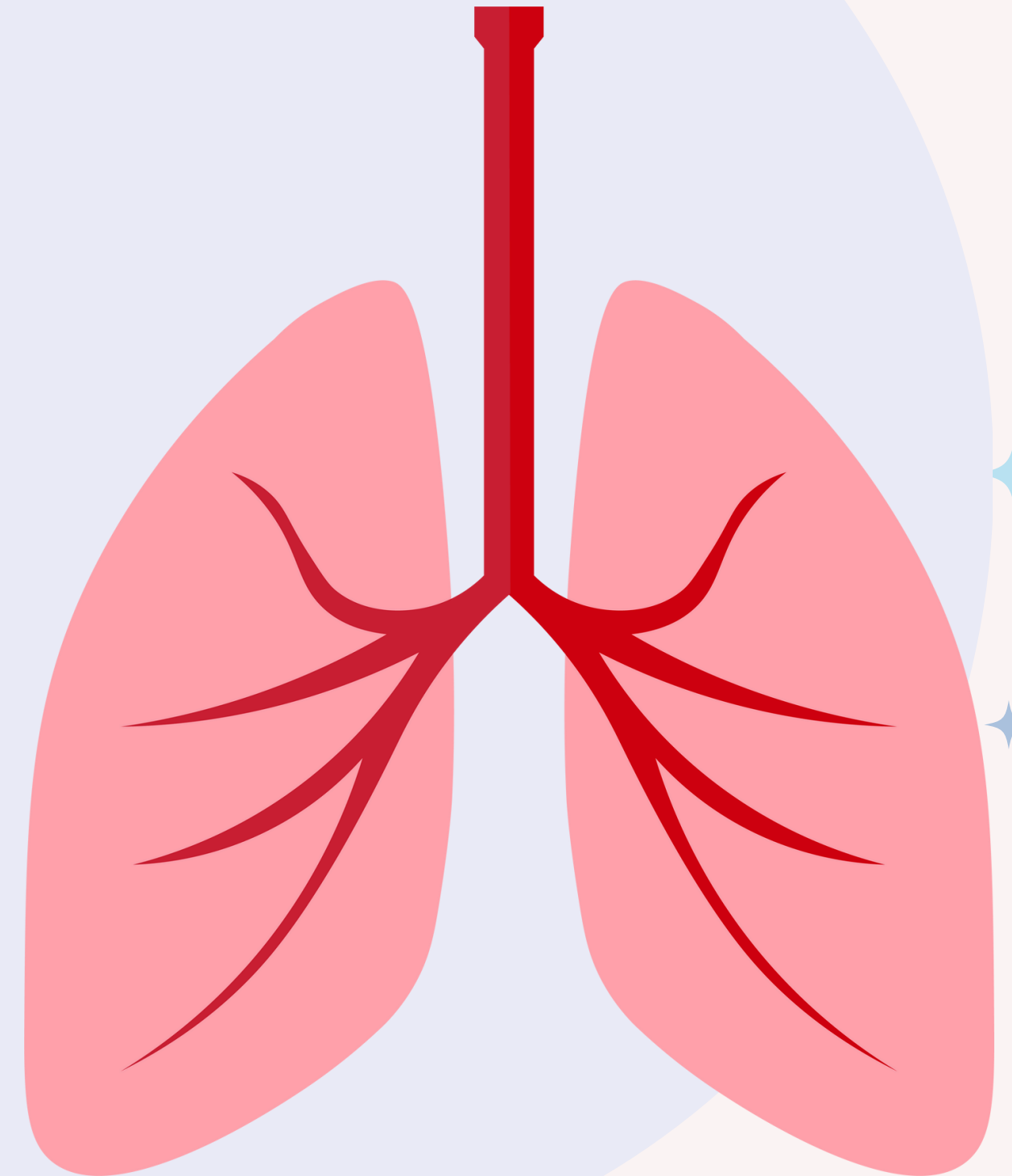
- Current smokers: increased risk post-op complications
- Quitting before surgery may reduce risk

### Chest x-ray

- Not routinely done unless specific indication

### Pulmonary function testing

- Not routinely done unless specific indication





# Preoperative evaluation

## Hematology

High risk of bleeding with low platelets or coagulopathy

**Goal platelets: > 50,000**

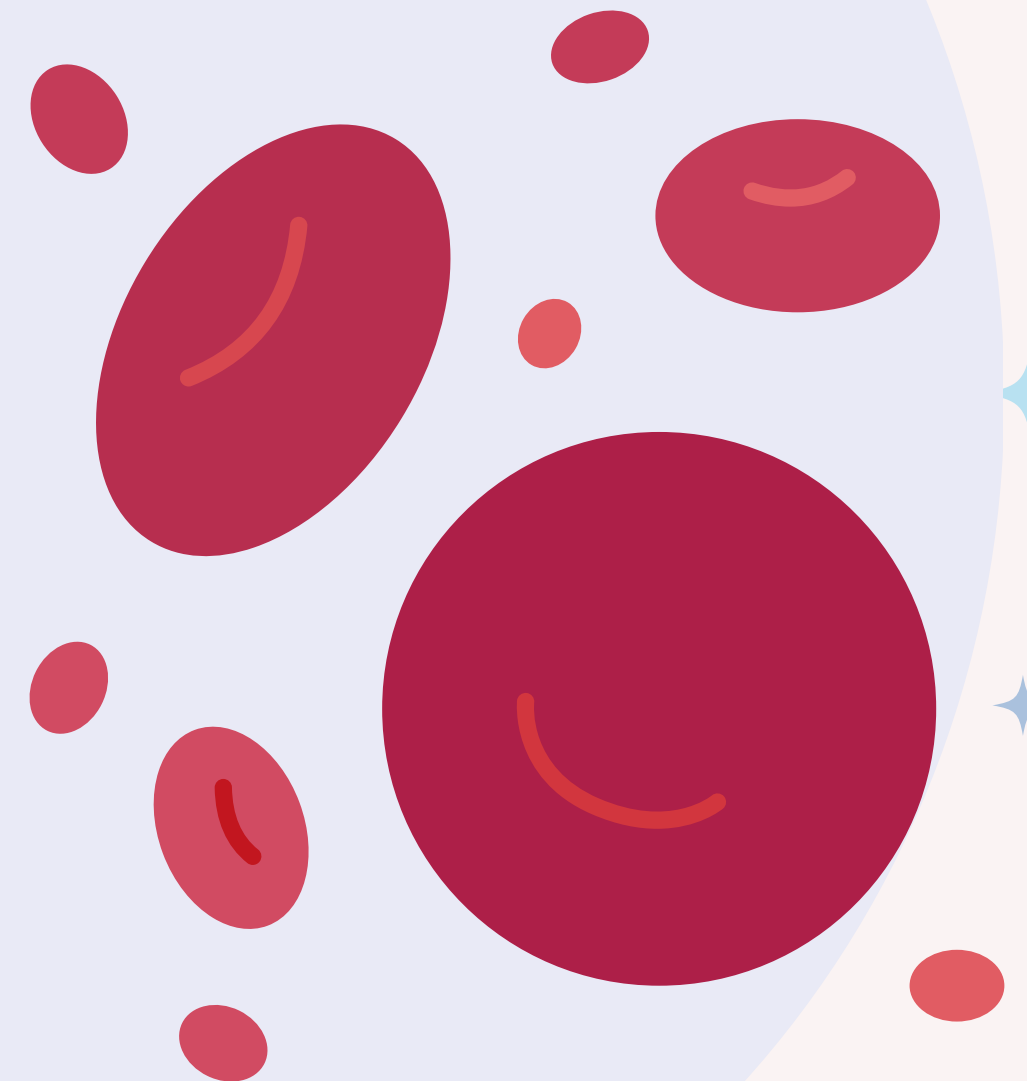
- Normal platelet count: 150,000 to 450,000/ML
- Bleeding risk usually not increased unless < 50,000

**Goal INR < 1.5**

- Normal INR = 1.0
- Bleeding risk increased INR > 1.5

**Goal Hgb > 7 g/dL (hct > 21)**

- Adverse outcomes below this level



# Preoperative evaluation

Surgical indications



- Emergency surgery
- Risk of forgoing surgery extremely high
- Very little role for preoperative evaluation
- Classic example: **trauma**



