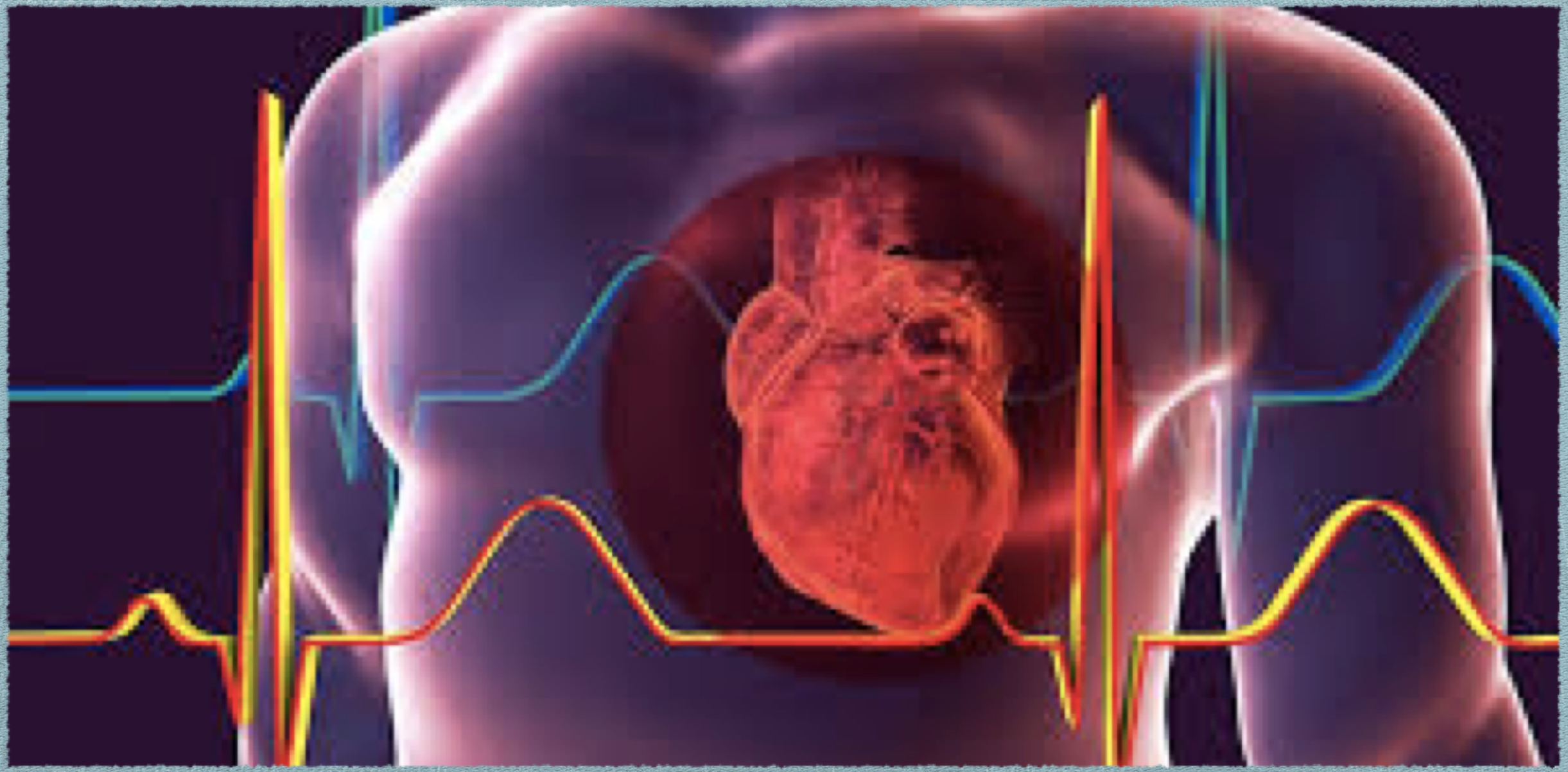


Heart Failure

- Definition
- Key concepts
- Clinical presentation
- Treatment
- APO

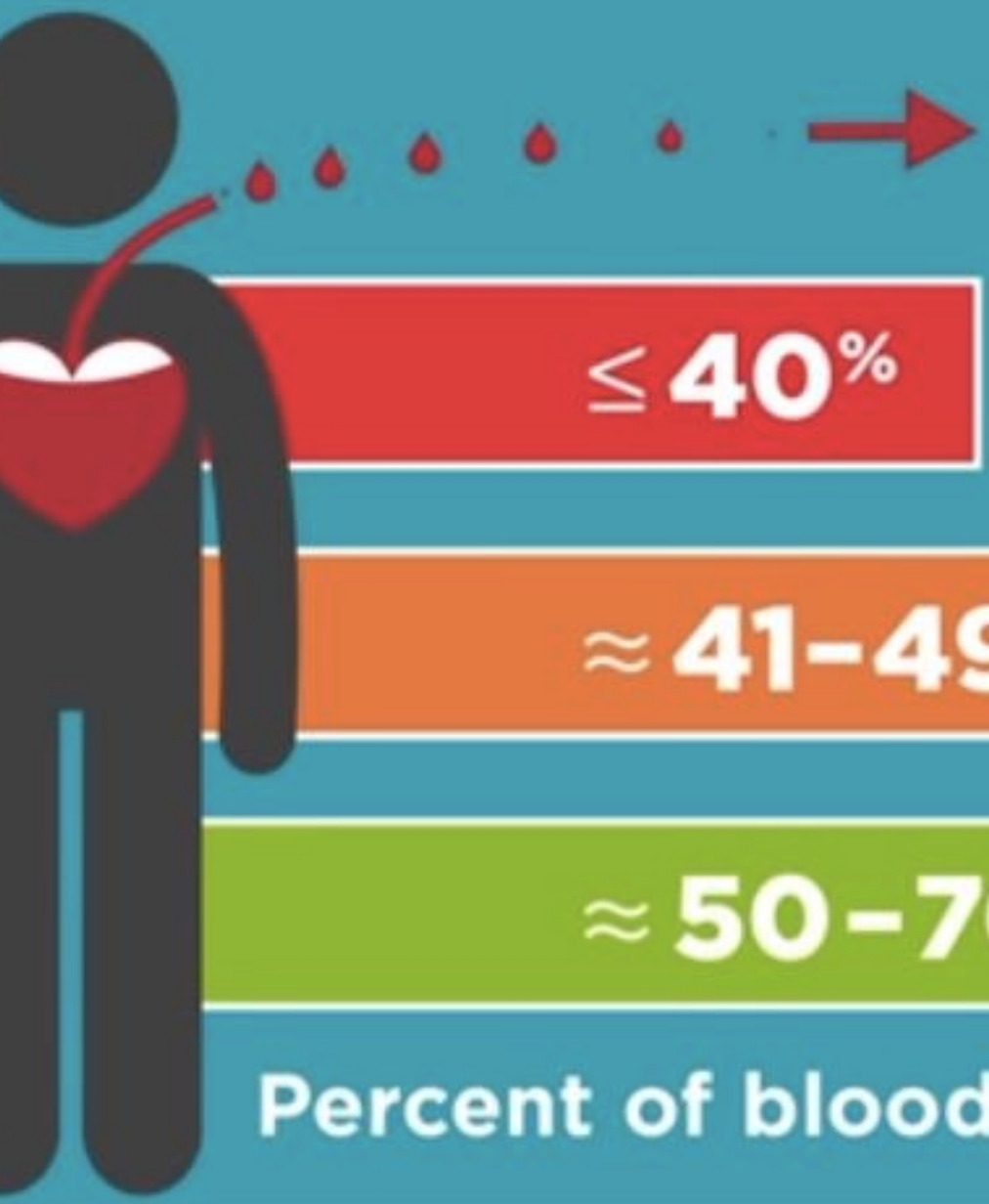
What is heart failure?

Definition

An abnormality of cardiac structure or function that impairs the ability of the heart to fill with blood at normal pressure or eject blood sufficient to fulfil the needs of the metabolising organs. - *Cardiac society of NZ.*

- All organs return blood to the heart.
- As the heart fails it is unable to adequately pump forward and fluid builds up.

REDUCED Ejection Fraction



≤40%

≈41–49%

≈50–70%

Percent of blood pumped out

RiseAboveHF.org

Systolic dysfunction

- Most common cause of failure.
- Decrease in LV EF (<40%)
- Due to
  - Impaired contractile function
  - Increased after load
  - Mechanical abnormalities
  - Cardiomyopathy

Diastolic dysfunction

- Impaired ability of the ventricles to relax and fill during diastole -> reduced SV and CO

- May have a normal EF on echo.

