
Acute heart failure

Martin Radvan

What we will talk about?

- Pathophysiology
- Clinical signs
- Diagnosis
- Therapy

Definition

- Acute heart failure (AHF) is generally defined as the rapid development or change of symptoms and signs of heart failure that requires urgent medical attentionis
- No new medication for last 30 years

Definition

- Symptoms related to pulmonary congestion due to elevated left ventricle filling pressures with or without low cardiac output

Definition

- De novo x acute decompensation of chronic heart failure
- Cardiogenic shock

Epidemiology

- No1 reason for hospitalisation in people older than 65 years
- 65-75% known HF before hospitalisation
- 25-55% preserved ejection fraction (HFpEF)

Diagnosis

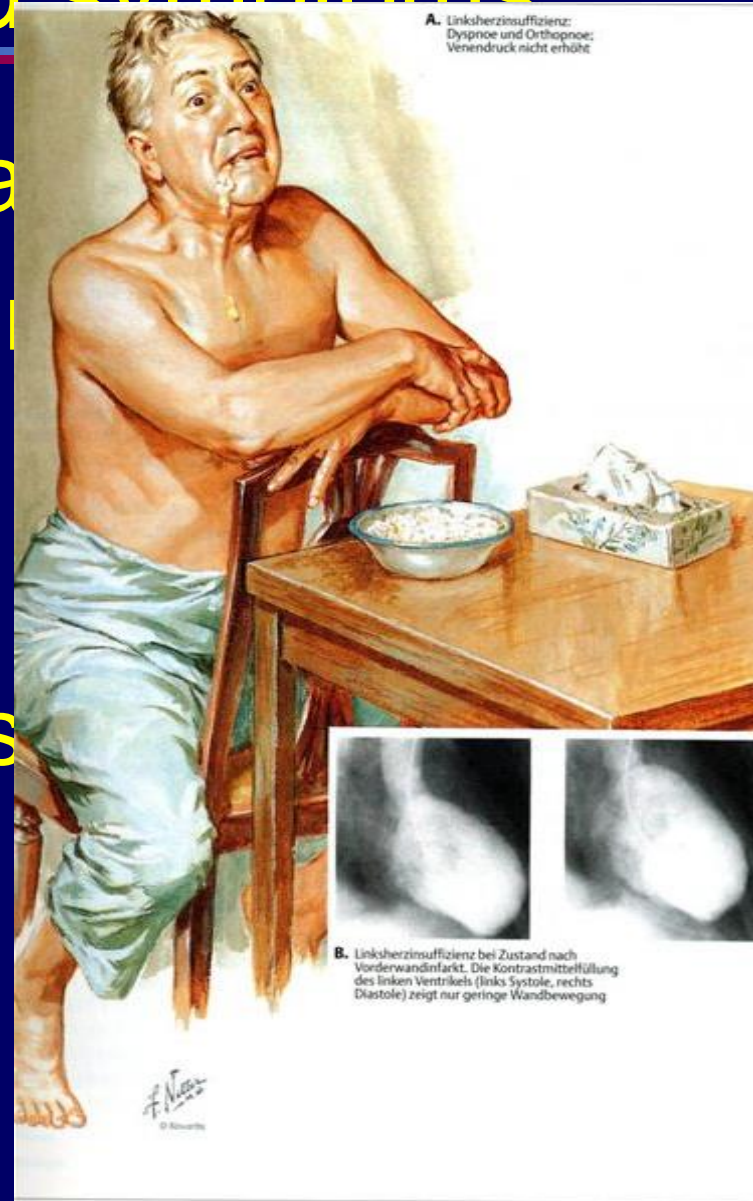
- Anamnesis
- Clinical signs
- Examination: perfusion and volume status
- ECG
- Echocardiography
- Labs
- X-ray, CT, coronarography, etc.

