

## Definition

Cardiac index  $< 1.8\text{L}/\text{min}/\text{m}^2$

## Classification

*Killip ranking of heart failure originally done for 30-day mortality post-MI*

- |                        |                  |
|------------------------|------------------|
| 1. Asymptomatic        | 5% mortality     |
| 2. Mild-mod (S3/creps) | 15-20% mortality |
| 3. APO                 | 40% mortality    |
| 4. Moribund/shocked    | 80% mortality    |

*New York Heart Association (NYHA)*

- I Symptoms on abnormal exertion
- II Symptoms on ordinary activity
- III Symptoms on less-than-usual activity
- IV Symptoms at rest

## Causes

*High output (Rare)*

- Fever, anaemia, AV fistula or malformation, thyrotoxicosis, beriberi (Thiamine [B<sub>1</sub>] deficiency), Paget's disease

*Low output*

- Mechanical: Valve lesions, tumours, tamponade. Congenital abnormalities
- Myocardial: Ischaemia/infarct, Toxins (colchicine, alcohol, negative inotropes, metabolic disturbances, chemotherapeutics), cardiomyopathy
- Pressure related: HT, massive PE

*Systolic failure (impaired ability to contract, LV Ejection Fraction  $< 0.45$ ):*

- IHD
- Severe systemic HTN
- Valve disorders - congenital, 2° to papillary mm. dysfunction, Rh Fever, endocarditis
- ASD, VSD
- AI, MS
- LA tumour
- HOCM, other cardiomyopathies

*Diastolic failure (impaired ability to fill in diastole):*

- Mainly HT
- Also HOCM, aortic stenosis, restrictive cardiomyopathy, infiltrative disease - sarcoid

*Arrhythmias*

- AF, SVT, VT

*Right Ventricular failure*

- LVF, RV MI, PE/COPD, pulm valve disease, TR, congenital L→R shunts

## Assessment

*History*

- Asymptomatic (80%)
- Dyspnoea (SOB, SOBOE), orthopnoea/PND, peripheral oedema/RUQ pain/anorexia if RVF
- Precipitants - ischaemia, arrhythmias, infection, anaemia, poor compliance, COPD, drug effects, PE, thyrotoxicosis, pregnancy

## Examination

- Relative tachy, displaced apex, S3/S4, 2° TR or MR
- LVF - ↑RR, fine insp creps, rising from base, cardiac asthma, pleural effusions
- RVF - ↑JVP, Kussmaul's sign, hepatomegaly, ascites, peripheral oedema & pleural effusions

## Investigations

**Bloods:** FBC, UEC, Cardiac markers, BNP (LVF release → RVF, <100pg/ml = HF unlikely, >500pg/ml = likely. Often equivocal. False pos from Ddx of HF incl PE, RF, AF & sepsis limits use in ED.)

**ECG:** for arrhythmias / IHD / LBBB

**Imaging:** CXR (↑CTR, Kerley B's, pulm oedema). Echo

**Special:** Bioimpedance CO monitoring, TFT if indicated

## DDx

- COPD/Asthma
- Non-cardiogenic pulm oedema
- Sepsis

## Management

### Priorities

- Pulm oedema - maintain oxygenation
- Hypotension - fluid Mx & inotropes
- Ischaemia - reperfusion strategies
- Treat underlying cause if possible
- RVF - non-urgent oedema reduction

### Oxygenation

- Sit upright (↑lung vent) +/- legs over side of bed (venous return/preload)
- High flow O<sub>2</sub>
- CPAP 10mmHg/BiPAP 15/5mmHg
- IPPV if NIPPV fails or GCS<9, unprotected airway

**Haemodynamic - IVC & consider invasive monitoring if shocked.**

- **Nitrates** - **GTN** 150-300mcg sl or infusion (start 300mcg/hr & titrate up to 2-12mg/hr). ↓pre- & after-load & coronary dilation/perfusion. Beware ↓BP, RVF, HOCM, AS.
- **Fluid** - restrict in overload; careful challenge if shock & no APO: 100-250ml **0.9% saline**.
- **Inotropes** - if BP ok: **dobutamine** 2-20mcg/kg/min IV. If ↓BP: **dopamine** 2-20mcg/kg/min. Even **adrenaline** or **NA** 0.5-30mcg/min (0.02-1mcg/kg/min) but ↑myocardial O<sub>2</sub> demand
- **Diuretics** - **furosemide** 40mg IV or 1-2x usual dose. Not 1st line - consider if fluid overload
- **PCI** - if AMI present (or thrombolysis if PCI not avail/CI)
- **Treat arrhythmias** - medical Rx or DC shock
- **Mechanical support** - intra-aortic balloon pump
- **Digoxin**, ACEI, statin, thrombosis prophylaxis, ±β-blocker (**carvedilol**) for chronic therapy
- **Morphine** 0.5-2.5mg IV - once a std Rx, now increasingly controversial with questions over haemodynamic effects and reports of poorer outcomes. Considered in low doses as anxiolytic if very agitated, BUT risk of resp depression. **Fentanyl** a possible alternative.
- **Nesiritide** - recomb DNA BNP - probably useless and ?assoc with ↑mortality

### Prognosis

- 50% mort post APO episode
- F>M
- Annual mort NYHA Class II - 10%, III - 20%, IV - 40%