Cardiac Output

- CO = SV x HR

Cardiac output = Stroke volume x Heart rate

SV is determined by preload, after load and myocardial contractility.

CARDIAC OUTPUT

CO = HR X Stroke Volume

Cardiac Output — Heart Rate

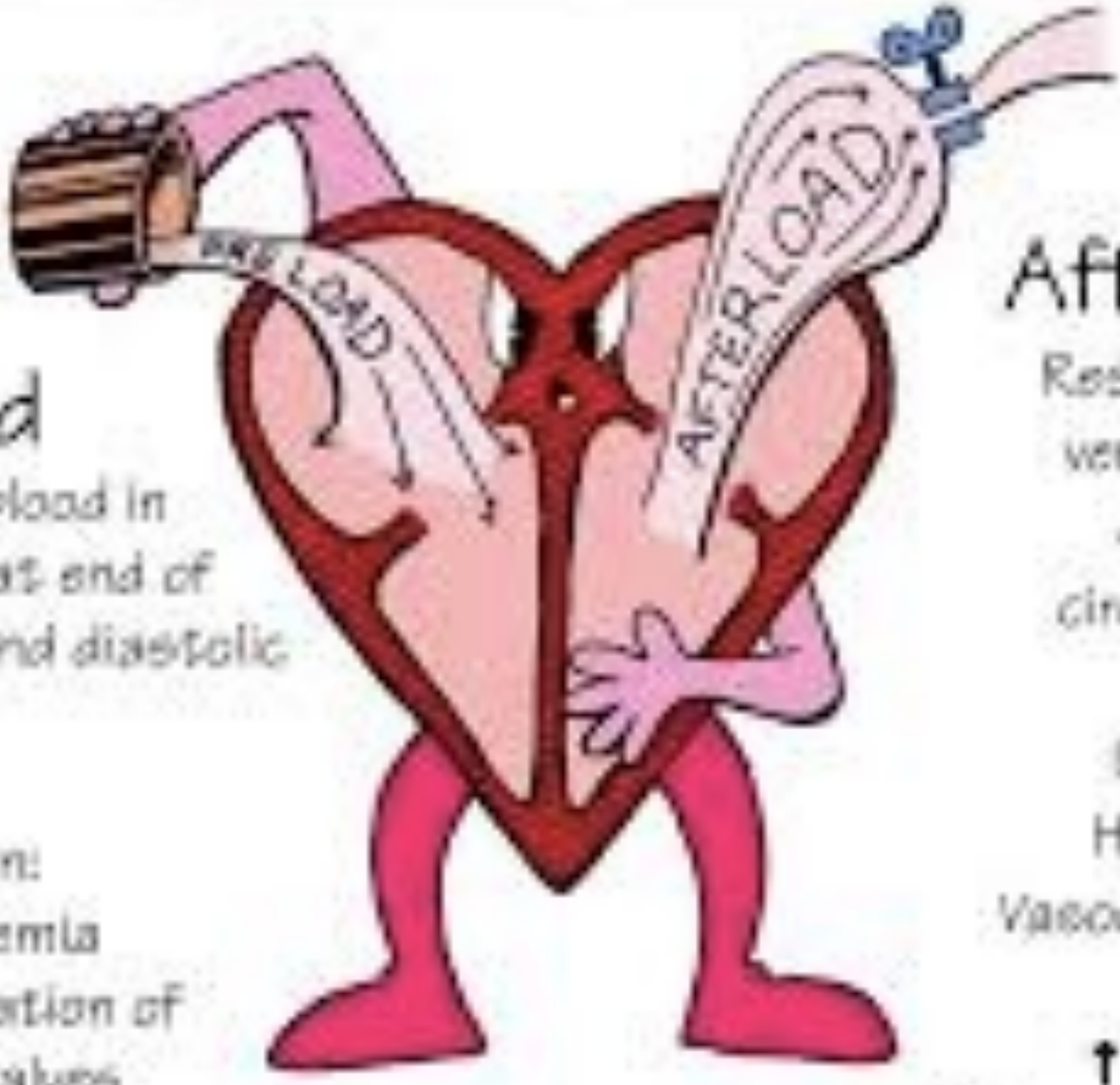
PRELOAD AND AFTERLOAD

Preload

Volume of blood in ventricles at end of diastole (end diastolic pressure)