Signs and symptoms

- noisy syndrome, rapid development
- elevated jugular venous pressure
- pulmonary edema
- +S3 (gallop)
- pulmonary crackles
- peripheral oedema
- orthopnoe

Signs and symptoms

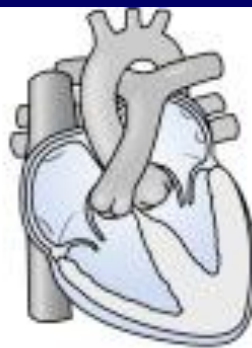
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Substrate



Normal



Structural heart disease



Chronic heart failure

Triggers

Hypertension, ACD, arrhythmias, infections, renal dysfunction, nonadherence, medications

Amplifying mechanisms

Myocardial

- Decreased CO
- Diastolic dysfunction
- Myocyte injury
- Mitral regurgitation
- Ventricular interdependence
- Tachycardia

Renal

- Sodium and volume retention
- Acute kidney injury
- RAAS activation

Vascular

- Endothelial dysfunction
- Increased arterial stiffness
- Vasoconstriction
- Afterload contractility mismatch
- Volume redistribution
- Capillary leakiness

Neurohormonal

- RAAS activation
- SNS activation
- Oxidative stress
- Inflammation

Congestion

End-organ dysfunction

Suspected acute heart failure

History/examination
(including blood pressure and respiratory rate)

Chest X-ray

Echocardiogram or NP (or both)

Blood chemistry

ECG

Oxygen saturation

Full blood count

Simultaneously
assess for

Ventilation/
systemic
oxygenation
inadequate?^a

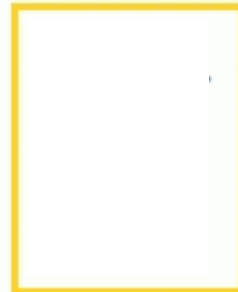
Life-threatening
arrhythmia/
bradycardia?^b

Blood pressure
<85 mmHg
or shock^c

Acute
coronary
syndrome^d

Acute
mechanical
cause/severe
valvular disease^e

Urgent
action
if present



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- Oxygen
- NIV
- ETT and
invasive
ventilation

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- Pacing



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- Inotrope/
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- Mechanical circulatory support (e.g. IABP)



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- Coronary reperfusion
- Antithrombotic therapy



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- Coronary reperfusion
- Antithrombotic therapy

- Echocardiography
- Surgical/
percutaneous intervention

ESC GUIDELINES

ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012

The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC

Suspected acute heart failure

respiratory rate)
ECG
Oxygen saturation
Full blood count

Simultaneously assess for

Ventilation/
systemic
oxygenation
inadequate?^a

Life-threatening
arrhythmia/
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Blood pressure
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- ETT and invasive ventilation

- Electrical cardioversion
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vasopressor
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percutaneous intervention

Pathophysiology

Dry-warm

Dry-cold

Wet –warm

Wet-cold

Pathophysiology

Dry-warm

Well perfused, normovolemic

Dry-cold

Hypoperfused, hypovolemic

Wet –warm

Congestion, well perfused

Wet-cold

Congested, hypoperfused

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Water challenge, inotropes

Wet –warm

Congestion, well perfused

Diuretics, vasodilators

Wet-cold

Congested, hypoperfused

Inotropes, MCS

Pathophysiology – Forrester classification (PCWP, CI)

