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FACULTY OF NURSING SCIENCES

By- SUDHA BENJAMINI
Associate Professor
Faculty of Nursing

Cardiac Emergencies

Overview

- Definition
- Risk factors &Causes
- Pathophysiology
- Clinical manifestation
- Diagnostic Evaluation
- Management
- Prevention

Cardiac Energencies (Paert –II)

- Pulmonary Edema
- Cardiogenic shock
- Cardiac Tamponade
- Dysrhythmias
- Pacemaker Failure
- Cardiac arrest

Acute pulmonary oedema

- Severe respiratory distress with exhaustion
- Altered level of consciousness
- Ability to talk in words only
- Central cyanosis
- Pale, clammy, anxious
- Cough, pink frothy sputum
- Audible respiratory crepitations
- History of cardiac disease
- (NSW Health 2007)

Acute pulmonary oedema

Patient position/Airway: sitting upright and maintain airway

- **Breathing**: Assess respiratory rate and effort,
- administer **high flow oxygen, maintain SpO2 >95%**
- **Circulation**: BP, pulse and capillary refill
- Monitor for dysrhythmias, IV cannula
- Blood tests
- **Disability**: GCS and pupil response
- 12 lead ECG, Blood Glucose
- Consider causes eg. Acute myocardial infarct

Acute pulmonary oedema

- Nitrates: venodilators which decrease cardiac preload Glyceryl trinitrate (Anginine) SL 300-600 mcg stat and then every 5 mins while systolic BP >90 mmHg (or SL, 1-2sprays), GTN infusion
- Topical nitrates not recommended – poor absorption due to sweatiness and peripheral vasoconstriction

- Non-invasive CPAP:
- - May decreased need for intubation
- - Use only if systolic BP >100 mmHg
- Diuretics:
- IV Lasix if creps present
- *IV Morphine not recommended*(, NSW Health 2007)

Cardiogenic Shock

Cardiogenic shock

- Characterised by left ventricular failure (LVF)
- Most common cause acute myocardial infarct
- Leads to decreased tissue perfusion and impaired
- cellular activity
- Adrenaline and noradrenaline are released to increase heart rate and contractility
- Heart muscle is placed under more pressure with
- increased myocardial oxygen demand
- LVF can lead to acute pulmonary oedema
- (Collins 2000, NSW Health 2007, Stillwell 2002)

Cardiogenic shock

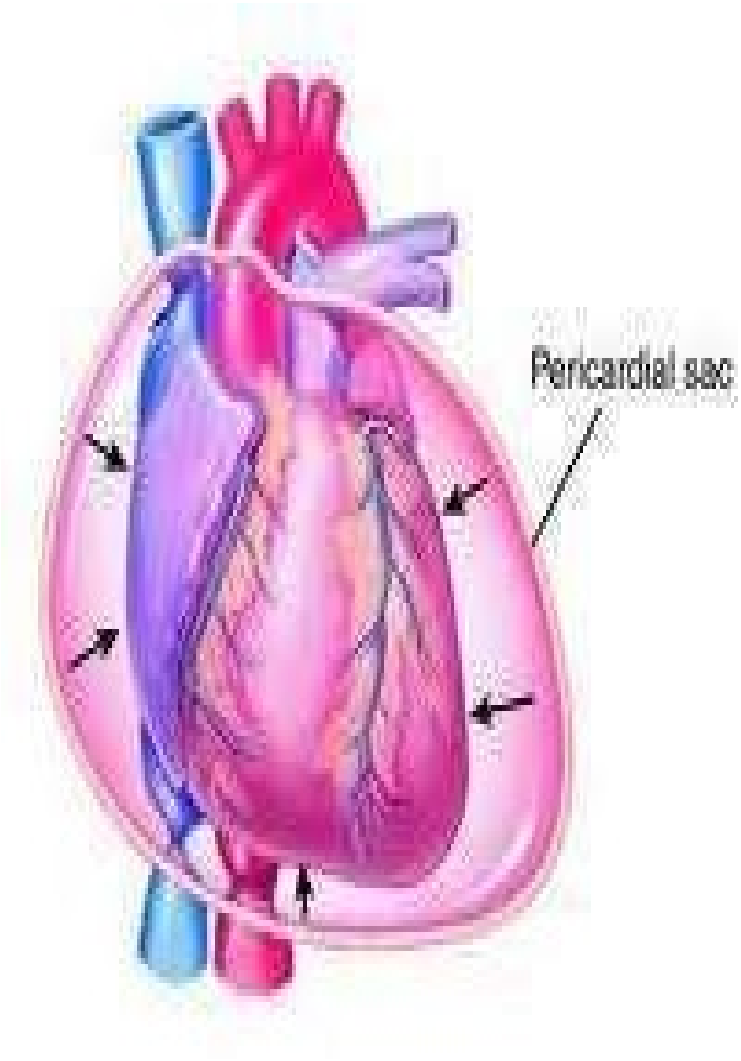
- Weak, rapid pulse
- Chest pain, may have dysrhythmias
- SBP < 80mmHg, HR >100/min, RR >20/min
- Skin cool, clammy, pale, cyanotic
- ? Confusion due to poor cerebral perfusion
- Talks in single words only
- Urine output < 0.5 ml/kg/hr
- Audible respiratory creps/cough