Increased in:

- Hypervolemia
- Regurgitation of cardiac valves
- Heart Failure



Afterload

Resistance left ventricle must overcome to circulate blood

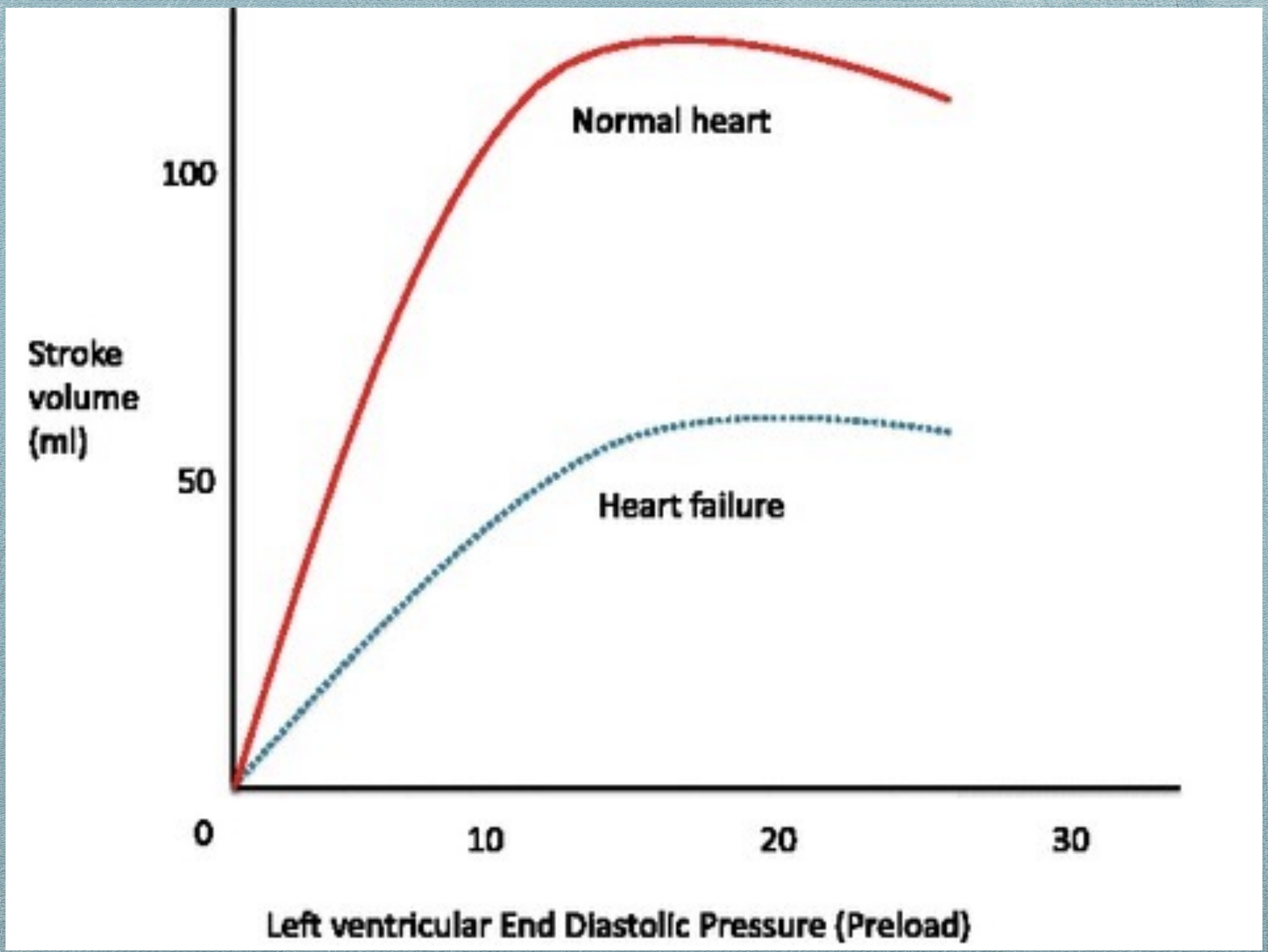
Increased in:

Hypertension
Vasoconstriction

↑ Afterload = ↑ Cardiac workload

How the body responds

- Sympathetic activation
  - Tachycardia and vasoconstriction
- Vasoconstriction causes decreased renal perfusion.
  - Increased renin-angiotensin release
  - Aldosterone release -> Na and H2O retention.


