





Cardinal Manifestations in Cardiology

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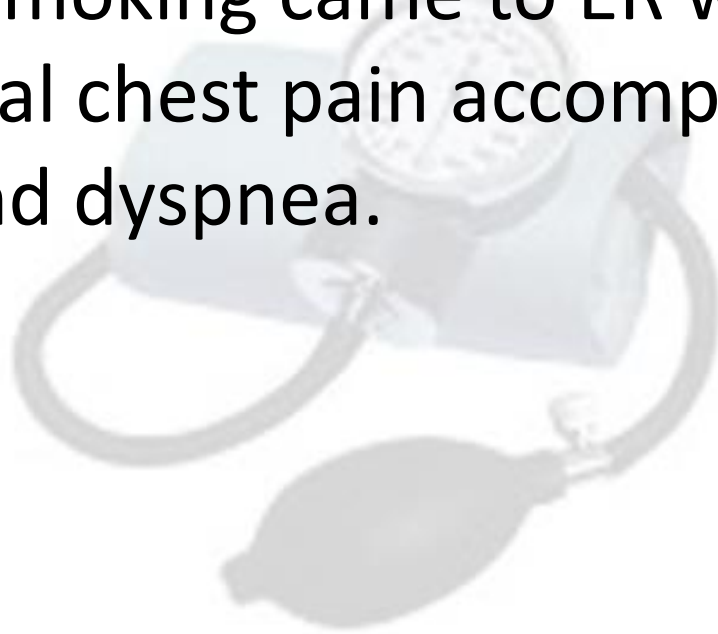
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Case 1



- A 46 Y.O man with a past medical history of cigarette smoking came to ER with severe retrosternal chest pain accompanied by Nausea and dyspnea.





What was the cardinal manifestation?



Chest Pain



Outlines



- Becoming familiar with chest pain
- Discussing Differential Diagnoses of CP
- Having a rapid look at classification of IHD
- Practicing our knowledge on some cases



Chest Pain



- Should Be considered as Cardiac until proven otherwise





Chest pain due to IHD



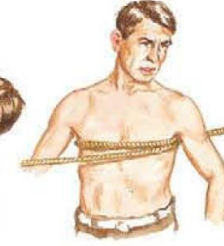
- Radiates to left arm
- Radiation to mandible is very specific
- May be accompanied by Nausea/Vomiting, Dyspnea or cold sweating
- Aggravates with activity
- Relives by rest or TNG
- Usually longer than 5 minutes and lower than 30 minutes unless there is an infarction

Radiate to neck,
back, abdomen,

Common
descriptions
of pain



Viselike

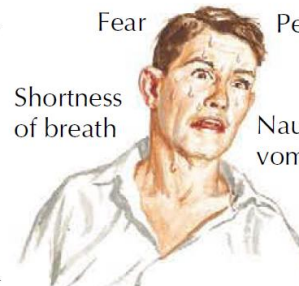


Constricting



Crushing weight
and/or pressure

Other
manifestations
of myocardial
ischemia



Fear

Shortness
of breath

Perspiration

Nausea,
vomiting



Weakness, collapse, coma



What is against a cardiac cause?



- Pleuritic pain (i.e., sharp or knifelike pain brought on by respiratory movements or coughing)
- Primary or sole location of the discomfort in the middle or lower abdominal region
- Pain that may be localized by the tip of one finger, particularly over the left ventricular apex
- Pain reproduced with movement or palpation of the chest wall or arms
- Constant pain that persists for many hours
- Very brief episodes of pain that last a few seconds or less
- Pain that radiates into the lower extremities

System	Syndrome	Clinical Description	Key Distinguishing Features
Cardiac	Angina	Retrosternal chest pressure, burning, or heaviness; radiating occasionally to the neck, jaw, epigastrium, shoulders, left arm	Precipitated by exercise, cold weather, or emotional stress; duration of 2-10 min
	Rest or unstable angina	Same as angina, but may be more severe	Typically <20 min; lower tolerance for exertion; crescendo pattern
	Acute myocardial infarction	Same as angina, but may be more severe	Sudden onset, usually lasting ≥30 min; often associated with shortness of breath, weakness, nausea, vomiting
	Pericarditis	Sharp, pleuritic pain aggravated by changes in position; highly variable duration	Pericardial friction rub
Vascular	Aortic dissection	Excruciating, ripping pain of sudden onset in the anterior aspect of the chest, often radiating to the back	Marked severity of unrelenting pain; usually occurs in the setting of hypertension or underlying connective tissue disorder such as Marfan syndrome
	Pulmonary embolism	Sudden onset of dyspnea and pain, usually pleuritic with pulmonary infarction	Dyspnea, tachypnea, tachycardia, signs of right-sided heart failure
	Pulmonary hypertension	Substernal chest pressure, exacerbated by exertion	Pain associated with dyspnea and signs of pulmonary hypertension
Pulmonary	Pleuritis and/or pneumonia	Pleuritic pain, usually brief, over the involved area	Pain pleuritic and lateral to the midline, associated with dyspnea
	Tracheobronchitis	Burning discomfort in the midline	Midline location, associated with coughing
	Spontaneous pneumothorax	Sudden onset of unilateral pleuritic pain, with dyspnea	Abrupt onset of dyspnea and pain
Gastrointestinal	Esophageal reflux	Burning substernal and epigastric discomfort, 10-60 min in duration	Aggravated by a large meal and postprandial recumbency; relieved by antacid
	Peptic ulcer	Prolonged epigastric or substernal burning	Relieved by antacid or food
	Gallbladder disease	Prolonged epigastric or right upper quadrant pain	Unprovoked or following a meal
	Pancreatitis	Prolonged, intense epigastric and substernal pain	Risk factors, including alcohol, hypertriglyceridemia, medications
Musculoskeletal	Costochondritis	Sudden onset of intense fleeting pain	May be reproduced by pressure over the affected joint; occasionally, swelling and inflammation over the costochondral joint
	Cervical disc disease	Sudden onset of fleeting pain	May be reproduced with movement of the neck
	Trauma or strain	Constant pain	Reproduced by palpation or movement of the chest wall or arms
Infectious	Herpes zoster	Prolonged burning pain in a dermatomal distribution	Vesicular rash, dermatomal distribution
Psychological	Panic disorder	Chest tightness or aching, often accompanied by dyspnea and lasting 30 min or more, unrelated to exertion or movement	Patient may have other evidence of an emotional disorder



Categorize the Chest Pain



Typical angina

1. Retrosternal component
2. Brought on by stress or exercise
3. Relieved promptly by rest or NTG

Atypical angina

- 2 of above 3 criteria

Non-anginal chest pain

- 1 of above 3 criteria



Define the Chest Pain Syndrome

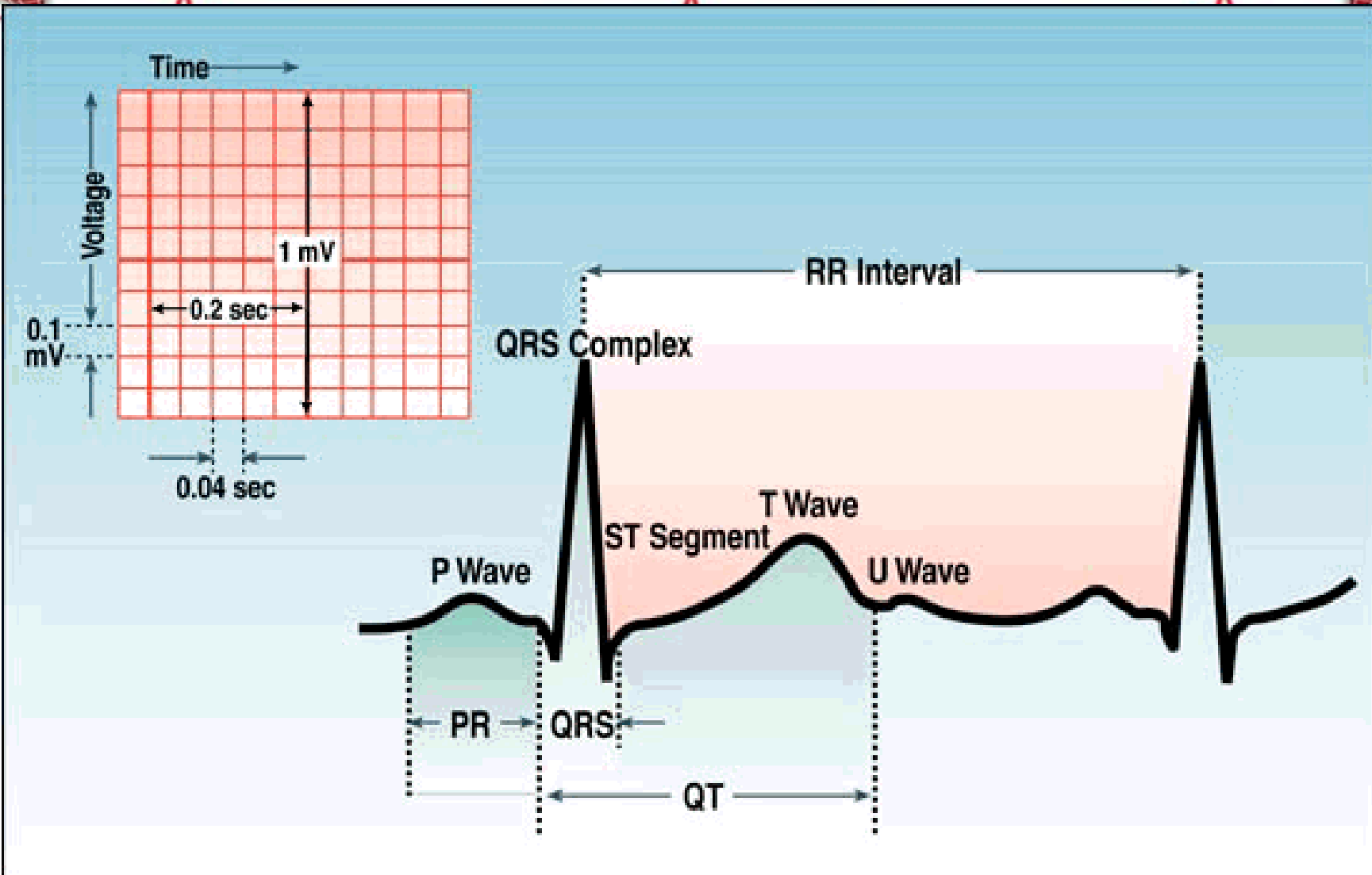
- Chronic stable angina
- Acute Coronary Syndrome
 - ST-elevation MI
 - Non-ST elevation ACS
 - Unstable angina
 - Non ST-elevation MI