Cardiogenic shock

- High flow oxygen, 15 litres via non re-breather mask
- Fibrinolysis considered if acute AMI
- Support heart with inotropes – dobutamine,
- noradrenaline
- Reduce oxygen demand with vasodilators & diuretics
- Relieve anxiety and pain
- Frequent vital signs, cardiac monitoring (including cardiac output)
- Consider early transfer for further management

CARDIAC TAMPONADE

Cardiac tamponade, also known as pericardial tamponade, is an acute type of pericardial effusion in which fluid accumulates in the pericardium (the sac in which the heart is enclosed).



CAUSES

- Pericardial effusion
- Pericarditis
- Heart tumors
- Hypothyroidism
- Kidney failure
- Leukemia
- Placement of central lines
- Radiation therapy to the chest
- Recent invasive heart procedures
- Recent open heart surgery

PATHOPHYSIOLOGY

Acute pericardial effusion

↓

The pressure of the pericardial cavity rises

↓

Filling volume of the ventricular diastole decreases

↓

Decreased stroke volume

↓

Decreased blood pressure

CLINICAL MANIFESTATIONS

- Elevated venous pressure
- Distended neck veins
- Kussmaul's sign
- Hypotension
- *Tachycardia*
- Narrow pulse pressure
- Beck's triad- Combination of low arterial blood pressure, distended neck veins and muffled heart sounds due to fluid built up in the pericardium.

DIAGNOSTIC EVALUATION

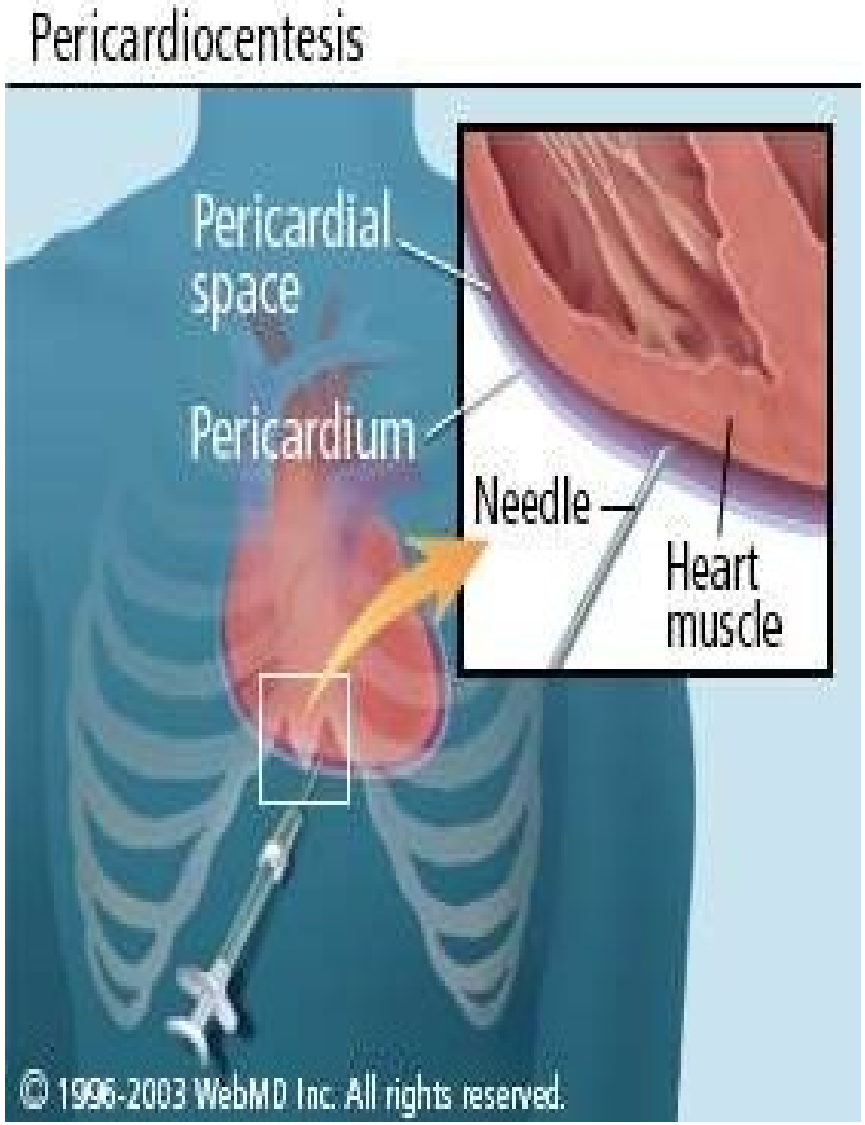
- Chest x ray
- ECG
- Echocardiography
- Cardiac catheterization
- CT Scan
- MRI scan
- Coronary angiography.