# Preoperative evaluation

## Anticoagulants and Antiplatelets

### Warfarin

- Hold 4-5 days before surgery
- Goal INR < 1.5

### Heparin drip

- Half life 60 to 90 minutes
- Discontinue hours before surgery

### LMWH

- Last dose 24 hours before surgery
- Last dose 50% normal dose

### Aspirin, clopidogrel, ticagrelor, prasugrel

- Discontinue 5 to 7 days before surgery





# Preoperative evaluation

## Other drugs

### ACE inhibitors and ARBs

- May cause hypotension through I RAAS activity
- Usually held morning of surgery

### NSAIDS

- Inhibit platelet function
- Avoided 1 week prior to surgery

### Oral contraceptive pills

- May increase risk of post-op thrombosis
- Hold if surgery high risk for post-op DVT/PE

**Beta-blockers and statins:** continue





# Preoperative evaluation

## Other drugs

### Oral hypoglycemic agents

- Sulfonylureas, thiazolidinediones
- Hold morning of surgery

### Metformin

- Associated with lactic acidosis with renal hypoperfusion
- Hold morning of surgery

### Insulin

- Continue, but decrease dose morning of surgery (NPO)



# Assessment of risk of surgery



- There are few patients who have no risk for surgery
- It is important to quantify the risks involved so they be discussed with the patients
- Two main prognostic scoring systems which are in current use are

**APACHE SYSTEM**

**ASA SYSTEM**

ASA System

- " American Society of Anaesthesiologist"
- It is very simple and widely accepted
- 50% patients presenting for elective surgery are in ASA Gr1



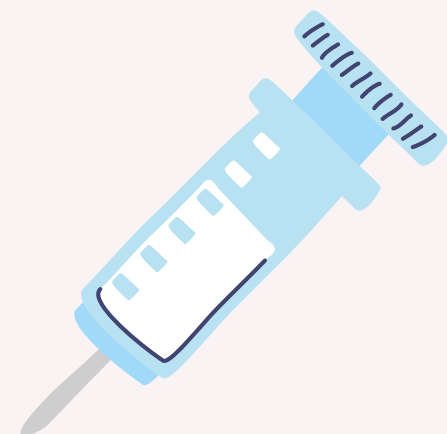
Operative mortality rate for these patients is less than 1 in 10,000

# Assessment of risk of surgery



## ASA Grading and Predictive Mortality

| ASA Grade | Definition                                                      | Mortality % |
|-----------|-----------------------------------------------------------------|-------------|
| I         | Normal healthy individual                                       | 0.06        |
| II        | Mild systemic disease that doesn't limit activity               | 0.4         |
| III       | Severe systemic disease that limits activity                    | 4.5         |
| IV        | Severe systemic disease that is constant threat to life         | 23          |
| V         | Moribund, not expected to survive 24hrs with or without surgery | 51          |



# Clinical predictors of increased risk

- **Major predictors**

1. Acute or recent MI
2. Unstable or Severe Angina  
Strongly positive stress test
3. Decompensated heart failure
4. Severe Valvular disease
5. Significant Arrhythmias

- **Intermediate predictors**

1. Mild angina
2. Previous MI by history or by Q waves
3. Compensated heart failure
4. Diabetes
5. Renal insufficiency (Cr >2.0)

- **Minor predictors**

1. Advanced Age
2. Abnormal ECG (LVH, LBBB, ST changes)
3. Low functional capacity
4. H/O of stroke
5. Uncontrolled systemic hypertension

# ✦ Surgery related risk



- **High Risk Surgery (>5%)**

- Emergent major surgery
- Aortic and other major vascular
- Peripheral Vascular
- Anticipated prolonged or associated with large fluid shift and/or blood loss

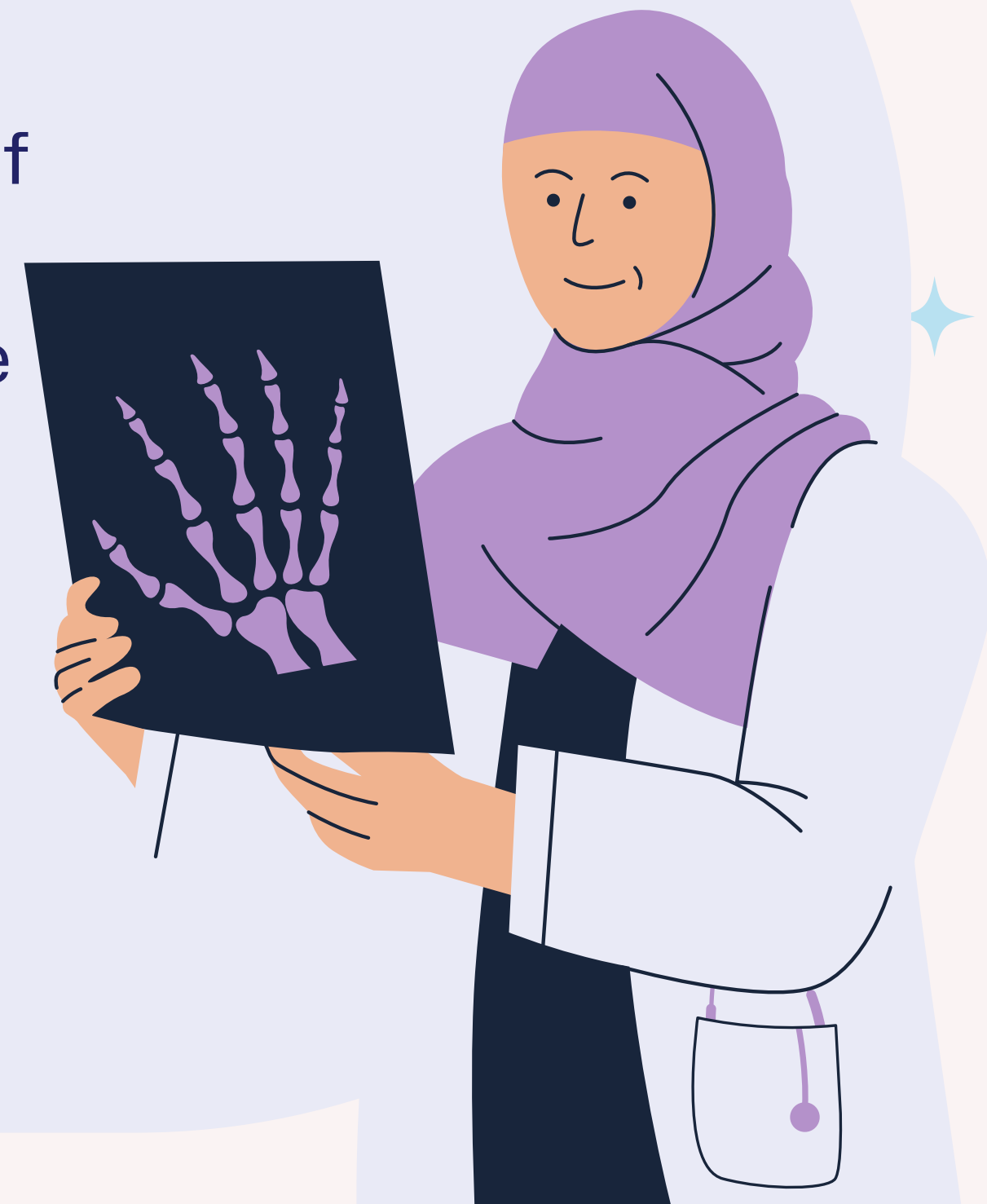
- **Intermediate Risk(<5%)**

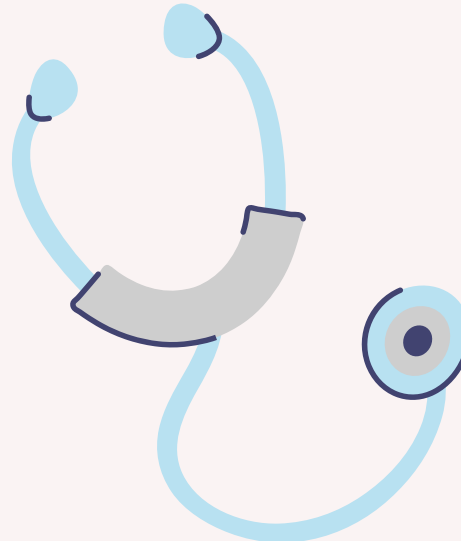
- Carotid endarterectomy
- Endovascular AAA repair
- Head and neck
- Intraperitoneal and intrathoracic
- Orthopedic
- Prostate