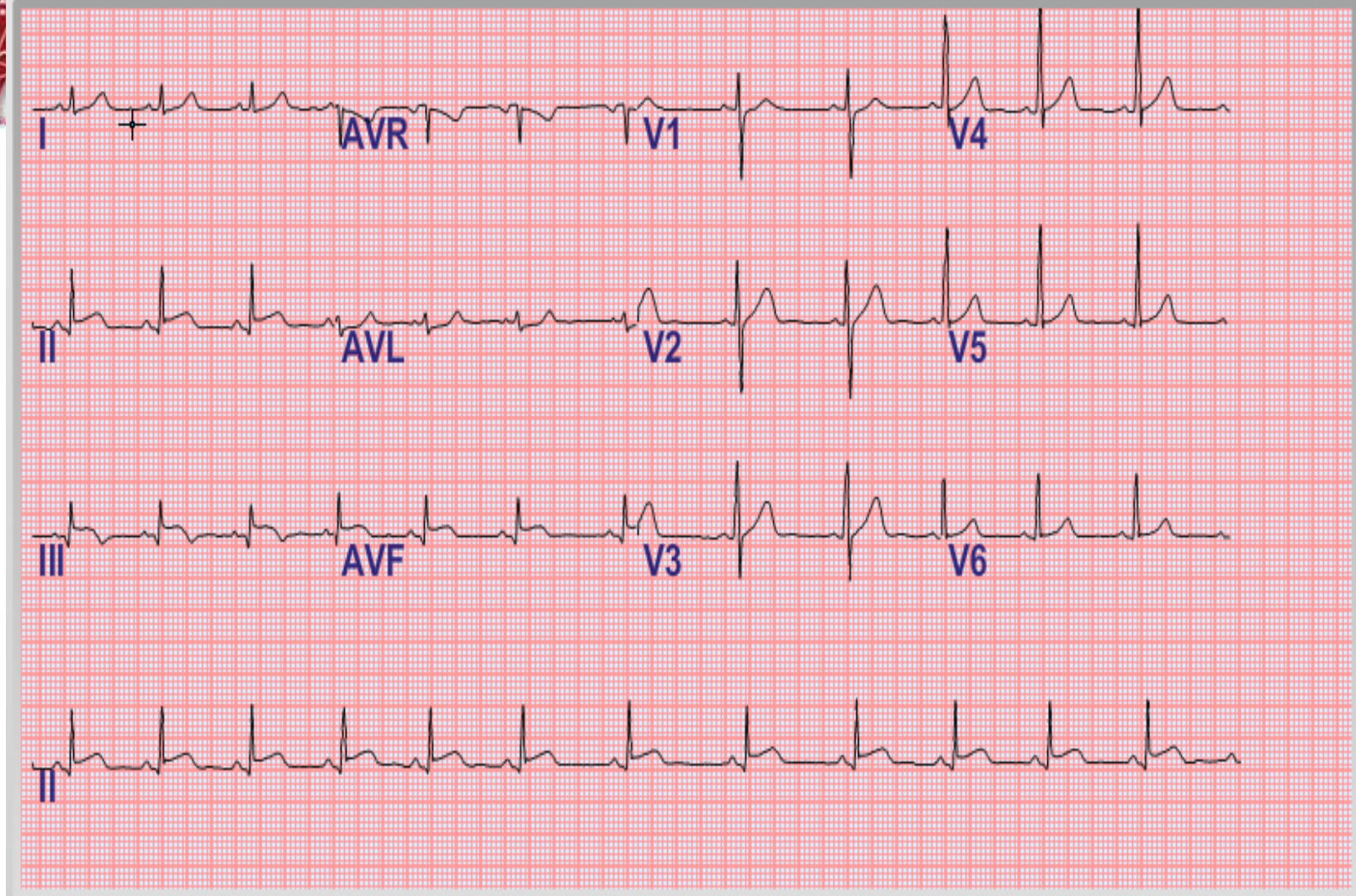


Acute Coronary syndrome:



- Features that help differentiate ACS from stable angina are :
- (1) onset of symptoms at rest (or with minimal exertion) and lasting longer than 10 minutes unless treated promptly;
- (2) severe, oppressive pressure or chest discomfort; and
- (3) an accelerating pattern of symptoms that develop more frequently, occur with greater severity, or awaken the patient from sleep.





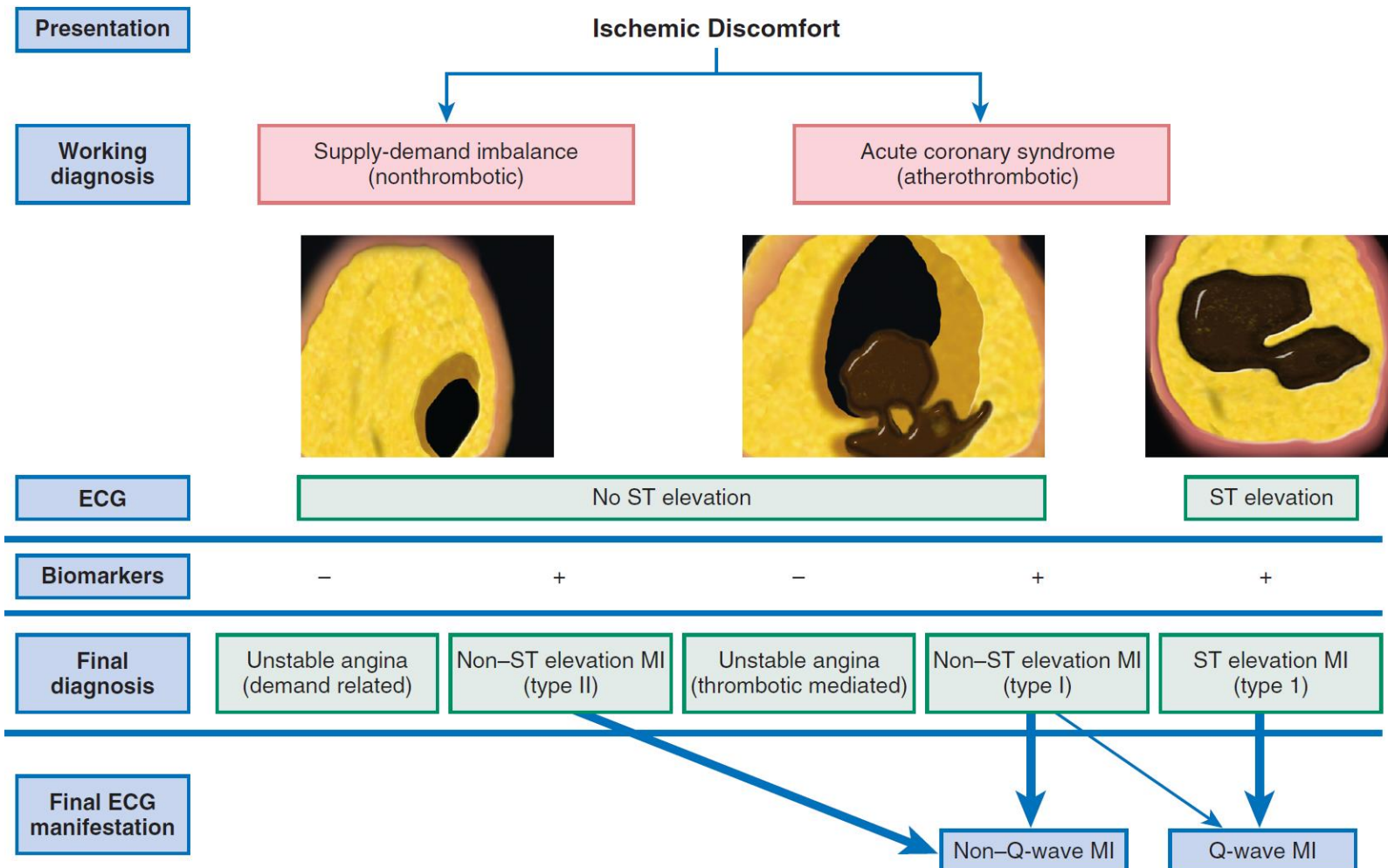
ST elevation Myocardial Infarction STEMI



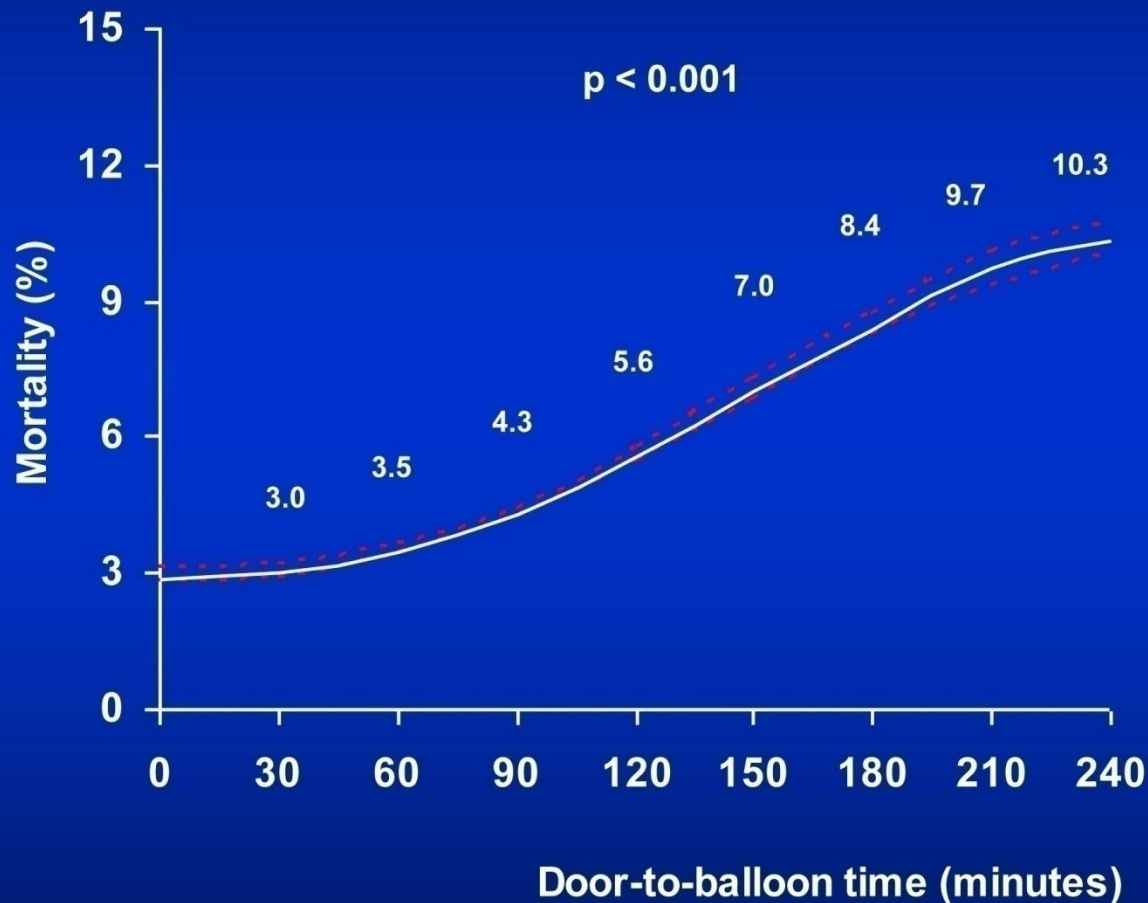
STEMI



- A very critical state shows acute total occlusion an of an epicardial coronary artery.