MANAGEMENT

- Oxygen administration
- Diuresis
- Positive inotropics
- Antihypertensives
- Antibiotics
- Pericardiocentesis

PERICARDIOCENTESIS

A procedure to drain the excessive fluid accumulation in the heart



Dysrhythmias

- Dysrhythmias present in the emergency department as chest pain, breathlessness, palpitation, sweating, pre-syncope, syncope and thromboembolic complications

Definition:

An arrhythmia is an abnormality of rate, regularity, or site of origin of the cardiac impulse or a disturbance in conduction that causes an abnormal sequence of activation.

- Irregular rhythm
- Abnormal Rate
- Conduction abnormality

Dysrhythmias and acute MI

- Many MI patients experience complications due to electrical dysfunction which include bradycardia, bundle branch block, and heart block.

Etiology of dysrhythmias in MI

- Tissue ischemia, hypoxemia
- Metabolic derangements
  - acid base imbalances
- Electrolyte imbalances
- Cardiomyopathy
- Drugs

Treatment

- Administer O2 to reduce myocardial hypoxia
- Administer bolus IV Lidocaine and infusion
- Correcting electrolyte and acid base imbalance

Diagnostic Approaches to Arrhythmias

- History and physical examination
- ECG
- Ambulatory ECG recording: Holter recording
- Exercise ECG : treadmill test
- Trans-esophageal electrophysiological study
- Invasive electrophysiological study (EPS)

Ventricular tachycardia (VT)

- Definition: A run of three or more premature ventricular contractions define VT. It is a life threatening dysrhythmia because of decreased cardiac output and the possibility of development of ventricular fibrillation(VF), which is a lethal dysrhythmia
- Forms of VT: Monomorphic, polymorphic
- Clinical association: VT is associated with MI, CAD, significant electrolyte imbalances, cardiomyopathy, mitral valve prolapse, long QT syndrome, drug toxicity, and CNS disorders

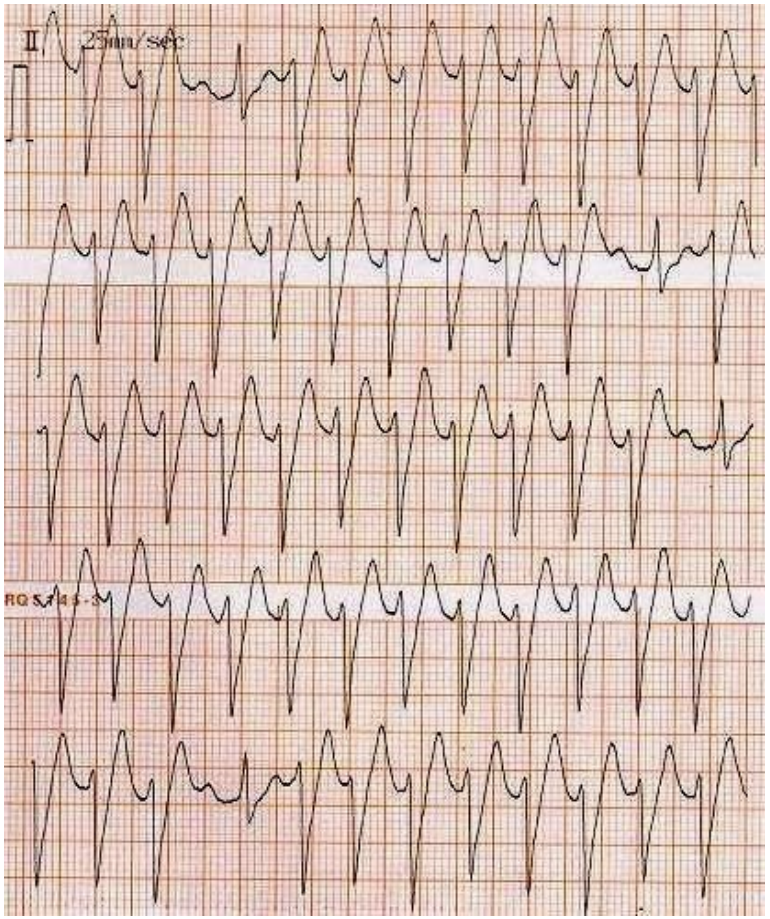
Ventricular tachycardia (VT)