- **Low Risk(<1%)**

- Endoscopic procedures
- Superficial procedures
- Cataract surgery
- Breast surgery

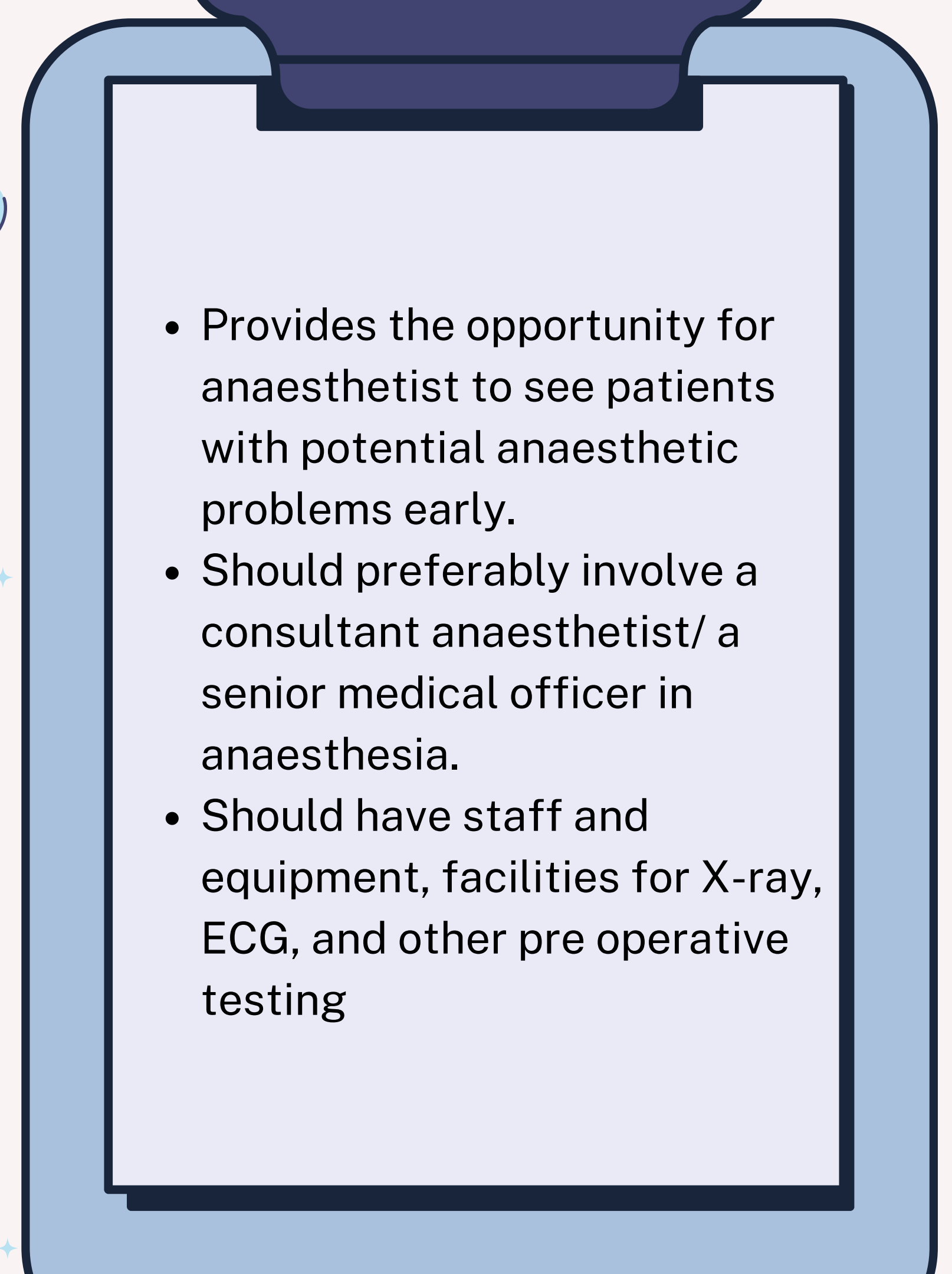
Assessment should be completed by classifying the patients according to ASA physical status and grading of surgery so that high risk patients with poor reserves will require consultation with specialists to help optimize the physical status for surgery and anaesthesia.





# The anaesthetic pre-op assessment clinic



- 
- Provides the opportunity for anaesthetist to see patients with potential anaesthetic problems early.
  - Should preferably involve a consultant anaesthetist/ a senior medical officer in anaesthesia.
  - Should have staff and equipment, facilities for X-ray, ECG, and other pre operative testing

# Validation of a pre-anesthetic screening questionnaire

- 
- 
- 
- 
1. Do you usually get chest pain or breathlessness when you climb up two flights of stairs at normal speed
  2. Do you have kidney disease
  3. Has anyone in your family (blood relatives) had a problem following an anaesthetic
  4. Have you ever had a heart attack
  5. Have you ever been diagnosed with an irregular heartbeat
  6. Have you ever had a stroke
  7. If you have been put to sleep for an operation were there any anaesthetic problems
  8. Do you suffer from epilepsy or seizures
  9. Do you have any problems with pain, stiffness or arthritis in your neck or jaw
  10. Do you have thyroid disease
  11. Do you suffer from angina
  12. Do you have liver disease
  13. Have you ever been diagnosed with heart failure
  14. Do you suffer from asthma
  15. Do you have diabetes that requires insulin
  16. Do you have diabetes that requires tablets only
  17. Do you suffer from bronchitis