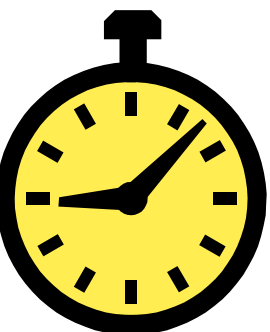


Adjusted in Hospital Mortality as Function of Door-to-Balloon Time





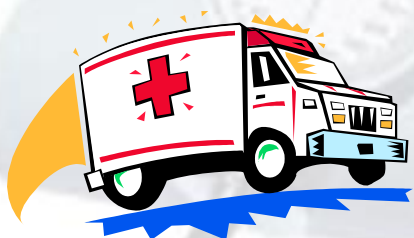
Treatment Delayed is Treatment Denied



**Symptom
Recognition**



**Call to
Medical
System**



PreHospital



ED



Cath Lab

Increasing Loss of Myocytes

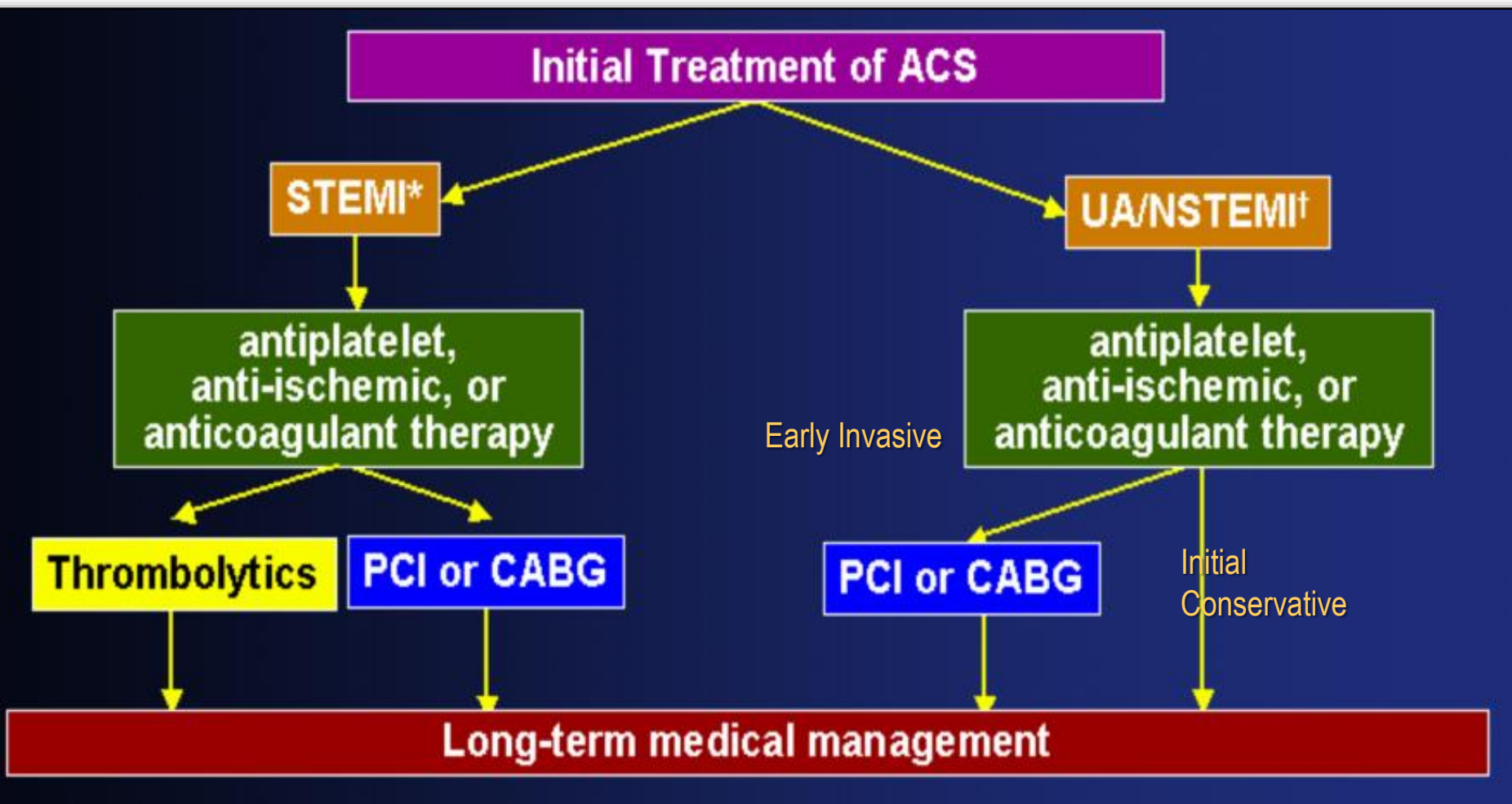


Non STE ACS types

- Subdivision is based on Troponin level, which is a specific Cardiac enzyme, that takes about 6 hrs (up to 12 hrs) to release into blood after MI.
- Troponin + = Non STEMI
- Troponin - = Unstable Angina



Treatment of Acute Coronary Syndrome

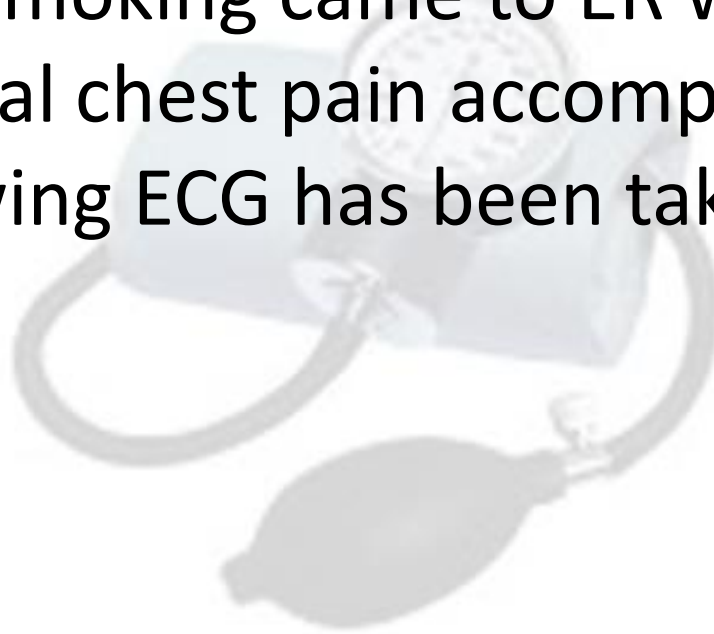


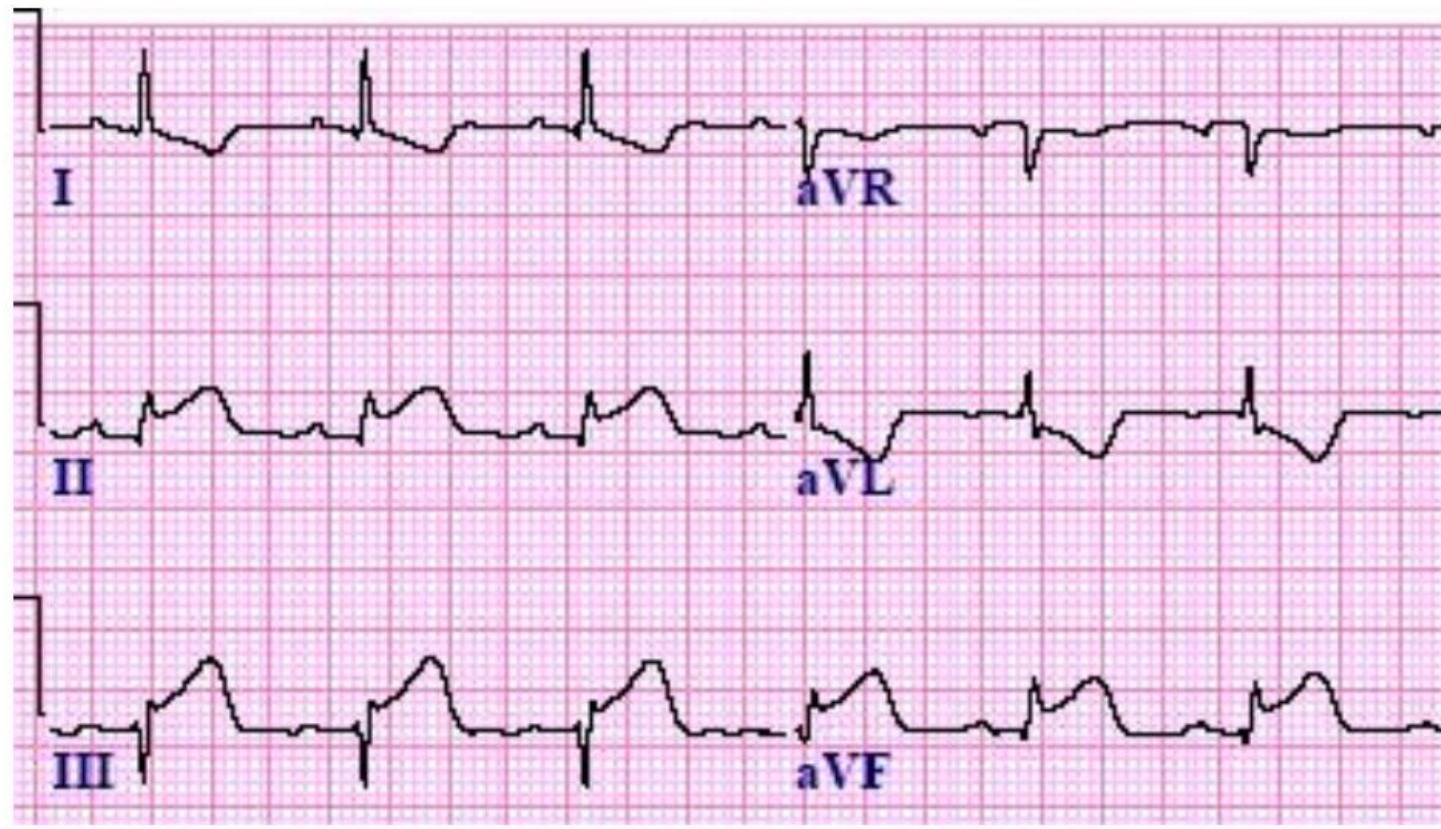


Case 1



- A 46 Y.O man with a past medical history of cigarette smoking came to ER with severe retrosternal chest pain accompanied by N/V. The following ECG has been taken from him.