- ECG Characteristics: ventricular rate is 150 to 250 beats/ minute, rhythm may be regular or irregular. AV dissociation may be present with p wave occurring independently of the QRS complex. The QRS complex is distorted in appearance, with a duration > 0.12 sec and with the ST- T wave in the opposite direction of the QRS complex. The R-R interval may be regular or irregular
- Clinical significance: VT can be stable (patient has a pulse) or unstable (patient is pulseless). VT causes decreased cardiac output results in hypotension, pulmonary edema, decreased cerebral blood flow, and cardiopulmonary arrest

Ventricular tachycardia (VT)

Treatment:

- Identify the cause and treat
- If pulse is present IV procainamide, sotalol, amiodarone, or lidocaine
- If VT without pulse- CPR and rapid defibrillation followed by administration of vasopressors and antidysrhythmics



Ventricular Fibrillation

Definition:

VF is a severe derangement of the heart rhythm characterized on ECG by irregular waveforms of varying shapes and amplitude

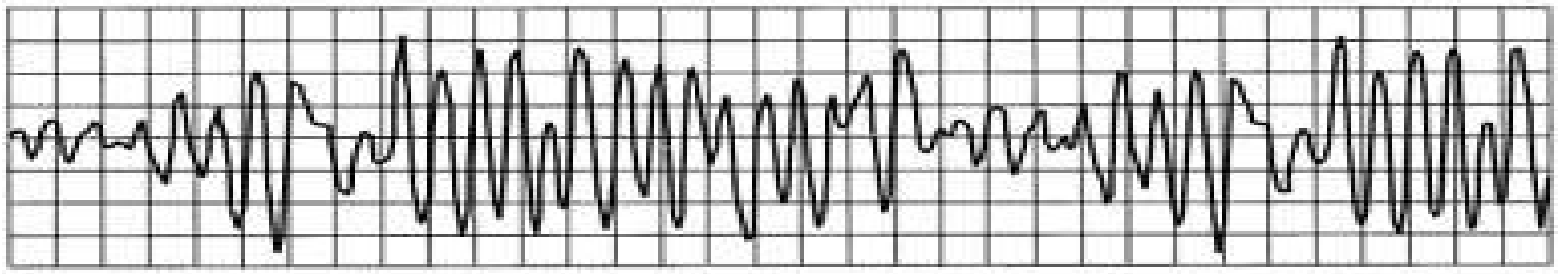
Clinical associations:

VF occurs in acute MI, myocardial ischemia, and in chronic diseases such as HF and cardiomyopathy. Other clinical associations are accidental electrical shock, hyperkalemia, acidosis, and drug toxicity

Ventricular Fibrillation

ECG characteristics:

HR not measurable, rhythm is irregular and chaotic, the p wave is not visible, and the PR interval and the QRS interval not measurable



Ventricular Fibrillation

Clinical significance:

- VF results in an unresponsive, pulseless, and apneic state. If not treated patient will die

Treatment:

- immediate initiation of CPR and advanced cardiac life support (ACLS) measures with the use of defibrillation and definitive drug therapy

ASYSTOLE

Definition:

Asystole represents the total absence of ventricular electrical activity, occasionally p waves are seen. Patients are unresponsive, pulseless and apneic requires immediate treatment.

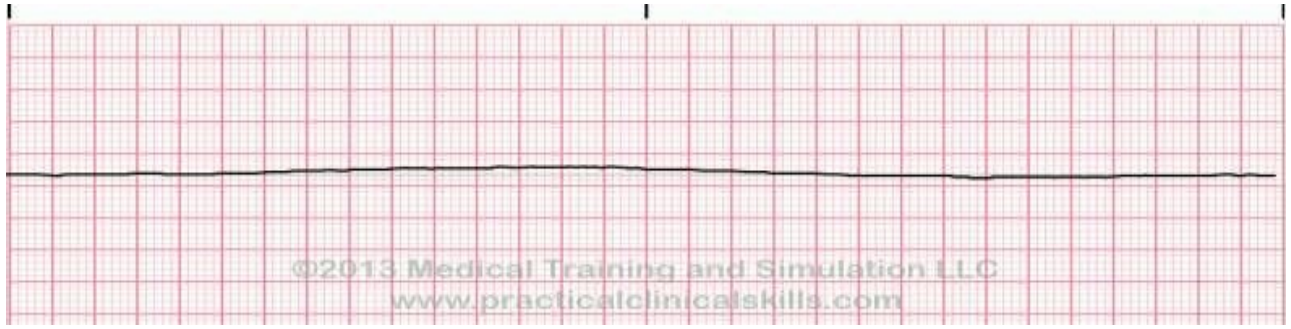
Clinical association:

Result of advanced cardiac disease, conduction system disturbance or end stage HF

ASYSTOLE

Clinical significance:

Generally patient has a prolonged arrest and cannot be resuscitated



Treatment:

CPR with initiation of ACLS which includes definitive drug therapy, intubation and possibly a transcutaneous temporary pacemaker

Pulseless electrical activity (PEA)

Definition: no mechanical activity of the ventricles and the patient has no pulse. The most common cause include hypovolemia, hypoxia, metabolic acidosis, hyperkalemia, or hypokalemia, hypothermia, drug overdose, cardiac tamponade, MI, Tension pneumothorax, trauma and pulmonary embolism. Treatment begins with CPR followed by drug therapy (epinephrine) and intubation. Atropine is used if the ventricular rate is slow

pacemaker failure to capture

- The 12-lead ECG demonstrates atrial fibrillation with a narrow QRS complex rhythm at a rate of 55 beats/minute with intermittent irregularity. More importantly, there are small pacer spikes seen throughout the 12-lead ECG that have no clear or consistent association with the QRS complexes. and below most programmed pacing thresholds

Pacemaker malfunctions

- failure to pace
- failure to capture
- Undersensing
- pacemaker-mediated dysrhythmias

Uses of Pacemakers

- To prevent Adams-Stokes attacks atrioventricular (AV) node and sinus node dysfunction,
- hypersensitive carotid sinus syndrome and neurally-mediated syncope (vasovagal syncope),
- prevention of tachycardia with long QT syndrome,
- hypertrophic cardiomyopathy,
- congestive heart failure, and prevention of atrial fibrillation.

A five-position code

- Position I indicates the chambers being paced, atrium (A), ventricle (V), both (D, dual), or none (0).
- Position II gives the location where the pacemaker senses native cardiac electrical activity (A, V, D, or O).
- Position III indicates the pacemaker's response to sensing: triggering (T), inhibition (I), both (D), or none (O).
- Position IV indicates the programmability of the pacemaker and the capability to adaptively control rate;
- position V identifies the presence of antitachydysrhythmia functions.

Common pacemaker

- DDD pacemaker Both the atria and the ventricles are sensed and either paced or inhibited depending on the native cardiac activity sensed.
- VVI pacing is useful in those with chronically ineffective atria, such as chronic atrial fibrillation or atrial flutter. In this mode, the ventricle is sensed and paced. If the native ventricular activity is sensed, then pacing is inhibited.

ECG patterns

- **ventricular pacing lead** in the right ventricle, the ventricles depolarize from right to left rather than by the regular conduction system, producing an overall QRS morphology similar to a left bundle branch block with QRS interval prolongation
- **intracardiac pacemaker** leads over left ventricle, resulting in a right bundle branch block pattern. Because of the abnormal ventricular depolarization seen in paced rhythms, repolarization also occurs abnormally, and ST segments and T waves should typically be discordant with the QRS complex.

Failure to pace

- .Cause: occurs when the pacemaker does not fire when pacing should occur.
- **s/s** ECG, there are no visible pacing spikes.
- **Causes** include oversensing, pacing lead problems (dislodgement or fracture), battery or component failure, and electromagnetic interference.

Oversensing & Undersensing

- **Undersensing** occurs when a pacemaker fails to sense or detect native cardiac activity. Pacing spikes will be seen when none should occur.

Evaluation

- 12-lead ECG, and cautious use of a magnet can assist in evaluating pacer function.

- Oversensing
- Causes include pacing problems, battery or co
failure, low pacing volta
elevated myocardial pac
thresholds, and exit blo

Management

- **no pacemaker activity** on the ECG, placing a magnet over the pacer will switch the pacemaker to asynchronous pacing and allow for assessment of capture.
- **if the patient's native cardiac rhythm is above the lower rate** threshold for pacing, cautious attempts to slow the rate with carotid massage or adenosine

Failure To Capture

- **Cause**: occurs when a pacing stimulus is generated, but fails to trigger myocardial depolarization.
- **s/s** ECG: presence of low amplitude pacing spikes without associated myocardial depolarization and Failure to sense native ventricular activity
- **Dx:** chest radiograph showing a fracture in the pacing wire
- **Management** Replacement of fractured right ventricular pacing lead as well as pacemaker