# Nutritional assessment

Malnutrition increases increases risk of

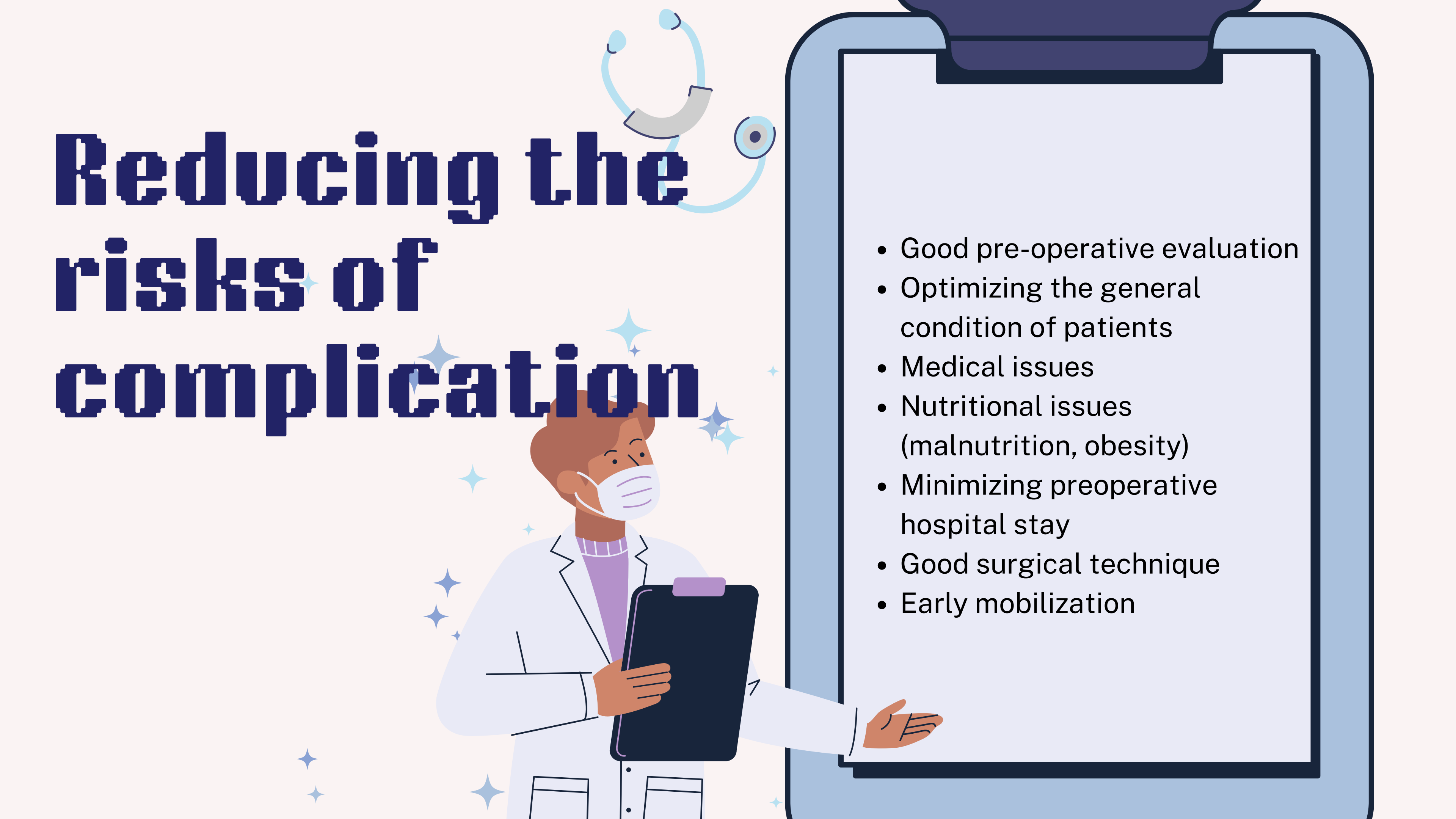
- morbidity, wound infection, sepsis, pneumonia, delayed wound healing, anasmotic complication.
- Assesment include careful history and examination.
- Usual weight, recent wt loss, loss of muscle bulk, change in bowel habit.
- IBS,DM,bulmia and anorexia nervosa.
- **Nutritional risk assesement (15.19x sr albumin g/dl+41.7x present wt/usual weight.**
- **NRI < 83% indicates increased mortality.**



# Postoperative Complications



# Reducing the risks of complication

The illustration features a doctor with brown hair, wearing a white lab coat over a purple shirt and a white surgical mask. The doctor is holding a black clipboard with a purple clip at the top. To the right of the doctor is a large, light blue clipboard with a dark blue clip at the top, which contains a list of seven bullet points. The background is a light cream color with several small, light blue star-like sparkles. Above the title, there is a decorative graphic consisting of a light blue curved line with a grey semi-circle and a small blue circle at the end.

- Good pre-operative evaluation
- Optimizing the general condition of patients
- Medical issues
- Nutritional issues (malnutrition, obesity)
- Minimizing preoperative hospital stay
- Good surgical technique
- Early mobilization



# **complications**

- **What operation did the patient have?**
- **What are the most common complications of this operation?**
- **What is most life-threatening?**
- **What co-morbidities does the patient have?**

Classification:

- |                       |                     |
|-----------------------|---------------------|
| 1. Thermal regulation | 4. cardiac          |
| 2. wound              | 5. Gastrointestinal |
| 3. pulmonary          | 6. Metabolic        |
|                       | 7. Neurological     |
- 

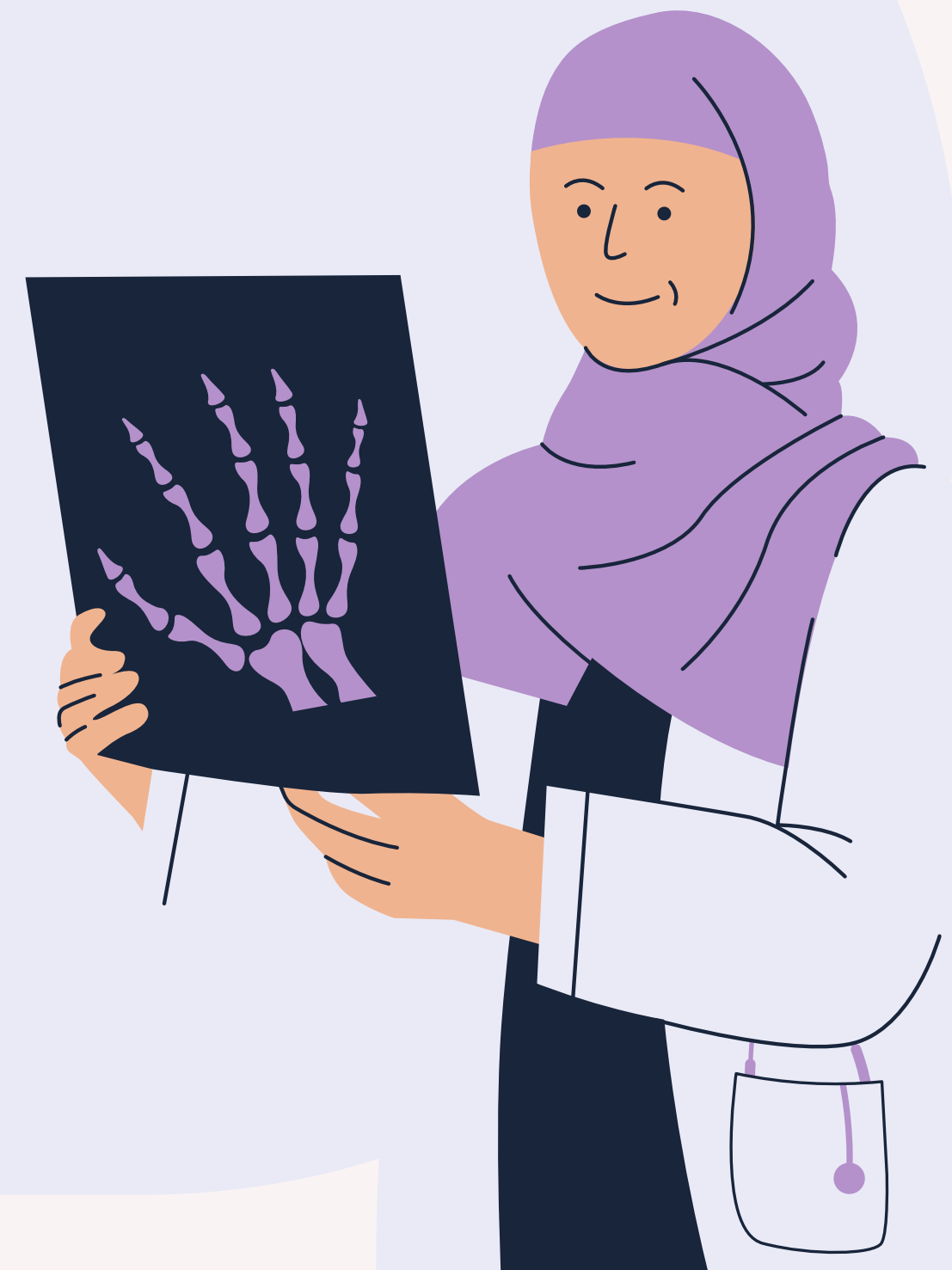


# Complications of thermal regulation

## Malignant hyperthermia

## Hypothermia

- Anaesthesia induces loss of thermoregulatory control. Exposure of skin and organs to a cold operating environment, and the infusion of cold intravenous fluids all lead to hypothermia.
- Drop in temp by 2° C
- Temp below 35 ° C → coagulopathy, platelet dysfunction
- Risks:
  1. 3x risk increase of cardiac events,
  2. 3x risk increase of SSI,
  3. increase risk of blood loss and transfusion requirement



# Postoperative fever

- **Immediate:**  
within 24 hours

- **Early:**  
within the first 3 days  
after surgery

- **Late:**  
after postoperative day 3



# Postoperative fever

Immediate causes:

- Inflammation due to surgery

- Trauma-related inflammation

Infections predating the operation

Immune reactions to blood products

- Malignant hyperthermia

# Malignant hyperthermia

- 
- A light blue syringe with a grey needle is positioned diagonally on the left side of the image. Below it, a light blue clipboard with a dark blue clip at the top holds a white sheet of paper. The paper contains a bulleted list of clinical features of malignant hyperthermia. The background is light blue with several small, four-pointed starburst graphics in shades of blue and white.
- Autosomal dominant
  - Rare, dangerous reaction to anesthetics
    - Halothane, succinylcholine
  - Fever, muscle rigidity
  - Tachycardia, hypertension
  - Muscle damage
  - Hyperkalemia
  - Increased creatine kinase
  - cyanosis

- 
- A blue and white DNA double helix is positioned diagonally on the left side of the image. Below it, a light blue clipboard with a dark blue clip at the top holds a white sheet of paper. The paper contains a single bullet point about the treatment of malignant hyperthermia. The background is light blue with several small, four-pointed starburst graphics in shades of blue and white.
- **Treatment** : dantrolene  
(muscle relaxant)

# Postoperative Fever

## Early Causes: Days 1 to 3

- **Idiopathic**

- Fever common 1 to 3 days after surgery
- Often not caused by serious infection
- Believed to be due to inflammation/cytokines
- Previously attributed to atelectasis
  1. Atelectasis also common in early period
  2. No longer considered cause of fever

- **Trauma- or burn-mediated inflammation**

- **Infection**

- Pneumonia
- Urinary tract infection
- Early surgical site infection
- Most site infections occur after day 5
- Rare early infections with two organisms
- Group A streptococcus
- Clostridium perfringens
- Fever, erythema, wound drainage



# **Postoperative Fever**

Late Causes :  
Day 3+

- **Surgical site infections**
- **Surgery-specific complications**
  1. **Anastomotic leak**
  2. **Deep abdominal abscess**
  3. **Ischemia (vascular surgery)**
- **Noninfectious causes**
  1. **Febrile drug reactions**
  2. **Venous thromboembolism**
  3. **Gout**



# PostOperative

## Fever

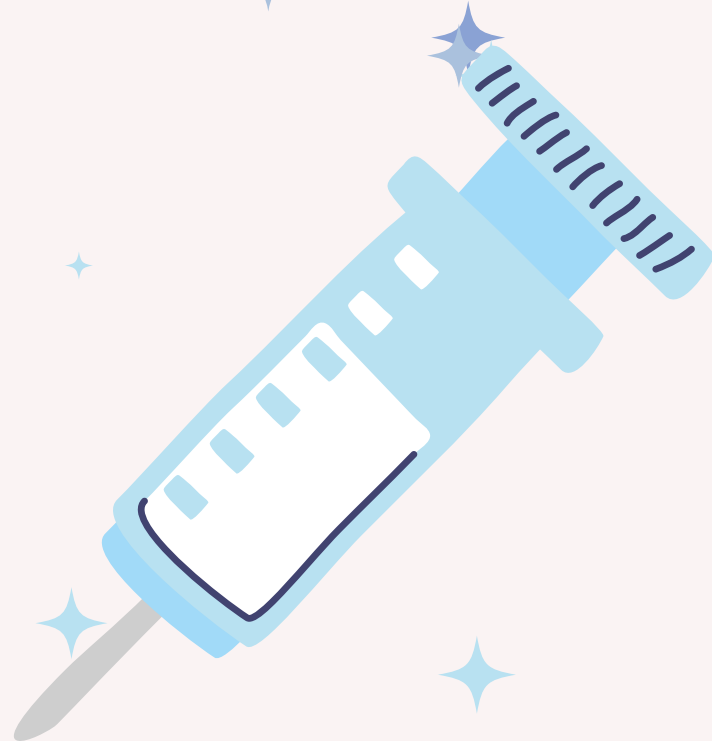
### Workup

- History and physical exam
  - \*Examine surgical site\*
- CBC with differential
- Chest x-ray
- Urinalysis and culture
- Sputum culture and gram stain
- Blood cultures



# The 6 W's

- **W**ind: atelectasis or pneumonia  
24 to 48 hours post-op
- **W**ater: UTI  
3 to 5 days post-op
- **W**ound: wound infection  
5 to 7 days post-op
- **W**alking: venous thromboembolism  
7 to 10 days post-op
- **W**aste: accumulation of fluids (abscess)
- **W**onder drug  
Drug fever



# Wound complications



- **Dehiscence**
- **Evisceration**
  - **Seroma**
  - **Hematoma**
  - **Infection**
- **Incisional hernia**

# Fascial Dehiscence



- Occurs with abdominal surgical incisions
- Wall tension overcomes suture strength
- Risk factors:
  - Inadequate closure
  - Infection
  - Malnutrition
  - Diabetes
- Treatment:  
Wound exploration/repair

# • Evisceration

Bowel Evisceration



- Protrusion of viscera through wound
- Surgical emergency

# Seroma



- Collection of liquefied fat, serum and lymphatic fluid under the incision
- Benign
- No erythema or tenderness
- Associated procedures: mastectomy, axillary and groin dissection
- Treatment: evacuation, pack, suction drains

# • Hematoma



- Abnormal collection of blood
- Presentation: discoloration of the wound edges (purple/blue), blood leaking through sutures
- Etiology: imperfect hemostasis
- The biggest concern with retained hematoma is potential for infection



# Surgical site infection

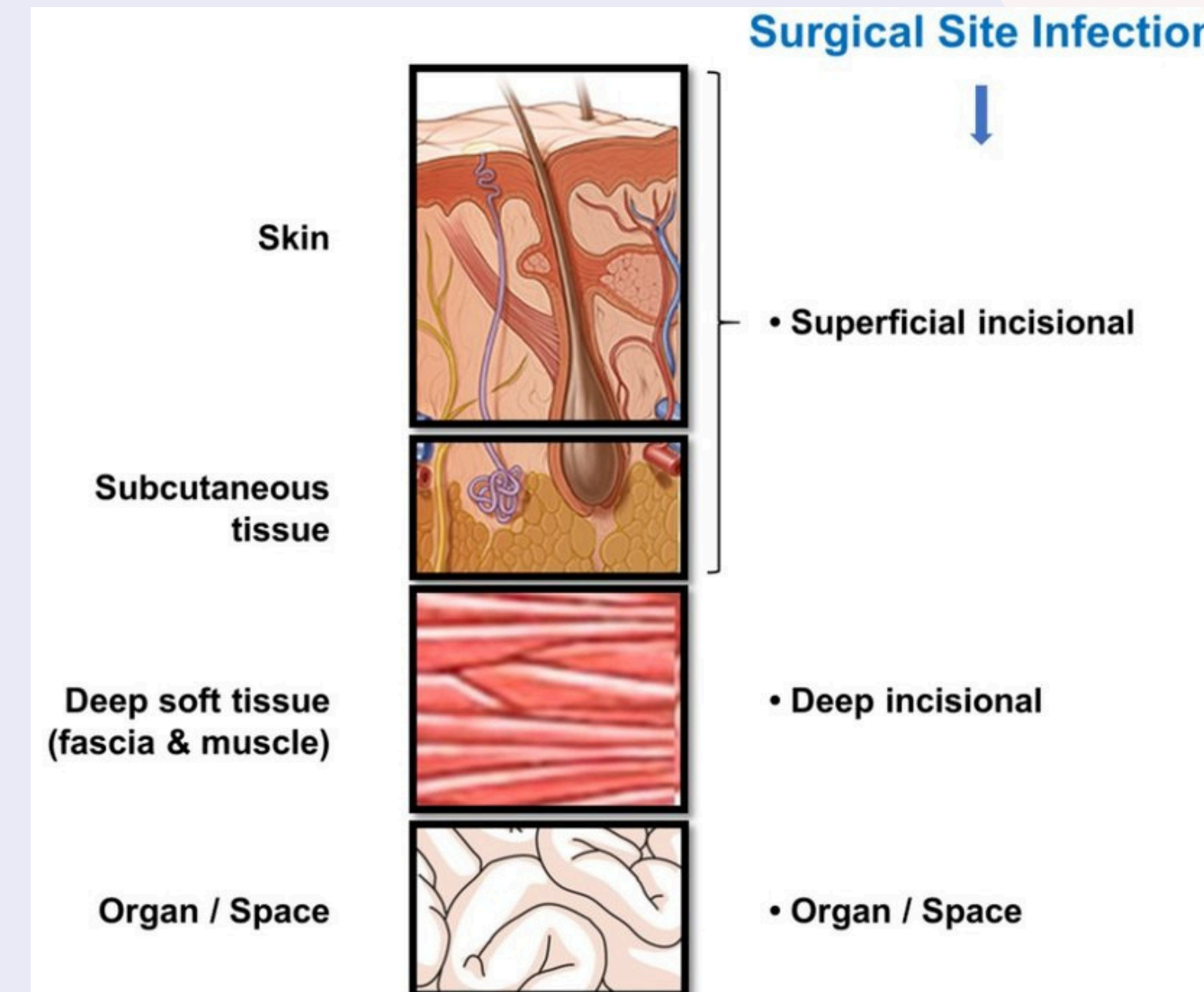
- **Superficial**
- **Deep (involving the fascia/muscle)**
- **Organ Space**