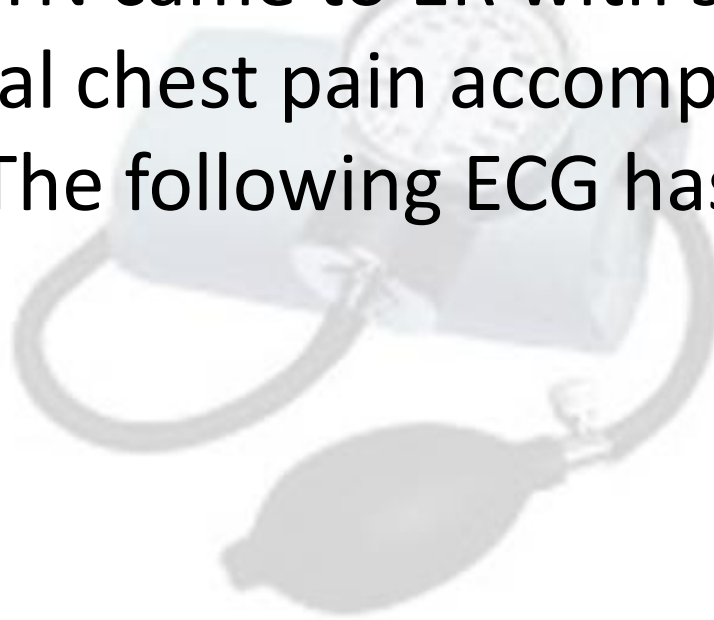


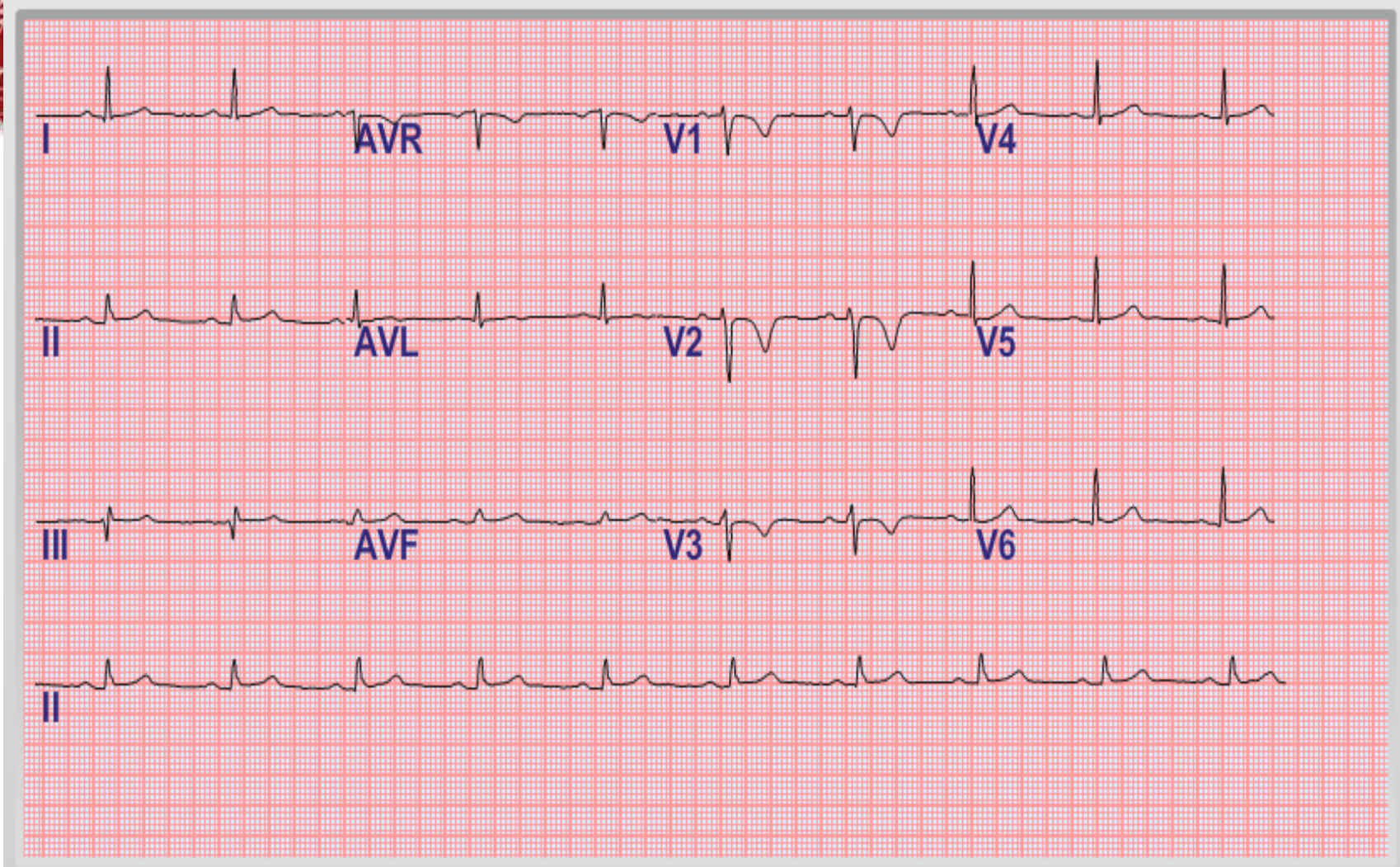


Case 2



- A 75 Y.O woman with a past medical history of DM and HTN came to ER with severe retrosternal chest pain accompanied by dyspnea. The following ECG has been taken from him.





What is your diagnosis?

What is your treatment plan?



Case 3



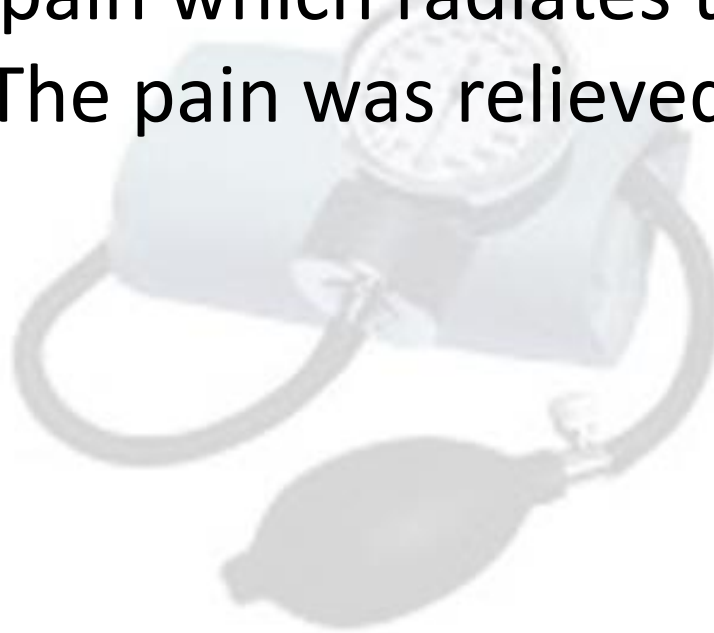
- A 31 y.o man comes to ER with severe retrosternal chest pain which aggravates with respiration and radiates to his trapezius ridge. The pain does not change with activity and worsen with lying down and improves with sitting.



Case 4



- A 64 y.o lady is brought to ER with severe epigastric pain which radiates to her left shoulder. The pain was relieved by sublingual TNG

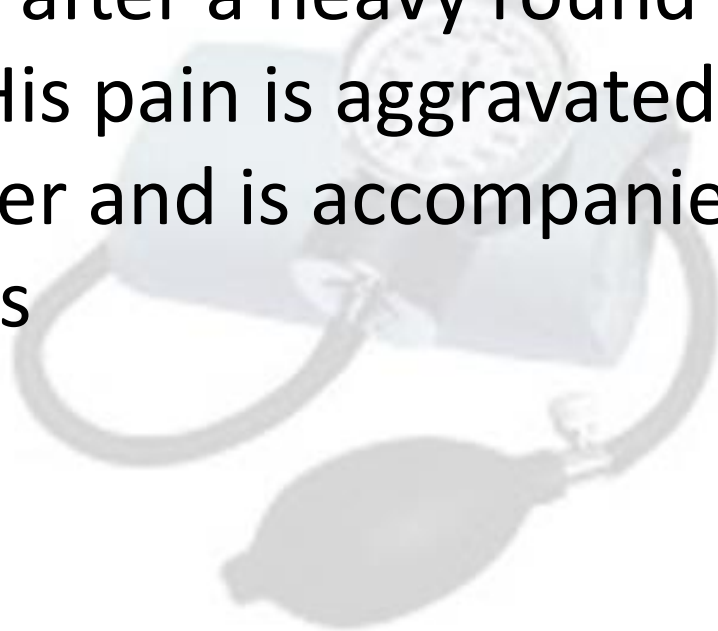




Case 5



- A 45 yo man came to ER with retrosternal chest pain after a heavy round of body building. His pain is aggravated by motion of his shoulder and is accompanied by local tenderness

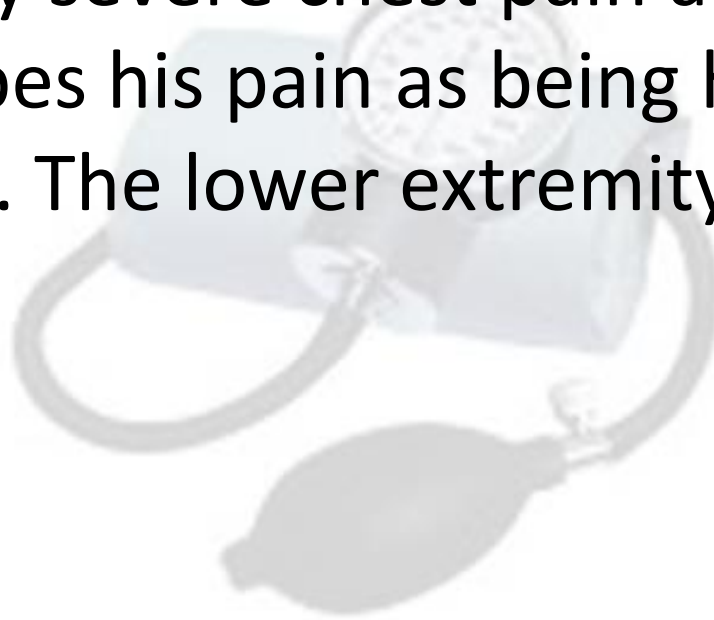




Case 6



- A 46yo man a known case of HTN came to ER with a very severe chest pain and back pain. He describes his pain as being hit by a knife from back. The lower extremity pulses are weak.



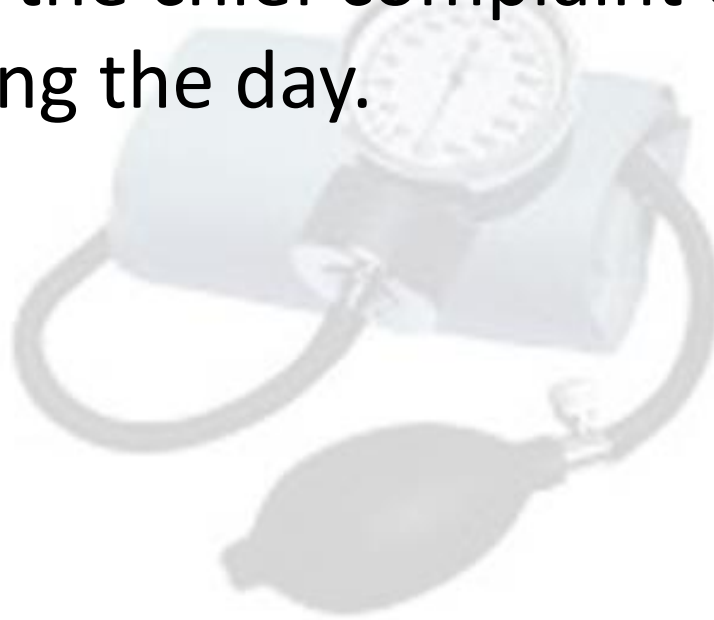




New Case



- A 21 Y.O lady, a medical student comes to clinic with the chief complaint of heavy heart beats during the day.





Palpitation



- Definition: A subjective awareness of one's own heartbeat

- # Bradycardia
- # tachycardia





Outlines



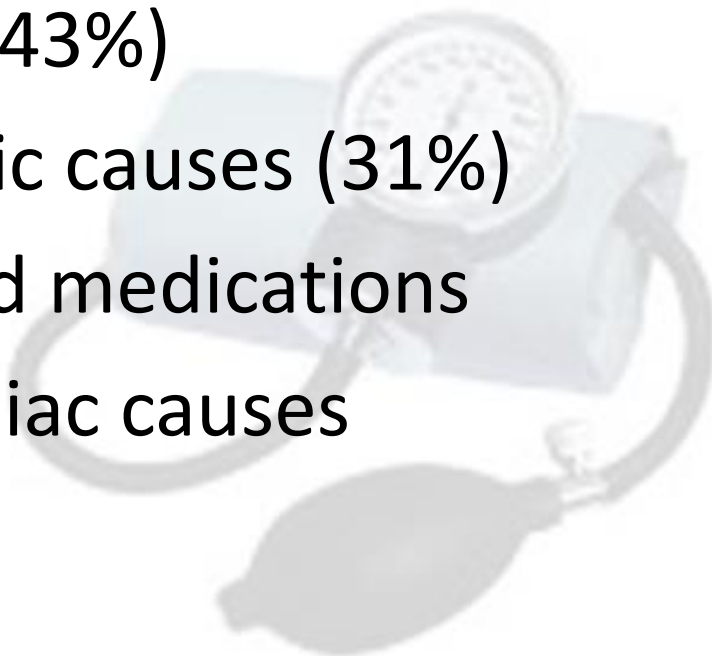
- Definition
- Most probable diagnoses & DDX.
- Important and serious diagnoses.
- Common pitfalls.