CARDIAC ARREST

DEFINITION OF SUDDEN CARDIAC ARREST

- Sudden cardiac arrest (SCA) is a condition in
- which the heart suddenly and unexpectedly stops beating.

this happens, blood stops flowing to the brain and other vi

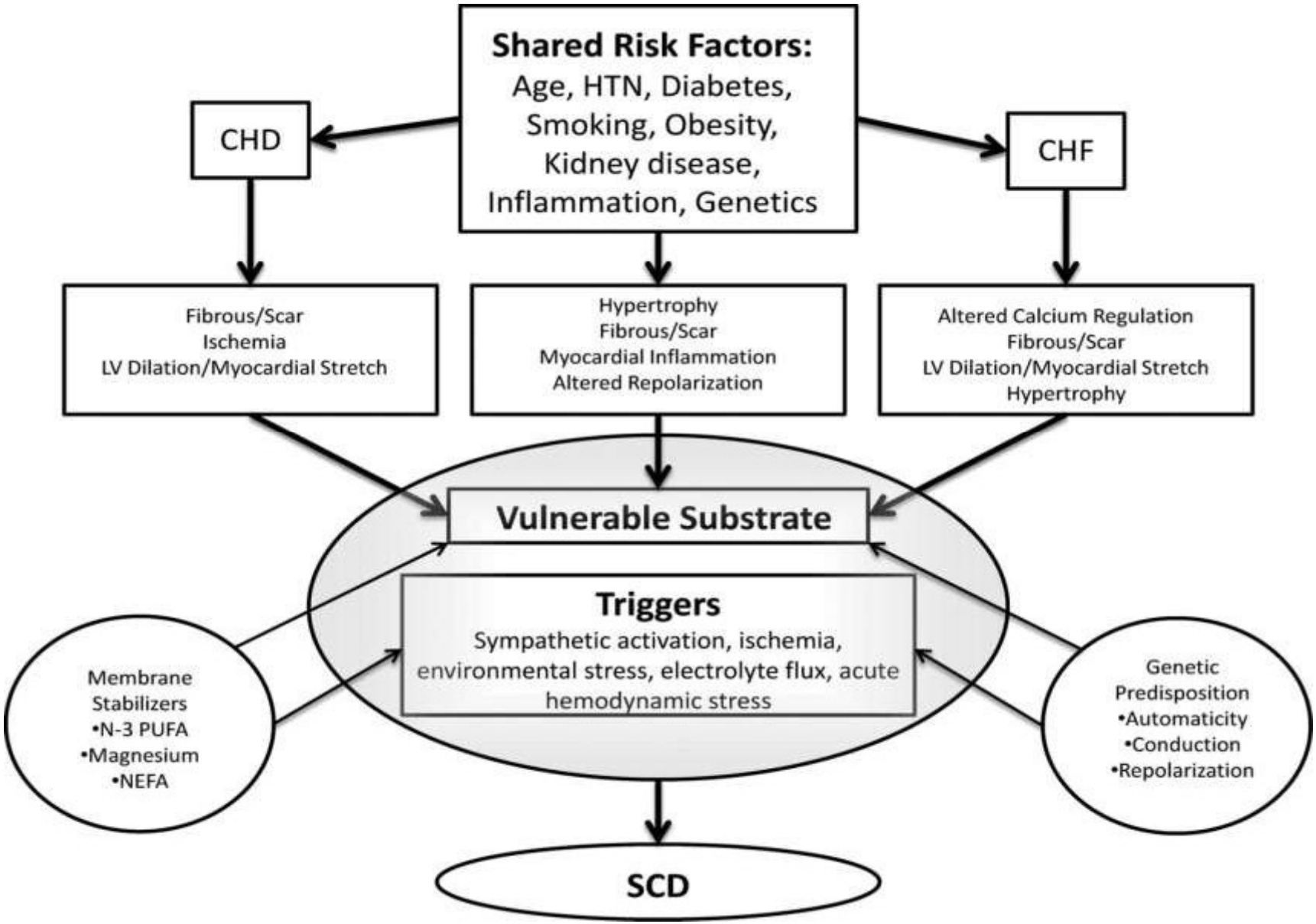
organs.