Occurring 4-6 days postop

- **PRESENTATION:**

- Erythema, warmth, edema and pain at incision site
- Purulent drainage may be present
- Fever, leukocytosis

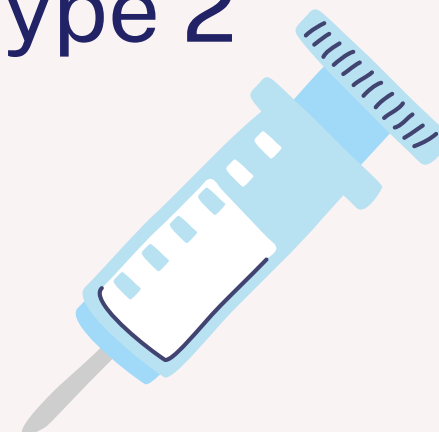
- **Treatment: antibiotics +/- surgical debridement**



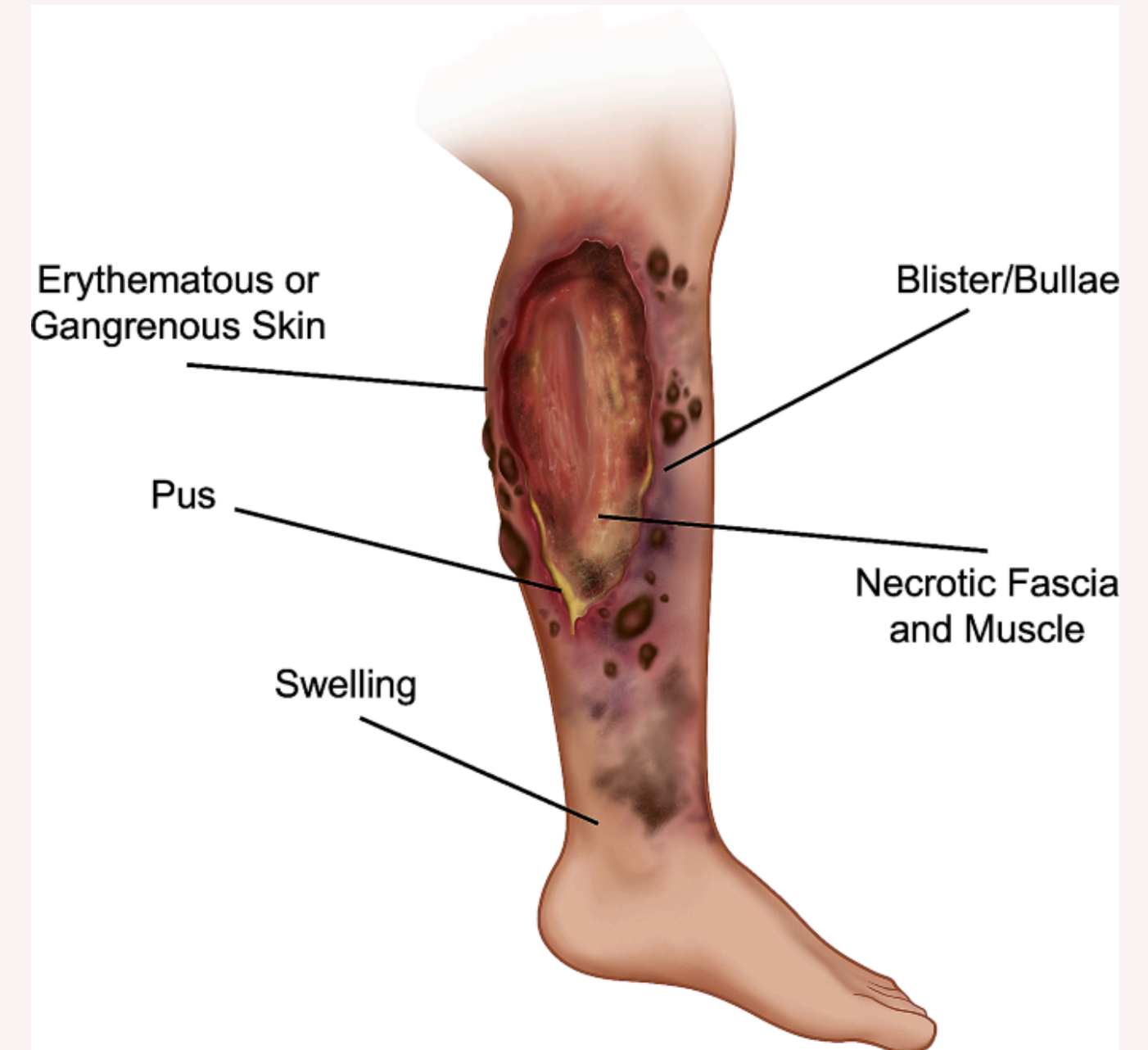


# Wound infection

1. Group A  $\beta$ -hemolytic streptococcal gangrene – following penetrating wounds
2. Clostridial myonecrosis – postoperative abdominal wound
  - Presentation: sudden onset of pain at the surgical site following abdominal surgery, crepitus → edema, tense skin, bullae = EMERGENCY
3. Necrotizing fasciitis – 4 types (type 1 accounts for 70%-80% of cases and is polymicrobial), type 2 (one third of cases)- Strep. pyogenes