Palpitation



- Cardiac (43%)
- Psychiatric causes (31%)
- Drugs and medications
- Extracardiac causes





Palpitation



Spectrum of Patients' Descriptions

- Heart flips or flip-flops
- Skipped beats
- Strong beats
- Irregular beats
- Heart thumping
- Bubble sensation in heart or chest
- Racing or rapid heart beats
- Pounding in neck or chest
- Heart jumping out of chest
- Chest or whole body shaking



Most probable diagnoses



- Anxiety
- Premature beats (Ectypes= PAC / PVC)
- Sinus tachycardia
- Drugs, e.g. stimulants
- Psychogenic
- Arrhythmia: PSVT , AF/afl , VT ,...



Common Pitfalls



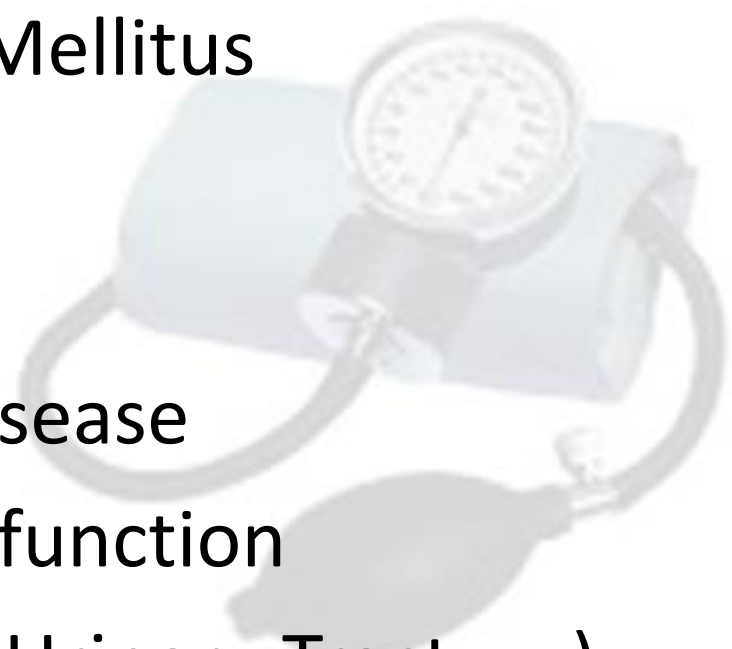
- Fever / Infection
- Pregnancy
- Menopause
- Drugs, e.g. caffeine, cocaine
- Mitral valve disease
- Aortic incompetence
- Hypoxia / Hypercapnia



Masquerade Checklist



- Depression
- Diabetes Mellitus
- Drugs
- Anemia
- Thyroid disease
- Spinal dysfunction
- Infection (Urinary Tract , ...)





Important and Serious Diagnoses



- Myocardial infarction / angina
- Life threatening Arrhythmias
 - Wolff-Parkinson-White Syndrome
 - LQTS / SQTs
 - Burgada sy.
- Electrolyte disturbances



History



Keys:

- Characterization of the palpitation
- Attendant symptoms
- Cardiac history
- Arrhythmia history
- Family history
- Possible systemic & endocrinology disorders
- Drug use



1-Characterization of the Palpitation

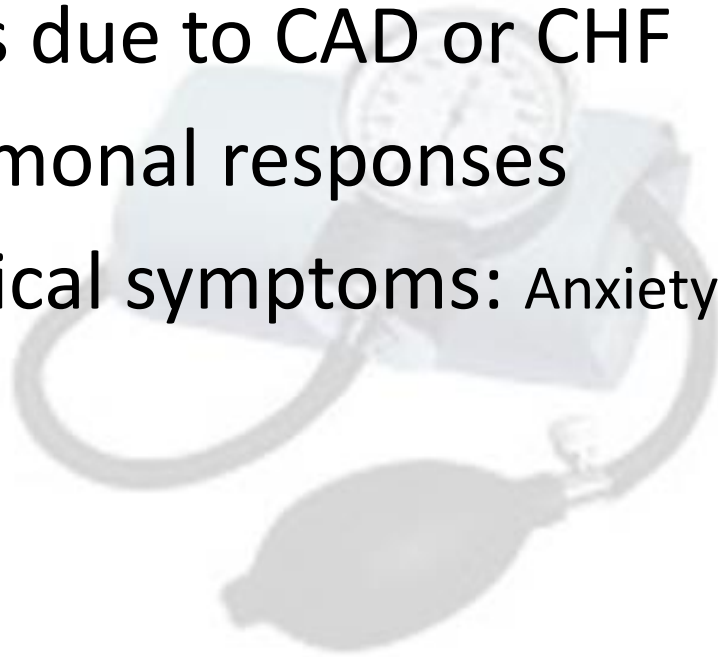
1. Circumstances at onset
2. Duration of the problem
3. Mode of onset/offset , Trigger factors
4. Heart rate estimate
5. Rhythm regularity vs. irregularity
6. Episode duration
7. Symptom frequency



2- Attendant Symptoms



- Symptoms arising from rhythm disorder
- Symptoms due to CAD or CHF
- Neurohormonal responses
- Psychological symptoms: Anxiety disorder , Panic attacks

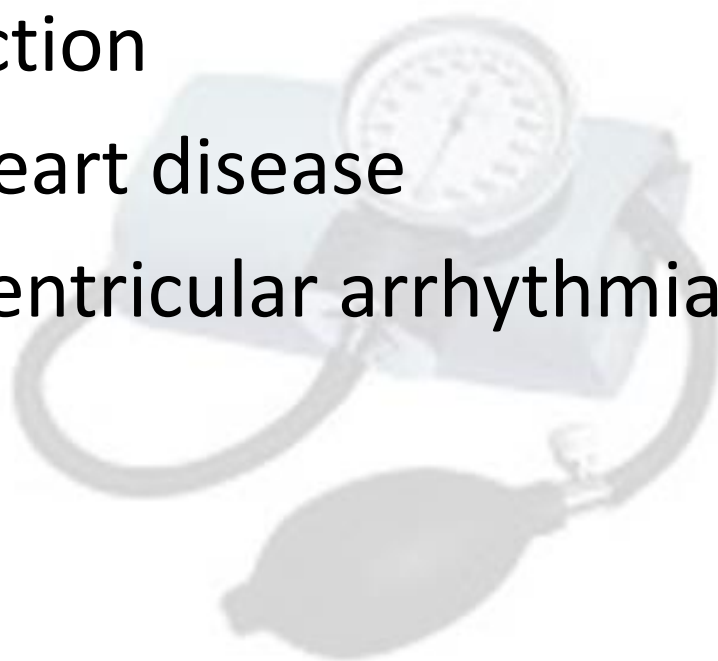




3- Cardiac History



- Ischemic heart disease
- LV dysfunction
- Valvular heart disease
- Atrial or ventricular arrhythmias

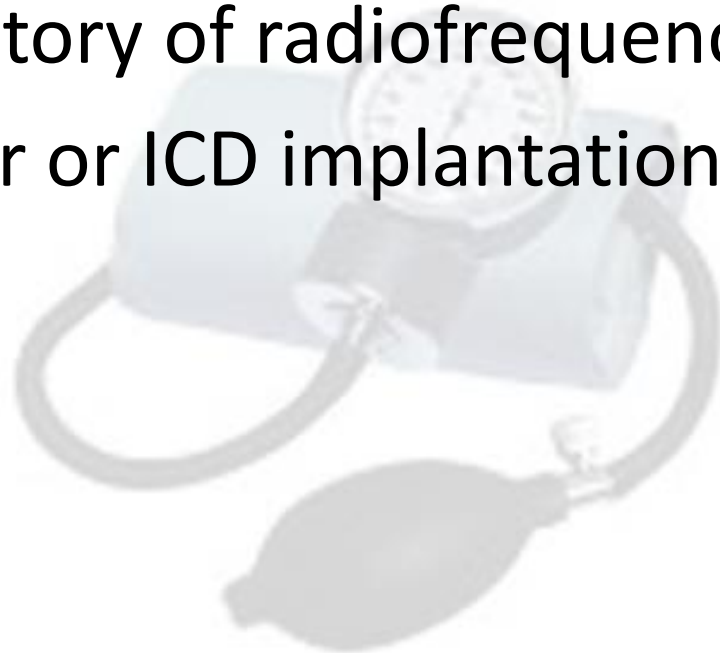




4-Arrhythmia History



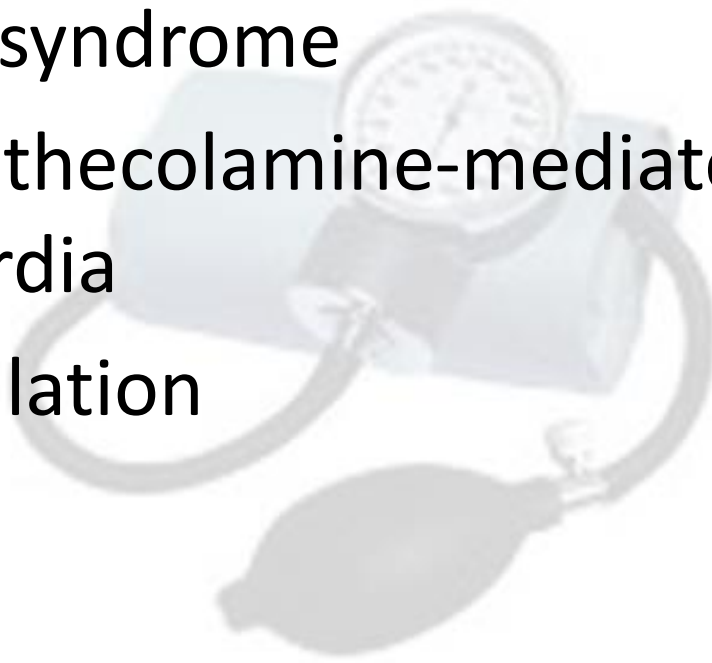
- Recurrence vs. new onset
- Recent history of radiofrequency ablation
- Pacemaker or ICD implantation





5- Family History

- Long QT syndrome
- Brugada's syndrome
- Familial catecholamine-mediated polymorphic V. tachycardia
- Atrial fibrillation