Normal heart
Heart failure
100
50
Stroke volume (ml)
0
10
20
30
Left ventricular End Diastolic Pressure (Preload)

The Vicious Cycle of Congestive Heart Failure

LV Dysfunction causes
Decreased cardiac output

Decreased Blood Pressure and
Decreased Renal perfusion

Stimulates the Release
of renin, Which allows
conversion of
Angiotensin
to **Angiotensin II.**
Angiotensin II stimulates
Aldosterone secretion which
causes retention of
Na+ and Water,
increasing filling pressure

Clinical presentation

Symptoms of heart failure

Extreme tiredness
or no energy

Shortness of breath, even
when lying down

Rapid heartbeat
or palpitations

Shortness of breath

Swelling in the
ankles/feet/stomach

Loss of
appetite

Coughing/
wheezing

Weight gain over a short
period of time (>2kg over
2 days)

More frequent urination,
especially at night

Global HEART Hub

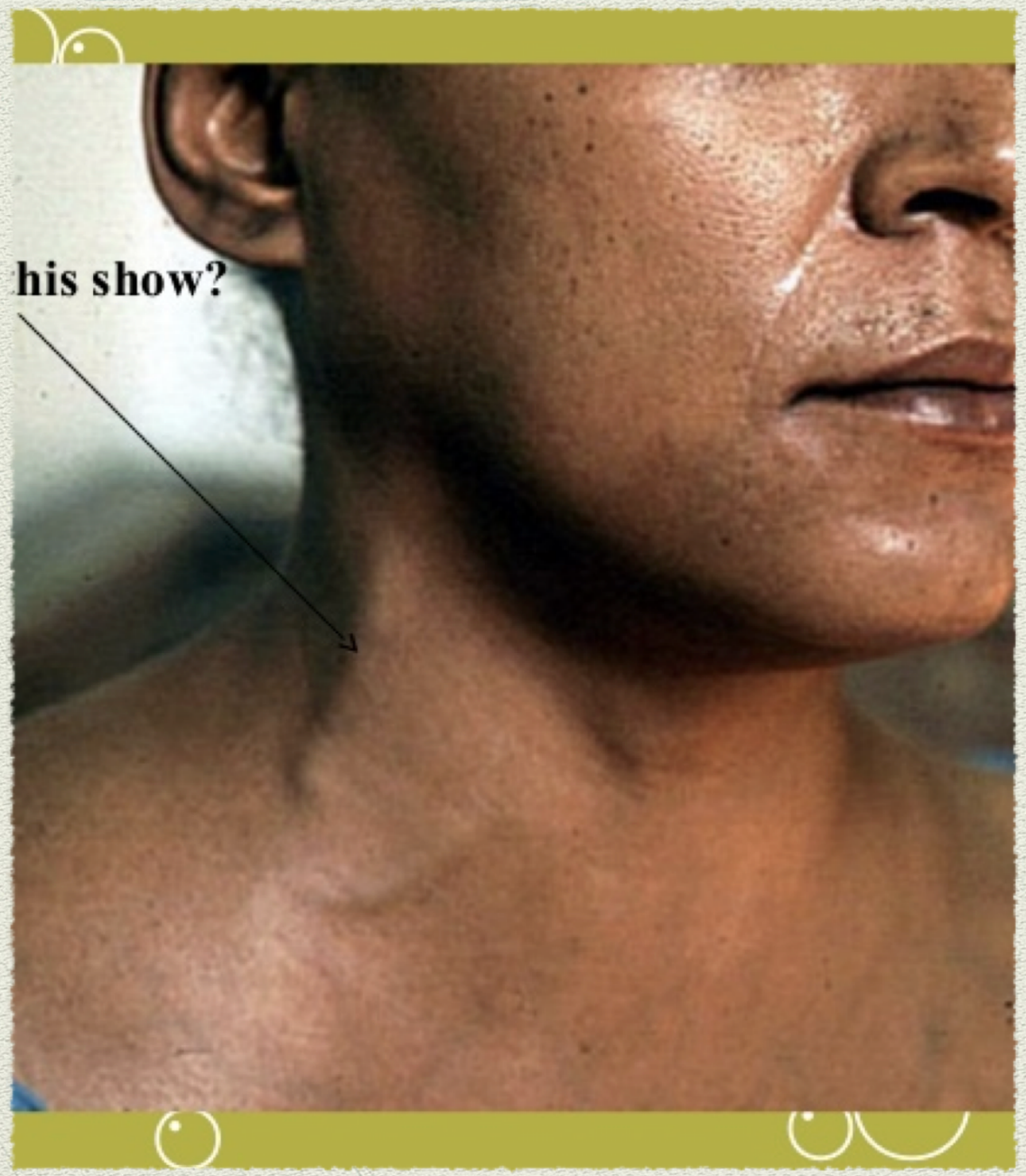
NYHA Classification

Class I	Ordinary physical activity does not cause undue fatigue, palpitations, dyspnea and/or angina
Class II	Ordinary physical activity does cause undue fatigue, palpitations, dyspnea and/or angina
Class III	Less than ordinary physical activity causes undue fatigue, palpitations, dyspnea and/or angina
Class IV	Fatigue, palpitations, dyspnea and/or angina occur at rest

Criteria Committee of the New York Heart Association, 1964.

Clinical findings

- Pedal oedema
- Muscle wasting
- Tender hepatosplenomagaly
- Elevated JVP
- Chest crepitations
- Displaced apex beat
- Third heart sound
- R heart heave
- Hypoxia
- Tachycardia



Clinical features	Sensitivity (%)	Specificity (%)
History:		
Shortness of breath	66	66
Orthopnoea	21	81
Paroxysmal nocturnal dyspnoea	33	76
History of oedema	23	80
Examination:		
Tachycardia (>100 beats/min)	7	99
Crepitations	13	91
Oedema (on examination)	10	93
Gallop (S3)	31	95
Neck vein distension	10	97
Chest *x* ray examination:		
Cardiomegaly	62	67

Investigations ED

- 12 lead ECG
- CXr
- Blood panel
- Consider troponin
- Consider BNP
- Weight

ECG Findings

- Non specific. May include
  - Signs LVH - S wave in V1 + tallest R wave of V5 or V6 >35mm + signs of strain. Lateral ST depression and T wave inversion.
  - Tachycardia
  - Arrhythmia - AF most common
  - Ischaemia