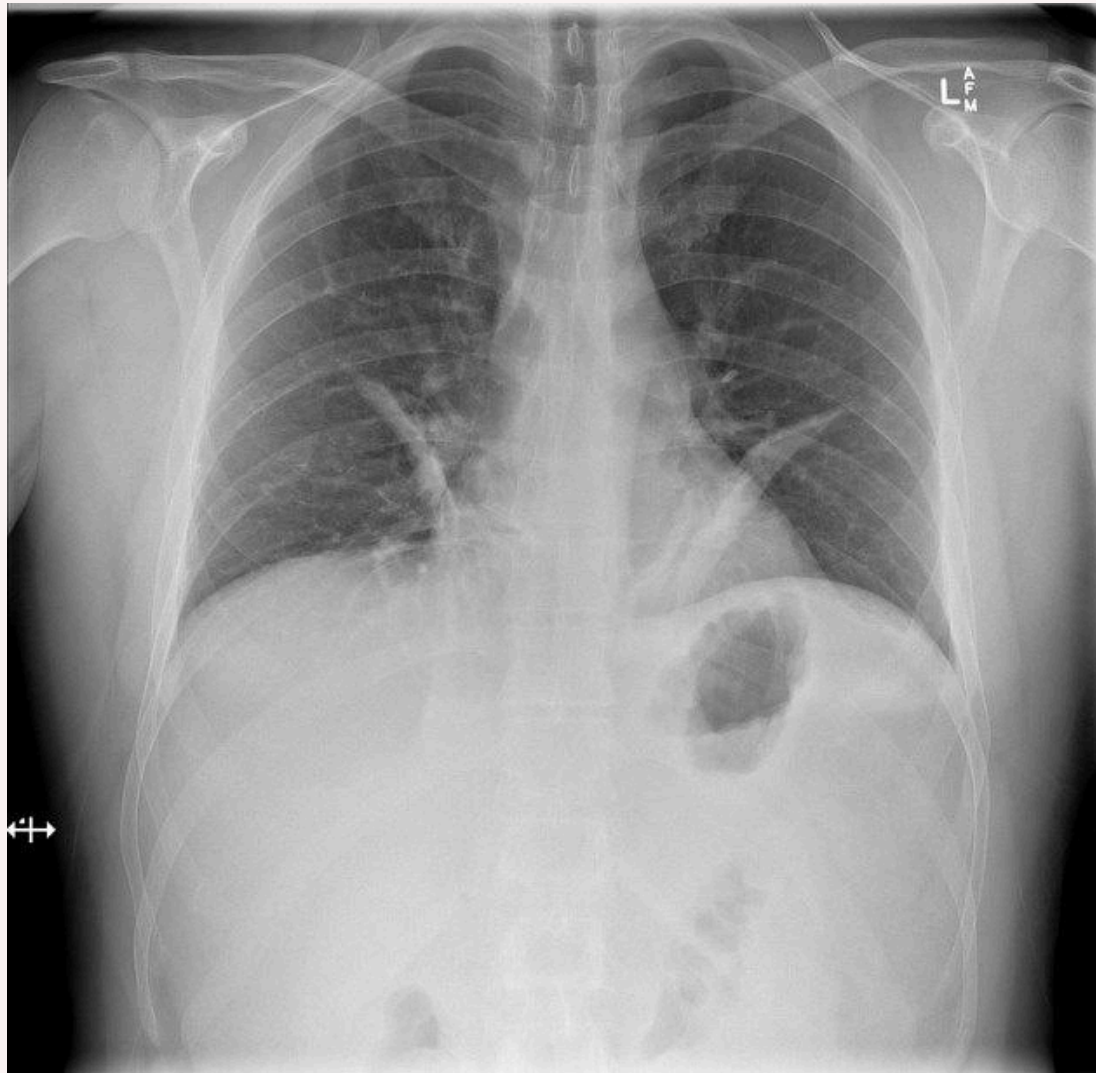
# Necrotizing fasciitis



# **pulmonary complications**

- **(1 )Atelectasis: collapse of the alveoli Most common cause of fever within 48 h**
- **Management: post operative incentive spirometry**
- **(2 )pulmonary embolism : DVT that embolizes to pulmonary artery**
- **It can be fatal**
- **The risk is due to the period of physical inactivity during and after the procedure**
- **(3 )Aspiration pneumonia: only requires 0.3 ml per kilogram of body weight (20 -25 ml in adults)**

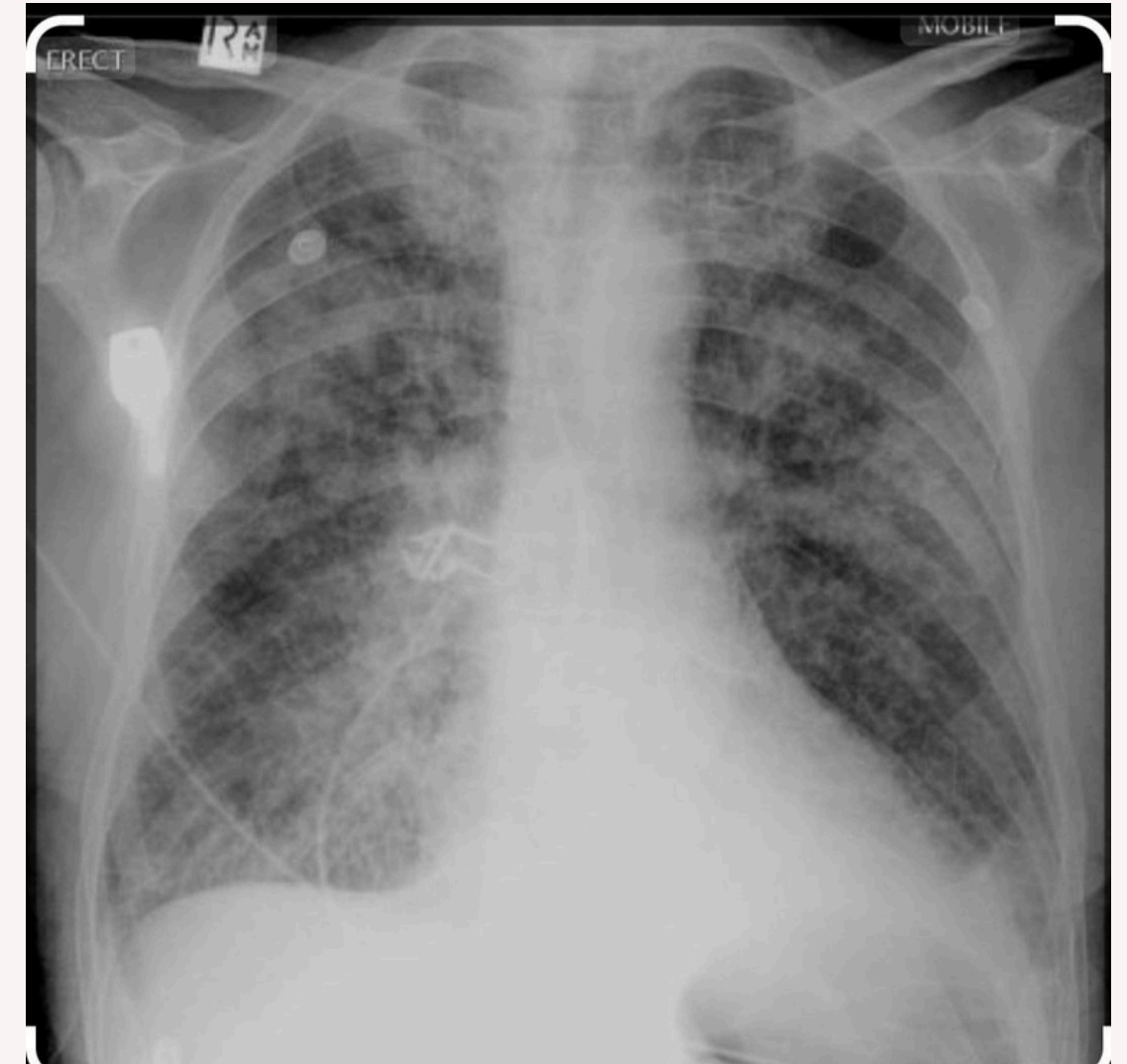
# Pulmonary complications



**Atelectasis**



**Pneumonia**



**Pulmonary edema**



# Cardiac complications

## Myocardial ischemia and infarction

The presentation is often silent or present with atypical pain , dyspnea , hypotension

Management:(**BEMOAN**)

1. **B**eta-blockers,
  2. **M**orphine,
  3. **O**xygen,
  4. **A**spirin,
  5. **N**itrates
- 