CAUSES

- Coronary artery disease
- Heart attack
- Enlarged heart (cardiomyopathy)
- Valvular heart disease
- Congenital heart disease
- Electrical problems in the heart

Reversible causes of Cardiac Arrest

PATHOPHYSIOLOGY



SIGNS AND SYMPTOMS

- Breathlessness
- Fatigue
- Breathlessness on lying down
- Waking up gasping for breath at night
- Swollen abdomen
- Enlarged liver
- Visible venous pulse in neck
- Swollen legs and ankles
- Decreased exercise tolerance
- Enlarged heart

DIAGNOSTIC EVALUATION

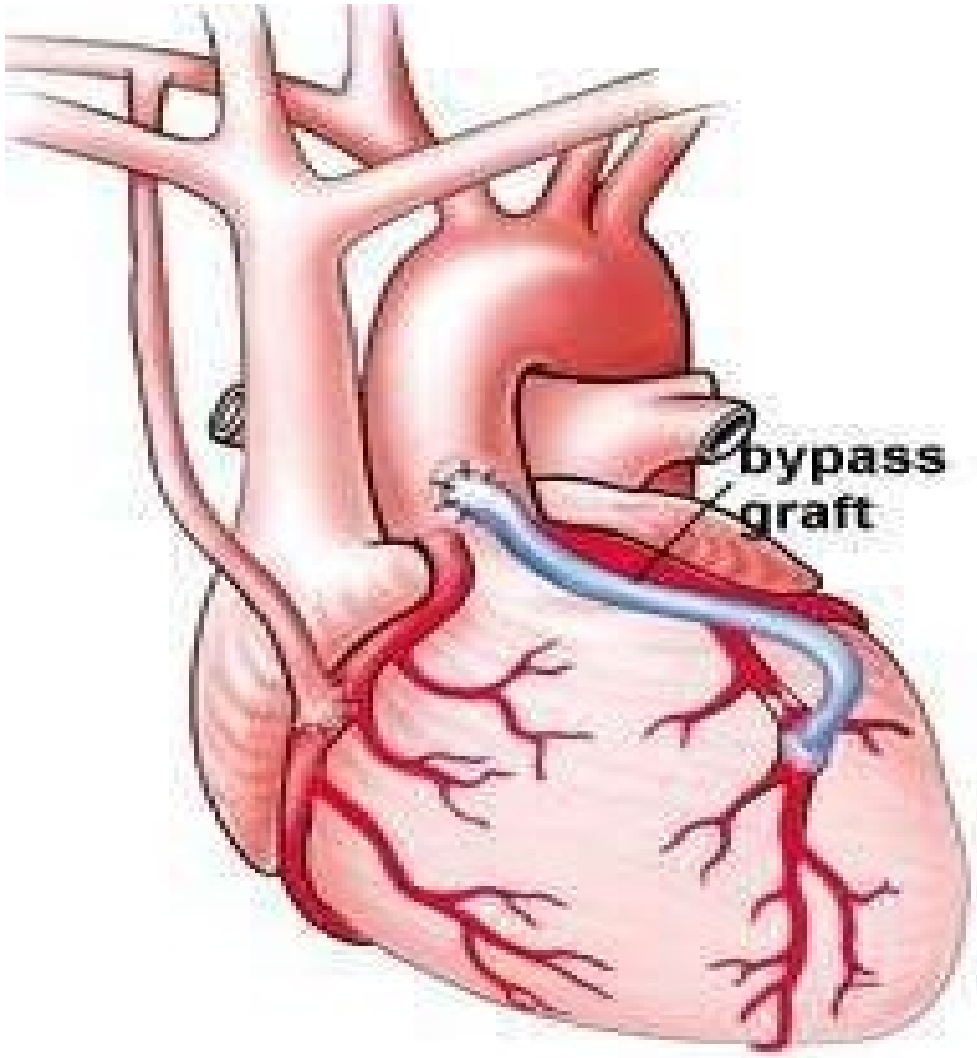
- Echocardiogram
- Electrocardiogram (ECG)
- Chest x-ray
- Exercise test (stress test)
- Cardiac catheterization
- Laboratory studies may include
- CBC, ESR, electrolytes, BUN/ creatinine, glucose, TSH, calcium, magnesium, and phosphorus
- Blood cultures