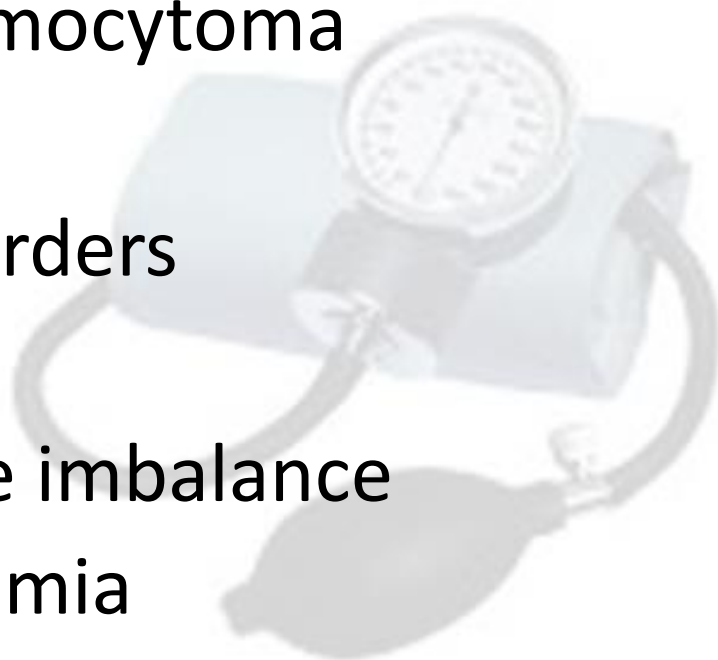




6- Possible Endocrine and Metabolic Disorders



- Hyper or hypothyroidism
- Pheochromocytoma
- Diabetes
- Renal disorders
- Anemia
- Electrolyte imbalance
- Hypoglycemia
- Hx of rheumatic fever





7- Drug & Dietary Use



- Bronchodilator therapy, beta agonists,
- Caffeine , alcohol , Chocolate
- Stimulants / substance abuse: Cocaine
- OTC sympathomimetic agents
- QT-prolonging drugs
- Thyroid replacement medications
- phenothiazine, isotretinoin, digoxin
- Tobacco



Bradycardia/AV blockade

Beta blockers
Calcium channel
blockers
Cardiac glycosides
Digoxin
Digitoxin
Red squill
Digitalis lanata
Digitalis purpurea
Bufotenin
Oleander
Alpha-adrenergic
agonists
Phenylpropanolamine
Clonidine
Imidazolines
Lithium
Cholinergics
Organophosphates
Carbamates
Opioids
Sedative-hypnotics
Magnesium

Supraventricular tachycardia

Sympathomimetics
Amphetamines
Cocaine
Theophylline
Caffeine
Methylphenidate
Ephedrine
Pseudoephedrine
Albuterol
Dobutamine
Epinephrine
Dopamine
Anticholinergics
Antihistamines
TCAs
Phenothiazines
Clozapine
Atropine
Scopolamine
Thyroid hormone
Cellular asphyxiants
Carbon monoxide
Drug withdrawal states



Ventricular tachycardia

Sympathomimetics
Cocaine
Amphetamines
Theophylline
Antidepressants
TCAs
Antipsychotics
Phenothiazines
Chlorinated
hydrocarbons
Chloral hydrate
Solvents
Fluoride
Cardiac glycosides
Potassium



QRS and QT interval prolongation

Antidepressants
Tricyclics
Maprotiline
Antipsychotics
Phenothiazines
Antihistamines
Diphenhydramine
Astemizole
Terfenadine
Antiarrhythmics
Quinidine
Disopyramide
Procainamide
Propafenone
Flecainide, encainide
Amiodarone

Calcium channel blockers (rare)
Beta blockers (rare)
Propoxyphene
Organophosphate insecticides
Antimicrobials
Amantadine
Chloroquine
Erythromycin
Pentamidine
Quinine
Arsenic
Thallium
Fluoride
Citrate
Lithium

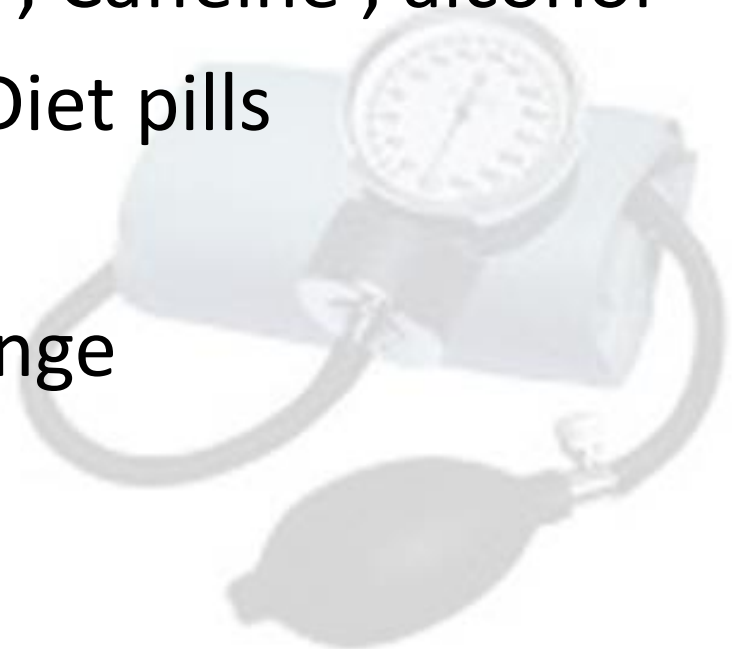




Dietary Supplement Causing Palpitation



- Chocolate , Caffeine , alcohol
- Ephedra/Diet pills
- Ginseng
- Bitter Orange
- Valerian
- Hawthorn





Physical Examination



Often uninformative in young adults

- Check for presence of organic heart disease
 - LV dysfunction
 - Valvular HD
 - Congenital HD
- Evidence of COPD
- Signs of anemia, thyroid and renal disease
- Pulse quality, rate, regularity, pauses
- Orthostatic hypotension



Physical Examination



- Best performed while having palpitations
- Signs especially to consider
 - Palm signs (sweaty, pallor)
 - Radial pulse (character)
 - Blood Pressure
 - Eye signs (pallor, eye signs of thyrotoxicosis)
 - Goitre
 - Jugular vein pulsations
 - Praecordium abnormalities (e.g. cardiac enlargement, murmurs)



TABLE 2

Key Clinical Findings with Palpitations and Suggested Diagnoses

<i>Finding</i>	<i>Suggested diagnosis</i>
Single "skipped" beats	Benign ectopy
Feeling of being unable to catch one's breath	Ventricular premature contractions
Single pounding sensations	Ventricular premature contractions
Rapid, regular pounding in neck	Supraventricular arrhythmias
Palpitations that are worse at night	Benign ectopy or atrial fibrillation
Palpitations associated with emotional distress	Psychiatric etiology or catecholamine-sensitive arrhythmia
Palpitations associated with activity	Coronary heart disease
General anxiety	Panic attacks
Medication or recreational drug use	Drug-induced palpitations
Rapid palpitations with exercise	Supraventricular arrhythmia, atrial fibrillation
Positional palpitations	Atrioventricular nodal tachycardia, pericarditis
Heat intolerance, tremor, thyromegaly	Hyperthyroidism
Palpitations since childhood	Supraventricular tachycardia
Rapid, irregular rhythm	Atrial fibrillation, tachycardia with variable block
Palpitations terminated by vagal maneuvers	Supraventricular tachycardia
Heart murmur	Heart valve disease
Midsystolic click	Mitral valve prolapse
Friction rub	Pericarditis

NOTE: The information in this table is based on clinical experience and not on the results of clinical trials.





Box 2. Which patients to refer or 'When to worry'

Patients with frequent or persistent palpitations

Sustained rapid palpitations

Significant associated symptoms:

- Pre-syncope/syncope (consider situational context)
- Breathlessness
- Chest pain

Family history of recurrent syncope or of sudden death

Significant resting 12-lead electrocardiography or echocardiographic abnormalities

- Wolff-Parkinson-White syndrome (pre-excitation including short PR interval and delta wave)
- Signs of structural or electrical abnormalities:
 - T wave abnormalities
 - Prior myocardial infarction (Q waves)
 - Long or short QT interval, Brugada pattern, early repolarisation pattern



Box 1. Palpitations: Key questions in history-taking

Onset and offset: sudden or gradual

Duration: momentary or sustained
(how long?)

Frequency

Triggers (frequently may not be obvious)

Associated symptoms

- Pre-syncope/syncope
- Breathlessness
- Chest pain (possibly ischaemic in nature)

Existing cardiac conditions

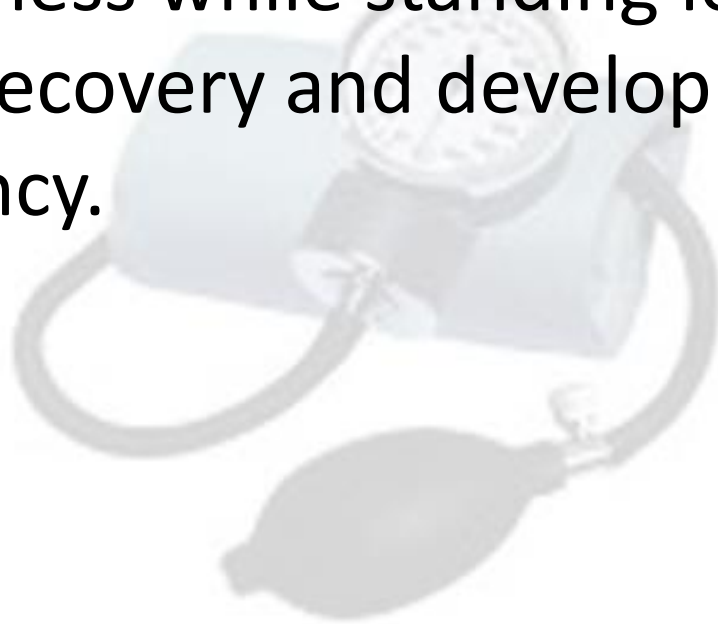




New Case



- A 19 Y.O soldier developed with acute loss of consciousness while standing leading to a fall with fast recovery and development of incontinency.

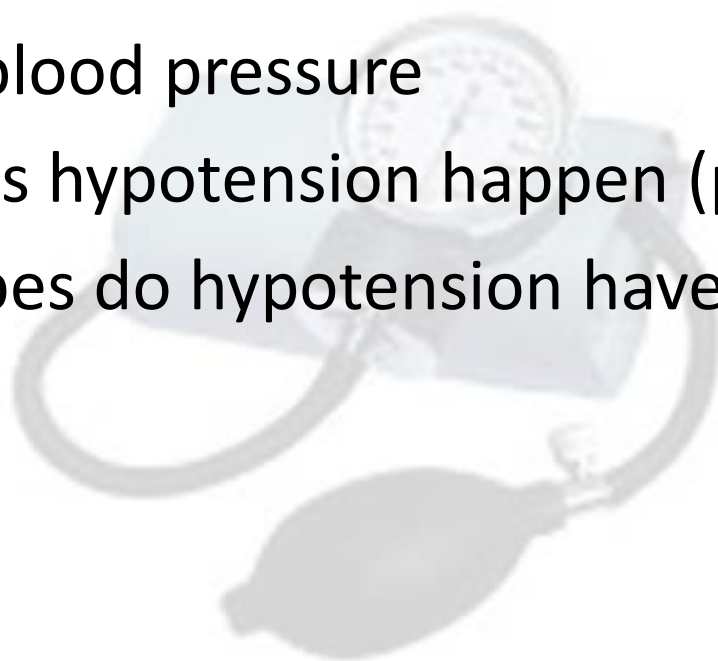




Outlines



- Become familiar with:
 - Normal blood pressure
 - How does hypotension happen (pathophysiology)
 - What types do hypotension have





Hypotension



Low blood pressure

A blood pressure level which is two standard deviation lower than mean population normal blood pressure.