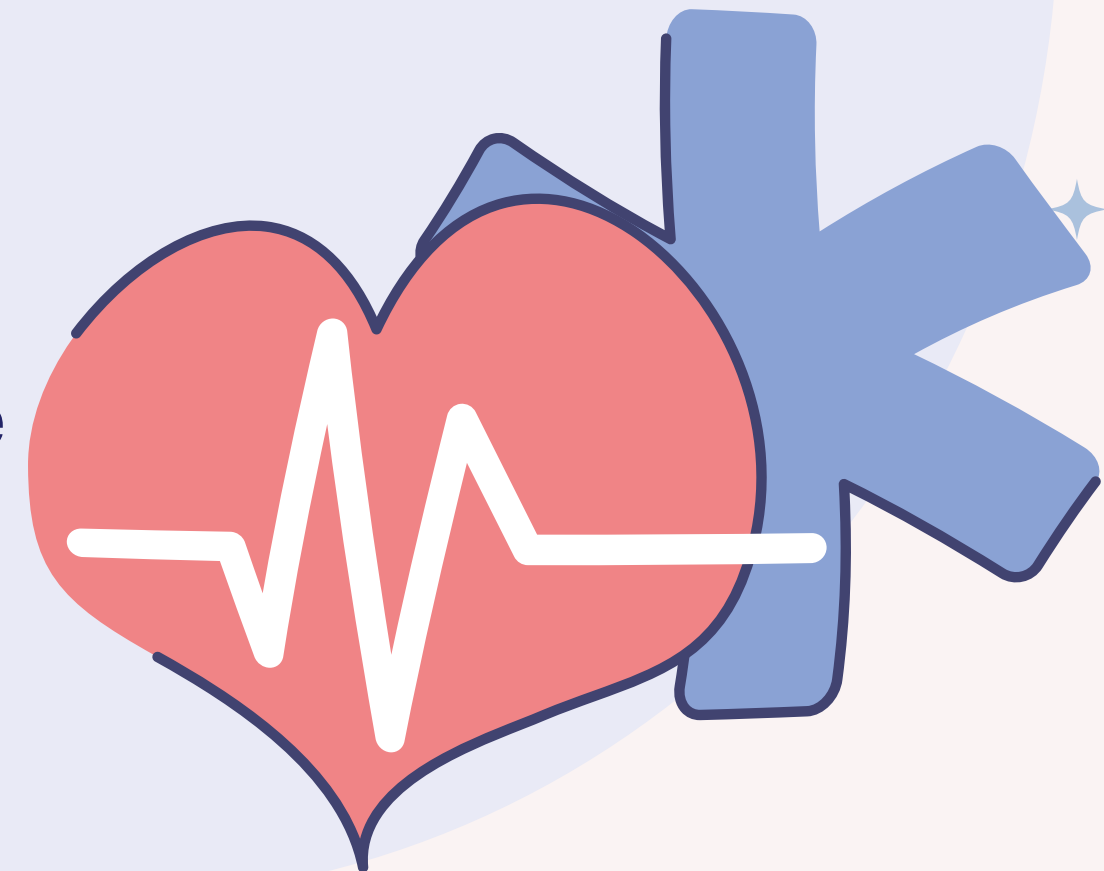
# Cardiac complications

## **Congestive heart failure**

occurs immediately postoperatively as a result of excessive of intraoperative administration of fluids or 24 to 48 hours postoperatively related to mobilization of fluids that are sequestered in the extracellular space  
Often presents in patients with underlying chronic heart failure .

## **Arrhythmia**

common and represent a major source of morbidity after both cardiac and non cardiac surgical procedures  
Management: correct underlying medical conditions, electrolyte replacement .





# Gastrointestinal complications

## Postoperative ileus

- Temporary cessation of bowel motility following surgery
- Affects small and large bowel
- Common in early postoperative period
- Must be distinguished from SBO

### Clinical Features

- Lack of flatus or bowel movements
- Dull abdominal pain
- Absent bowel sounds

### Diagnosis

- X-ray : diffuse bowel distention
- Dilated loops of bowel
- Air in the colon and rectum (no obstruction)
- No transition zone

### Treatment :

- Out of bed
- Fluid





# Gastrointestinal complications

## Small bowel obstruction

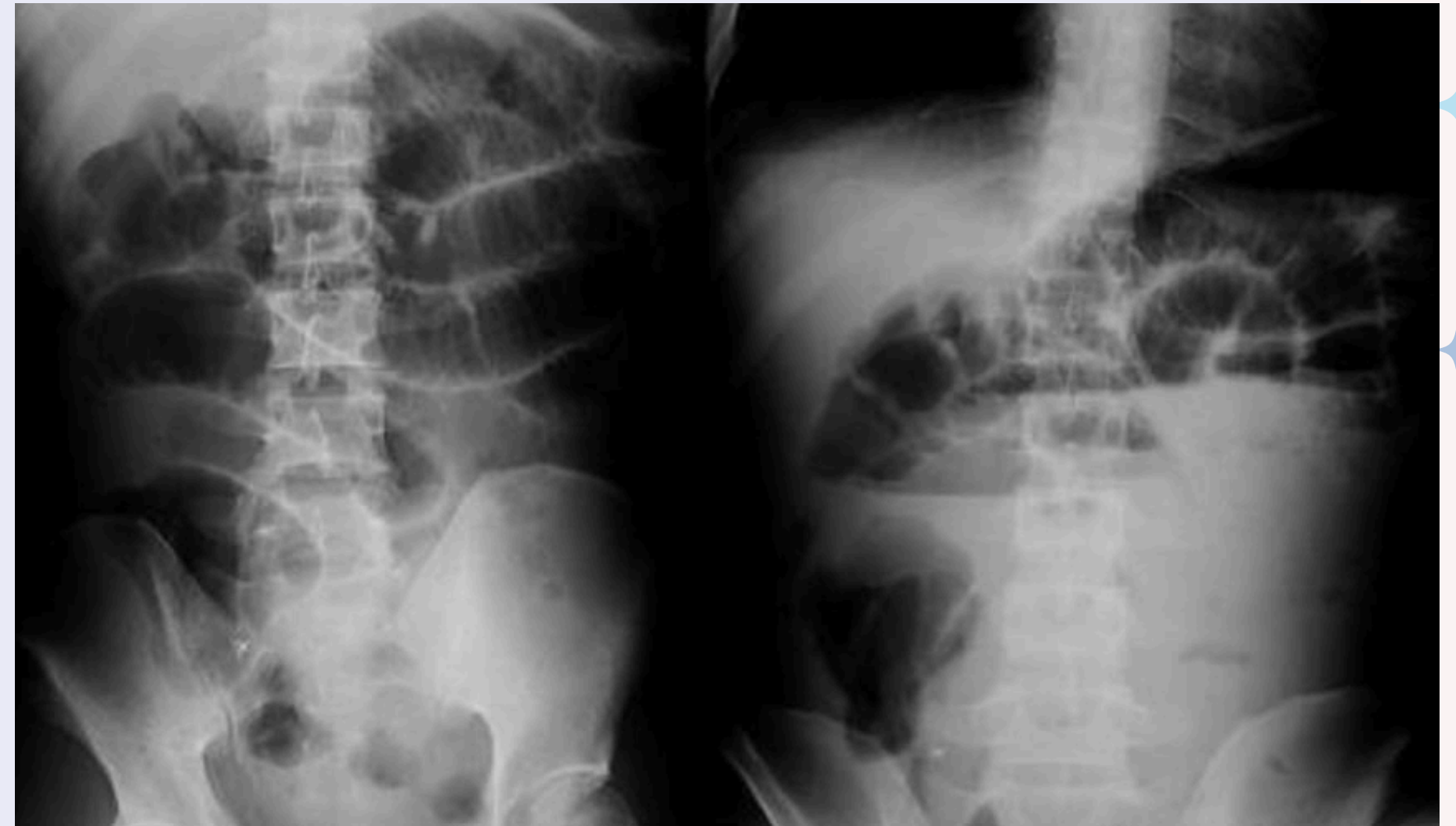
- Can occur due to adhesions, hernias, or strictures forming after surgery

### Clinical features

- Distended abdomen
- Dull abdominal pain
- **Diagnosis:**
- KUB: Dilated small bowel, compressed colon
- Abdominal CT

### Treatment

- Often managed without surgery
- Placement of NG tube
- Abdominal decompression
- Pain control





# Gastrointestinal complications

## GI bleeding

- From any source → get detailed history, place NG tube

## Pseudomembranous colitis

- Superinfection with C difficile due to alteration in normal flora

## Anastomotic leak

Leakage from a surgical connection between two parts of the intestine

## Enterocutaneous fistula

- The most complex and challenging complication



**Anastomotic leak**



## **Neurologic complications**

- **Beware the drugs that you will be subscribing**
  - **Delirium, dementia, psychosis**
  - **Seizure disorders**
  - **Stroke and TIA**
- 

# Metabolic complications

## 1) Adrenal insufficiency

- Sudden cardiovascular collapse
- Uncommon but potentially lethal
- **Presentation:** hypotension, fever, confusion, abdominal pain

## 2) Syndrome of inappropriate antidiuresis (SIAD)

- Continue ADH secretion despite hyponatremia

## 3) • Hyper/Hypothyroidism



**Thank you for  
your attention**