MEDICAL MANAGEMENT

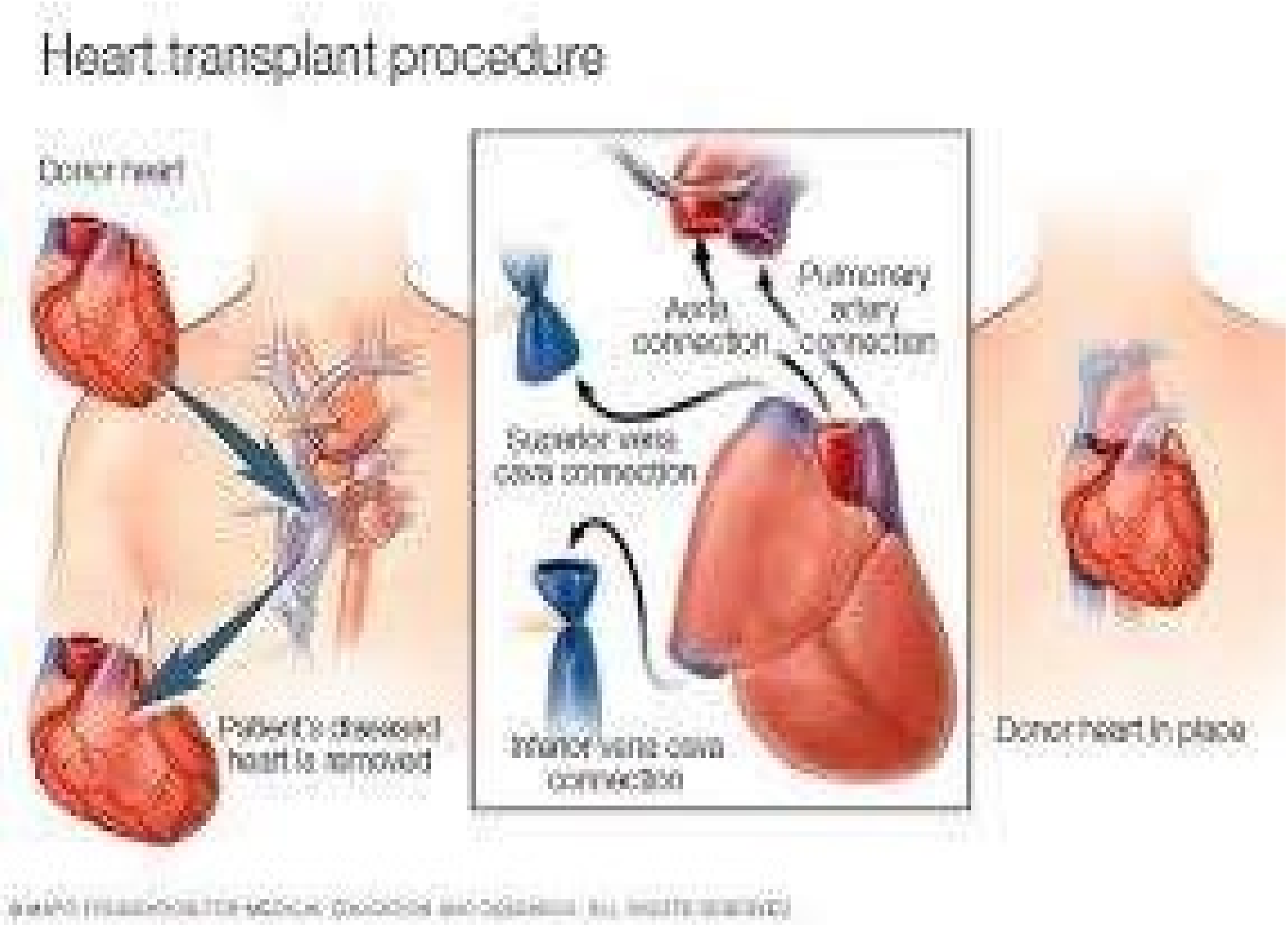
- Angiotensin II receptor blockers (ARBs)
- Vasodilators/Nitrates
- Potassium or magnesium
- Aldosterone inhibitors (spironolactone)
- Calcium channel blockers (for diastolic dysfunction only)
- Inotropic therapy
- Diuretics
- Angiotensin-converting enzyme (ACE) inhibitors

SURGICAL MANAGEMENT

- **Coronary artery bypass grafting-** It's a surgical procedure used to treat coronary heart disease. It diverts blood around narrowed arteries to improve blood flow and oxygen to the heart.



HEART TRANSPLANTATION



NURSING DIAGNOSIS

1. Acute pain related to myocardial ischemia and decreased myocardial oxygen supply as manifested by severe chest pain and tightness, radiation of pain to the neck and arms
2. Ineffective cardiopulmonary tissue perfusion related to reduced coronary blood flow
3. Potential air exchange related to fluid overload
4. Activity intolerance related to fatigue secondary to decreased cardiac output
5. Fear and anxiety related to disease condition and its prognosis

Summary

- Every patient diagnosed with life threatening cardiac emergency like acute myocardial infarction, SCD, HF, Cardiac tamponade, Dysrhythmias and hypertensive emergencies should receive the emergency care as early as possible including oxygenation, ventilator support and appropriate pharmacotherapy which would help in saving patients life and preventing complications

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