Hypotension

A low blood pressure level which causes symptoms for patients

Shock

A low blood pressure level leading to organ malperfusion and malfunction



Low blood pressure



- As these patients are not symptomatic this entity is not considered a disease.
- So, very few studies are done for this entity
- Known causes are:
 - Usually idiopathic
 - Mitral valve prolapse (MVP)
 - Chronic adrenal insufficiency
 - Heart failure



Hypotension



- Usual signs are light-headedness, palpitation and dizziness
- Orthostatic hypotension:
 - Orthostatic hypotension, defined as a reduction in systolic blood pressure of at least 20 mmHg or diastolic blood pressure of at least 10 mmHg within 3 min of standing.



Hypotension



B. Orthostatic Hypotension

Primary autonomic failure due to idiopathic central and peripheral neurodegenerative diseases—the “synucleinopathies”

- Lewy body diseases

 - Parkinson’s disease

 - Lewy body dementia

 - Pure autonomic failure

- Multiple system atrophy (the Shy-Drager syndrome)

Secondary autonomic failure due to autonomic peripheral neuropathies

- Diabetes

- Hereditary amyloidosis (familial amyloid polyneuropathy)

- Primary amyloidosis (AL amyloidosis; immunoglobulin light chain associated)

- Hereditary sensory and autonomic neuropathies (HSAN) (especially type III—familial dysautonomia)

- Idiopathic immune-mediated autonomic neuropathy

- Autoimmune autonomic ganglionopathy

- Sjögren’s syndrome

- Paraneoplastic autonomic neuropathy

- HIV neuropathy

- Postprandial hypotension

- Iatrogenic (drug-induced)

- Volume depletion



Hypotension



- Syncope :
 - a transient, self-limited loss of consciousness due to acute global impairment of cerebral blood flow. The onset is rapid, duration brief, and recovery spontaneous and complete.
 - Other causes of transient loss of consciousness need to be distinguished from syncope; these include seizures, vertebrobasilar ischemia, hypoxemia, and hypoglycemia.



Hypotension





Hypotension



- The upright posture imposes a unique physiologic stress upon humans; most, although not all, syncopal episodes occur from a standing position.
- Standing results in pooling of 500–1000 mL of blood in the lower extremities and splanchnic circulation. There is a decrease in venous return to the heart and reduced ventricular filling that result in diminished cardiac output and blood pressure.
- These hemodynamic changes provoke a compensatory reflex response, initiated by the baroreceptors in the carotid sinus and aortic arch, resulting in increased sympathetic outflow and decreased vagal nerve activity.
- The reflex increases peripheral resistance, venous return to the heart, and cardiac output and thus limits the fall in blood pressure.
- If this response fails, as is the case chronically in orthostatic hypotension and transiently in neurally mediated syncope, cerebral hypoperfusion occurs.
- From the clinical standpoint, a fall in systemic systolic blood pressure to ~50 mmHg or lower will result in syncope.



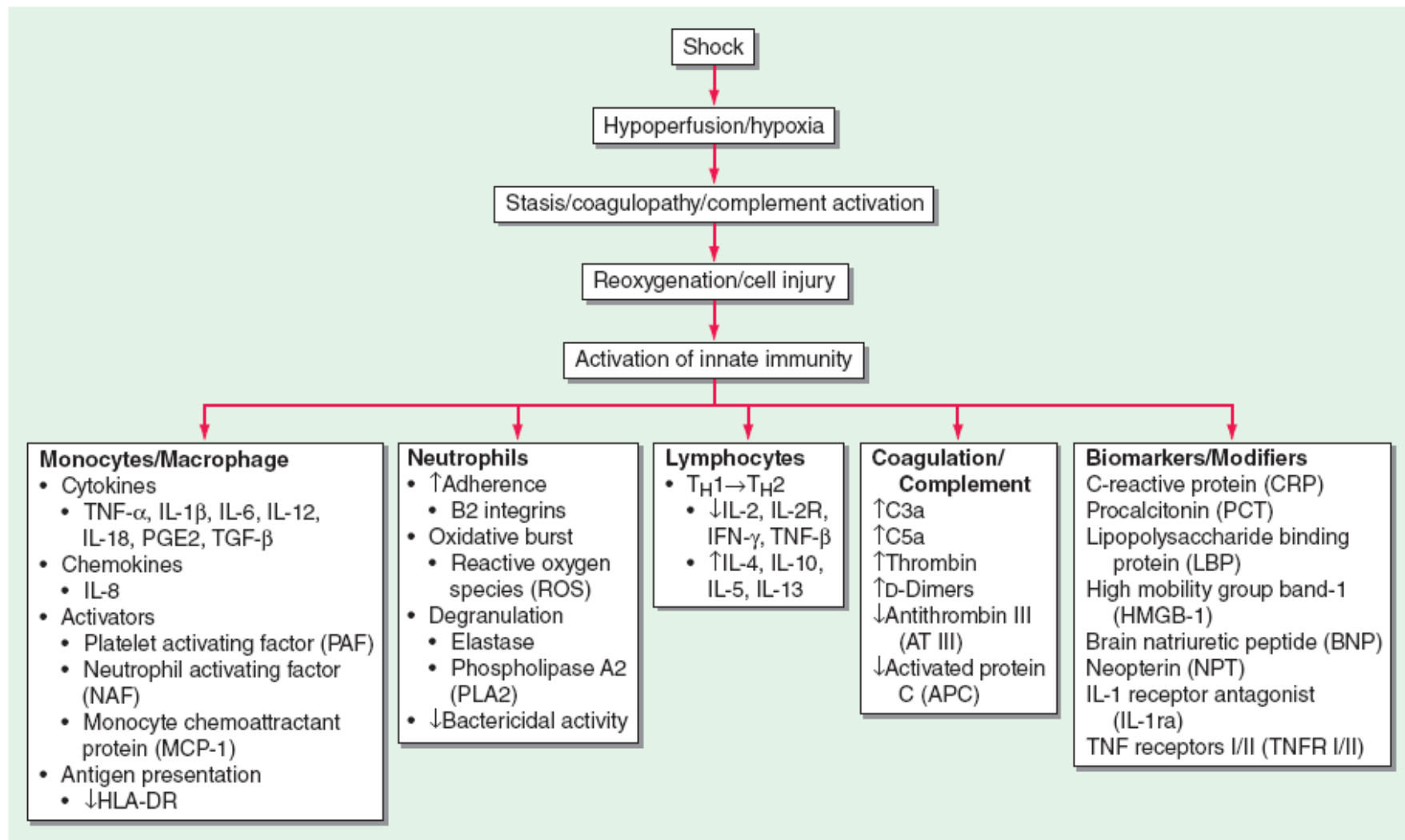
Shock



- *Shock is the clinical syndrome that results from inadequate tissue perfusion. Irrespective of cause, the hypoperfusion-induced imbalance between the delivery of and requirements for oxygen and substrate leads to cellular dysfunction.*
- Clinical shock is usually accompanied by hypotension (i.e., a mean arterial pressure [MAP] <60 mmHg in previously normotensive persons).



Shock





Shock



- Normally when cardiac output falls, systemic vascular resistance rises to maintain a level of systemic pressure that is adequate for perfusion of the heart and brain at the expense of other tissues such as muscle, skin, and especially the gastrointestinal (GI) tract.



Shock

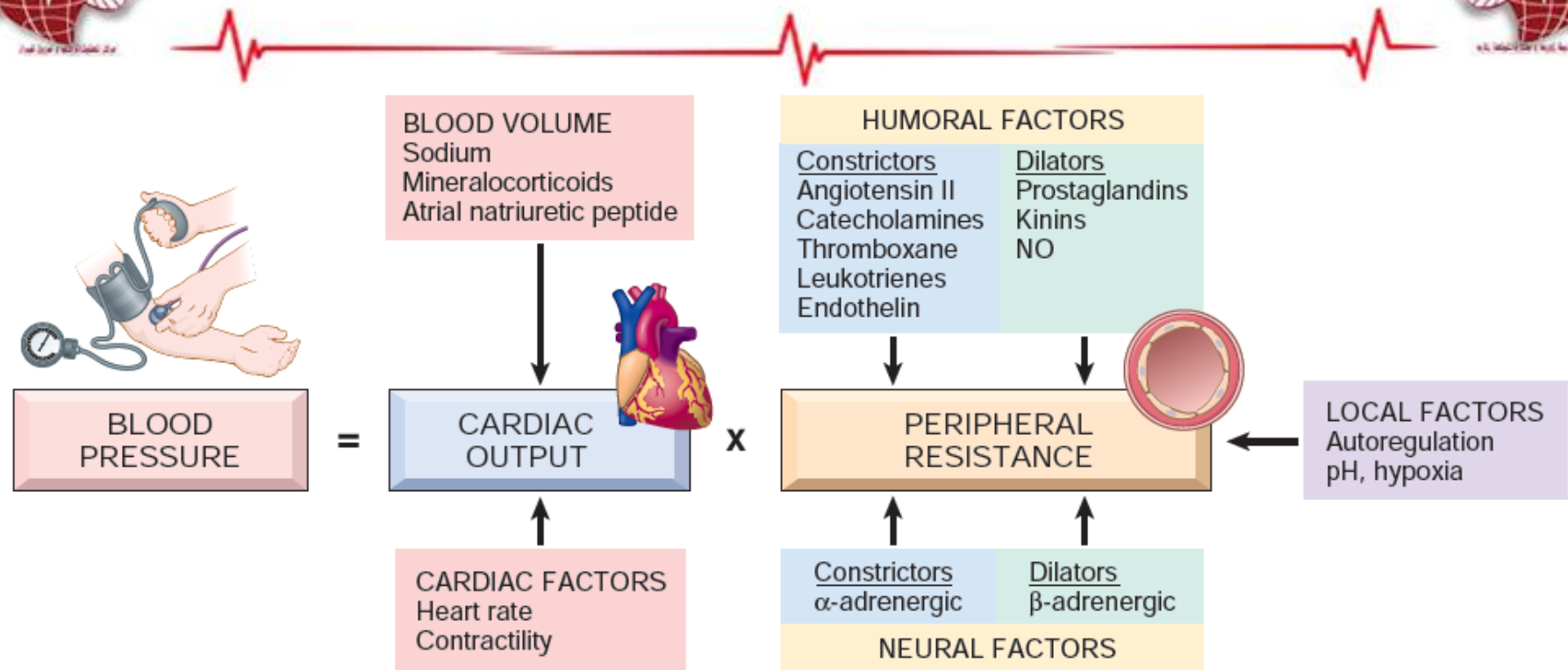


TABLE 324-1 CLASSIFICATION OF SHOCK	
Hypovolemic	Septic
Traumatic	Hyperdynamic (early)
Cardiogenic	Hypodynamic (late)
Intrinsic	Neurogenic
Compressive	Hypoadrenal



Shock



TABLE 324-4 **PHYSIOLOGIC CHARACTERISTICS OF THE VARIOUS FORMS OF SHOCK**

Type of Shock	CVP and PCWP	Cardiac Output	Systemic Vascular Resistance	Venous O ₂ Saturation
Hypovolemic	↓	↓	↑	↓
Cardiogenic	↑	↓	↑	↓
Septic				
Hyperdynamic	↓↑	↑	↓	↑
Hypodynamic	↓↑	↓	↑	↓↑
Traumatic	↓	↓↑	↑↓	↓
Neurogenic	↓	↓	↓	↓
Hypoadrenal	↓	↓	=↓	↓

Abbreviations: CVP, central venous pressure; PCWP, pulmonary capillary wedge pressure.