aVR

V1

V4

aVL

V2

V5

aVF

V3

V6

mm/s 10.0 mm/mV 4 by 2.5s + 1 rhythm ld MAC 8 002B

CXr Findings

- Elevated CTR >0.5
- Upper lobe pulmonary venous diversion
- Pulmonary interstitial oedema - septal lines, peribronchial cuffing
- Pulmonary oedema - airspace opacifications, air bronchograms
- Pulmonary effusions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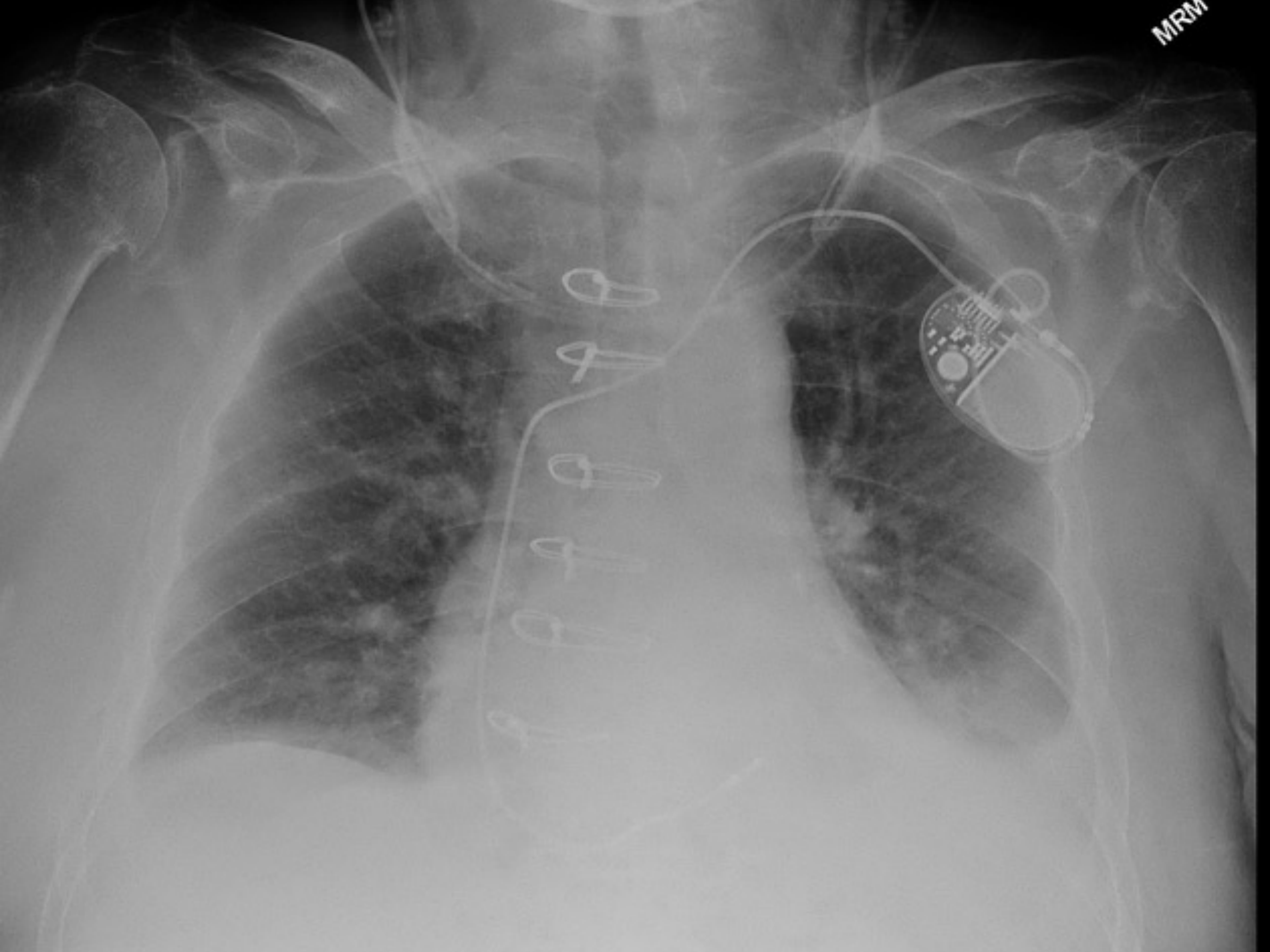
MRM

Blood work

- Useful to know Cr and Na
- Troponin only if clinical suspicion acute ischaemia
- BNP occasionally useful if the diagnosis unclear. Sometimes. Maybe. Perhaps.

Weight

- Really useful to document for future presentations and if possible compare against previous ‘dry weight’.

Treatment

Acute Treatment

- Supplemental oxygen +/- ventilatory support.
- Sitting position
- Diuretics
- Vasodilatory therapy

Oxygen

- Only administer oxygen if hypoxic (oxygen can cause vasoconstriction and worsen after load)
- Good evidence for symptomatic improvement with HFNP and CPAP.

Diuretics

- Frusemide diuretic of choice in ED.
- Dose will depend on patients usual medications and renal function. Dose should be at least equal to usual home oral dose.
- Typically administered as IV bolus from ED.

Nitrates

- Typically GTN. Can start with sublingual administration and switch to infusion.
- Can only be used if systolic BP>90mmHg
- Reduces preload and after load. May rapidly reduce breathlessness.
- Use is limited by SE hypotension

Who Needs Admission

- Oxygen requirement
- Symptoms limiting ability to perform ADLs
- Rhythm instability
- Haemodynamic instability

Identify and Treat Underlying/Contributing Cause

- TFT
- Anaemia
- Medications
- Compliance
- Ect

SCAPE

Sympathetic Crashing Acute Pulmonary Edema

- Typically present early morning
- Hypertensive, hypoxic, respiratory distress, acidotic.
- Typically not fluid overloaded.

EMNote.org

Treatment of Pulmonary Edema

Current Mnemonic: POND

- **P**: Position / PPV
- **O**: Oxygen
- **N**: Nitroglycerin
- **D**: Diuretics

Old Mnemonic: LMNOP

- **L**: Lasix (diuretics)
- **M**: Morphine
- **N**: Nitroglycerin
- **O**: Oxygen
- **P**: Position / phlebotomy

PPV: positive pressure ventilation.
Use of morphine could be associated with increased mortality (PMID: 28411112).