		Peripheral vascular resistance	
Cardiac output		Decreased	Increased
	Decreased	Neurogenic	Hypovolemic Cardiogenic
	Increased	Septic	-----



Clinical Manifestations



		Congestion at rest? (e.g., orthopnea, elevated jugular venous pressure, pulmonary rales, S3 gallop edema)	
		No	Yes
Low perfusion at rest? (e.g., narrow pulse pressure, cool extremities, hypotension)	No	Warm and dry	Warm and wet
	Yes	Cool and dry	Cool and wet

FIGURE 23-2 Schema for categorizing patients with HF on the basis of perfusion (warm versus cold) and presence of congestion (dry versus wet). The four categories of HF identified in this schema have different treatment strategies. (Based on data from Nohria A, Tsang SW, Fang JC, et al: Clinical assessment identifies hemodynamic profiles that predict outcomes in patients admitted with heart failure. *J Am Coll Cardiol* 41:1797, 2003.)



Shock



- **Hypovolemic shock:**
- Mild hypovolemia ($\leq 20\%$ of the blood volume) generates mild tachycardia but relatively few external signs, especially in a supine young patient.
- With moderate hypovolemia ($\sim 20\text{--}40\%$ of the blood volume), the patient becomes increasingly anxious and tachycardic; although normal blood pressure may be maintained in the supine position, there may be significant postural hypotension and tachycardia.
- If hypovolemia is severe ($\geq 40\%$ of the blood volume), the classic signs of shock appear; the blood pressure declines and becomes unstable even in the supine position, and the patient develops marked tachycardia, oliguria, and agitation or confusion.
- Perfusion of the central nervous system is well maintained until shock becomes severe. Hence, mental obtundation is an ominous clinical sign.



Shock



TABLE 324-5 **HYPOVOLEMIC SHOCK**

Mild (<20% Blood Volume)	Moderate (20–40% Blood Volume)	Severe (>40% Blood Volume)
Cool extremities	Same, plus:	Same, plus:
Increased capillary refill time	Tachycardia	Hemodynamic instability
Diaphoresis	Tachypnea	Marked tachycardia
Collapsed veins	Oliguria	Hypotension
Anxiety	Postural changes	Mental status deterioration (coma)



Shock



- It is essential to distinguish between hypovolemic and cardiogenic shock because, although both may respond to volume initially, definitive therapy differs significantly. Both forms are associated with a reduced cardiac output and a compensatory sympathetic mediated response characterized by tachycardia and elevated systemic vascular resistance.
- However, the findings in cardiogenic shock of jugular venous distention, rales, and an S3 gallop distinguish it from hypovolemic shock and signify that ongoing volume expansion is undesirable and may cause further organ dysfunction.



Shock



- **Traumatic shock:**

- Shock following trauma is, in large measure, due to hemorrhage. However, even when hemorrhage has been controlled, patients can continue to suffer loss of plasma volume into the interstitium of injured tissues. These fluid losses are compounded by injury-induced inflammatory responses, which contribute to the secondary microcirculatory injury.



Shock



- **Neurogenic shock**

- Interruption of sympathetic vasomotor input after a high cervical spinal cord injury, inadvertent cephalad migration of spinal anesthesia, or devastating head injury may result in neurogenic shock.
- In addition to arteriolar dilation, venodilation causes pooling in the venous system, which decreases venous return and cardiac output.
- The extremities are often warm, in contrast to the usual sympathetic vasoconstriction induced coolness in hypovolemic or cardiogenic shock.
- Treatment involves a simultaneous approach to the relative hypovolemia and to the loss of vasomotor tone.



Shock



- **Cardiogenic shock:**

- Obstructive: A mechanical factor prevents heart from emptying:

- Cardiac Tamponade
 - Tension pneumothorax
 - Massive pulmonary Emboli
 - Hypertrophic obstructive cardiomyopathy



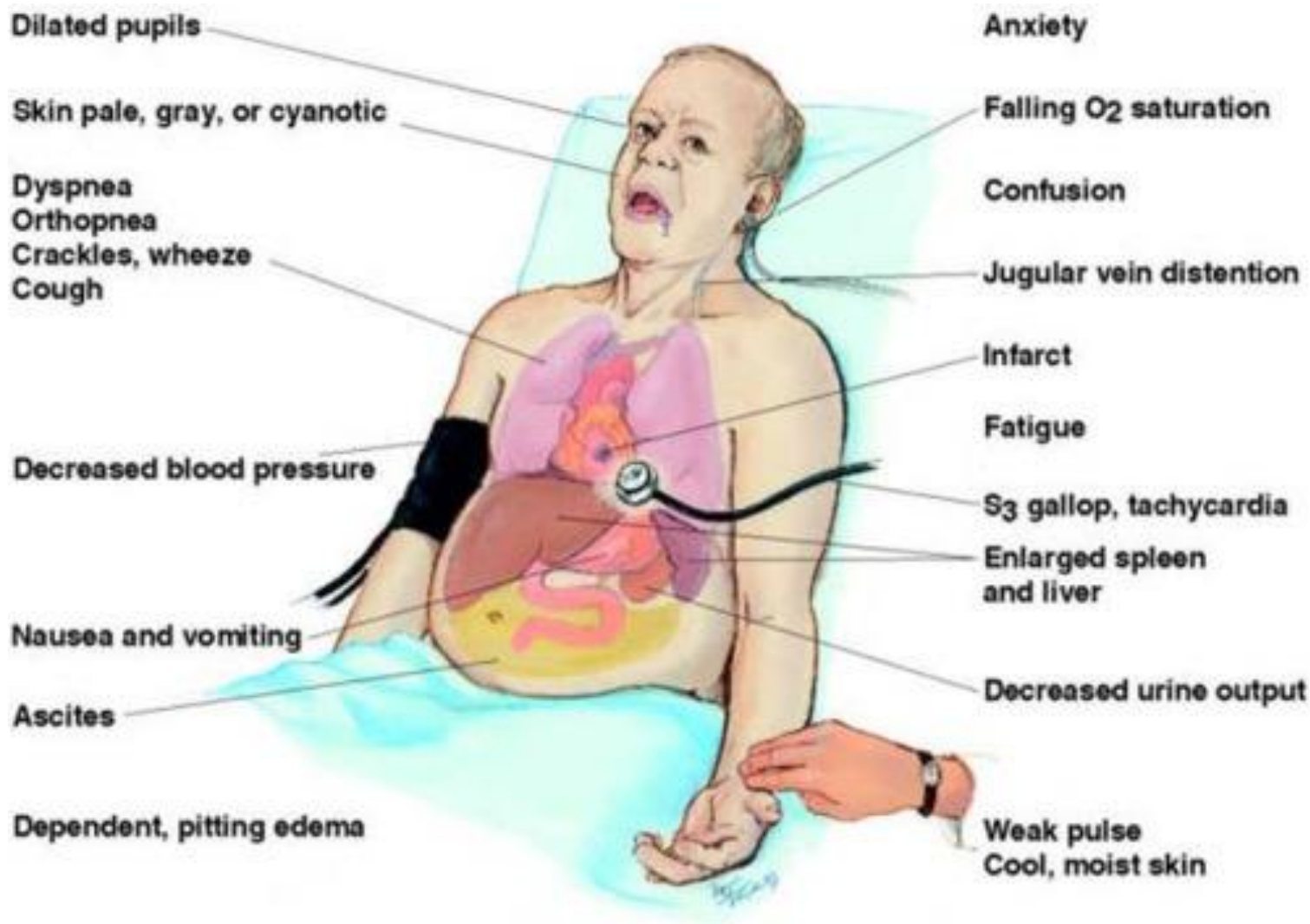
Shock



- Cardiogenic shock (CS) is characterized by systemic hypoperfusion due to severe depression of the cardiac index (<2.2 [L/min]/m²) and sustained systolic arterial hypotension (<90 mmHg) despite an elevated filling pressure (pulmonary capillary wedge pressure [PCWP] >18 mmHg). It is associated with in-hospital mortality rates $>50\%$.



Shock





Shock



TABLE 326-1 ETIOLOGIES OF CARDIOGENIC SHOCK (CS)^a AND CARDIOGENIC PULMONARY EDEMA

Etiologies of Cardiogenic Shock or Pulmonary Edema

Acute myocardial infarction/ischemia

LV failure

Ventricular septal rupture

Papillary muscle/chordal rupture–severe MR

Ventricular free wall rupture with subacute tamponade

Other conditions complicating large MIs

Hemorrhage

Infection

Excess negative inotropic or vasodilator medications

Prior valvular heart disease

Hyperglycemia/ketoacidosis

Post-cardiac arrest

Post-cardiotomy

Refractory sustained tachyarrhythmias

Acute fulminant myocarditis

End-stage cardiomyopathy

LV apical ballooning

Takotsubo's cardiomyopathy

Hypertrophic cardiomyopathy with severe outflow obstruction

Aortic dissection with aortic insufficiency or tamponade

Severe valvular heart disease

Critical aortic or mitral stenosis

Acute severe aortic regurgitation or mitral regurgitation

Toxic/metabolic

β blocker or calcium channel antagonist overdose

Other Etiologies of Cardiogenic Shock^b

RV failure due to:

Acute myocardial infarction

Acute cor pulmonale

Refractory sustained bradyarrhythmias

Pericardial tamponade

Toxic/metabolic

Severe acidosis, severe hypoxemia

^aThe etiologies of CS are listed. Most of these can cause pulmonary edema instead of shock or pulmonary edema with CS. ^bThese cause CS but not pulmonary edema.

Abbreviations: LV, left ventricular; MI, myocardial infarction; MR, mitral regurgitation; RV, right ventricular; VSR, ventricular septal rupture.



Shock



Clinical signs: Shock, hypoperfusion, congestive heart failure, acute pulmonary edema
Most likely major underlying disturbance?

Acute pulmonary edema

Hypovolemia

Low output-cardiogenic shock

Arrhythmia

First line of action

Administer

- **Furosemide** IV 0.5 to 1.0 mg/kg
- **Morphine** IV 2 to 4 mg
- **Oxygen**/intubation as needed
- **Nitroglycerin** SL, then 10 to 20 µg/min IV if SBP greater than 100 mmHg
- ***Norepinephrine, 0.5 to 30 µg/min IV or Dopamine, 5 to 15 µg/kg per minute IV if SBP <100 mmHg and signs/symptoms of shock present**
- **Dobutamine** 2 to 20 µg/kg per minute IV if SBP 70 to 100 mmHg and **no** signs/symptoms of shock

Administer

- Fluids
- Blood transfusions
- Cause-specific interventions

Consider vasopressors

Check blood pressure

Section 9.5 – 2013 American College of Cardiology Foundation /American Heart Association Guidelines for Management of STElevation Myocardial Infarction and Figures 3 and 4 – 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, Part 8: Adult Advanced Cardiovascular Life Support

Bradycardia

Tachycardia

Second line of action

Check blood pressure

Systolic BP
Greater than 100 mmHg
and not less than 30 mmHg
below baseline

ACE Inhibitors
Short-acting agent such as
captopril (1 to 6.25 mg)

Systolic BP
Greater than 100 mmHg

Nitroglycerin
10 to 20 µg/min IV

Systolic BP
70 to 100 mmHg
NO signs/symptoms of shock

Dobutamine
2 to 20 µg/kg per minute IV

Systolic BP
less than 100 mmHg
signs/symptoms of shock*

***Norepinephrine 0.5 to 30 µg/min IV
or
Dopamine, 5 to 15 µg/kg per minute IV**



Thanks