~~Dry-warm~~

~~Well perfused, normovolemic~~

Dry-cold

Hypoperfused, hypovolemic

Water challenge, inotropes

Wet –warm

Congestion, well perfused

Duoretics, vasodilatators

90-95%

Wet-cold

Congested, hypoperfused

Inotropes, MCS

5-10%

PCWP, CI

PCWP

Invasive vs. non-invasive
measurment

Pressure in left atrium

Volume status

Cardiac index

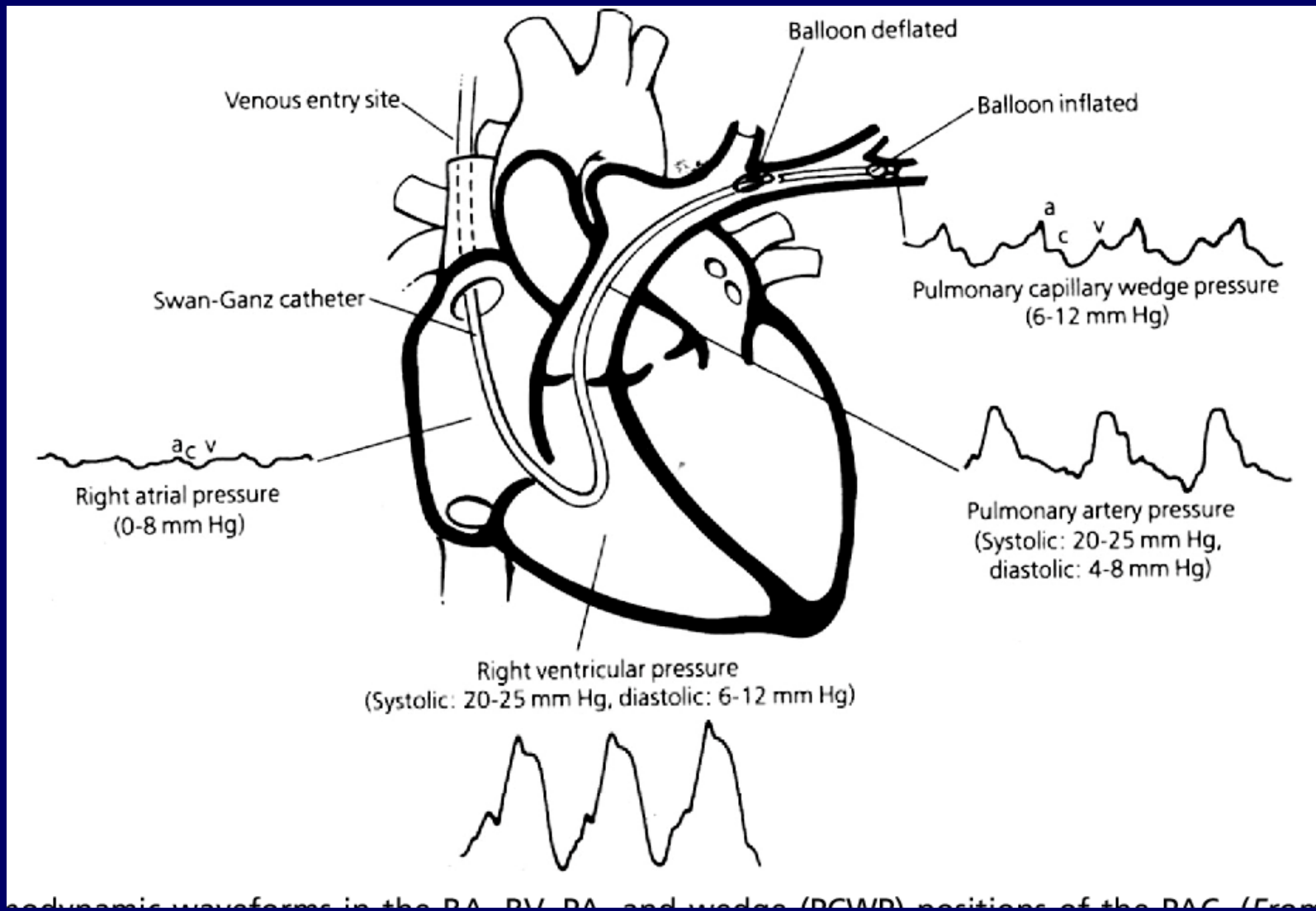
Invasive vs. Non-invasive
measurment

2,2L/min/m²

Cardiac output

Degree of perfusion

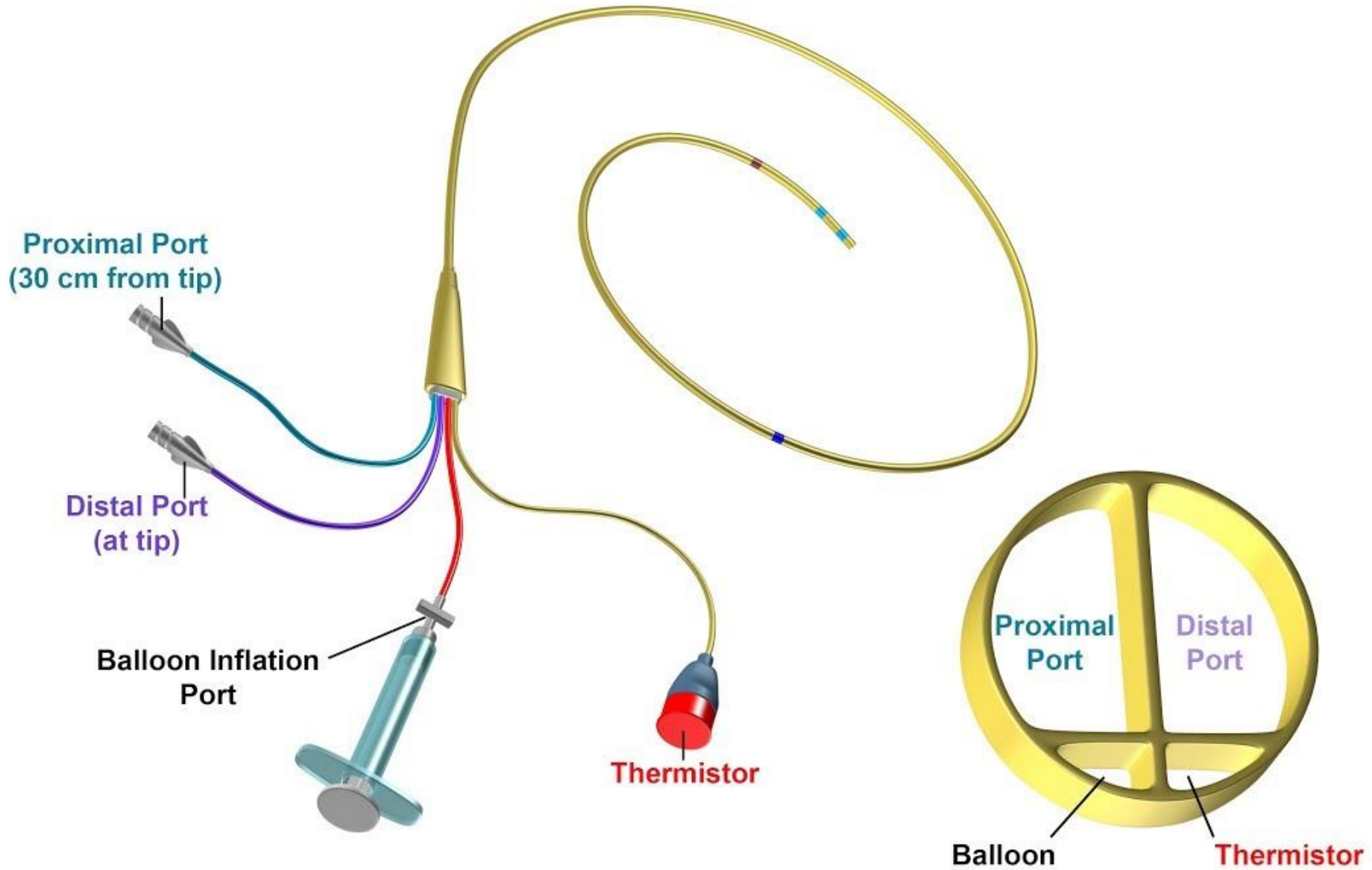
PCWP, CI



ive

hemodynamic waveforms in the RA, RV, PA, and wedge (PCWP) positions of the PAC. (From

PCWP CI



PCWP, CI

PCWP

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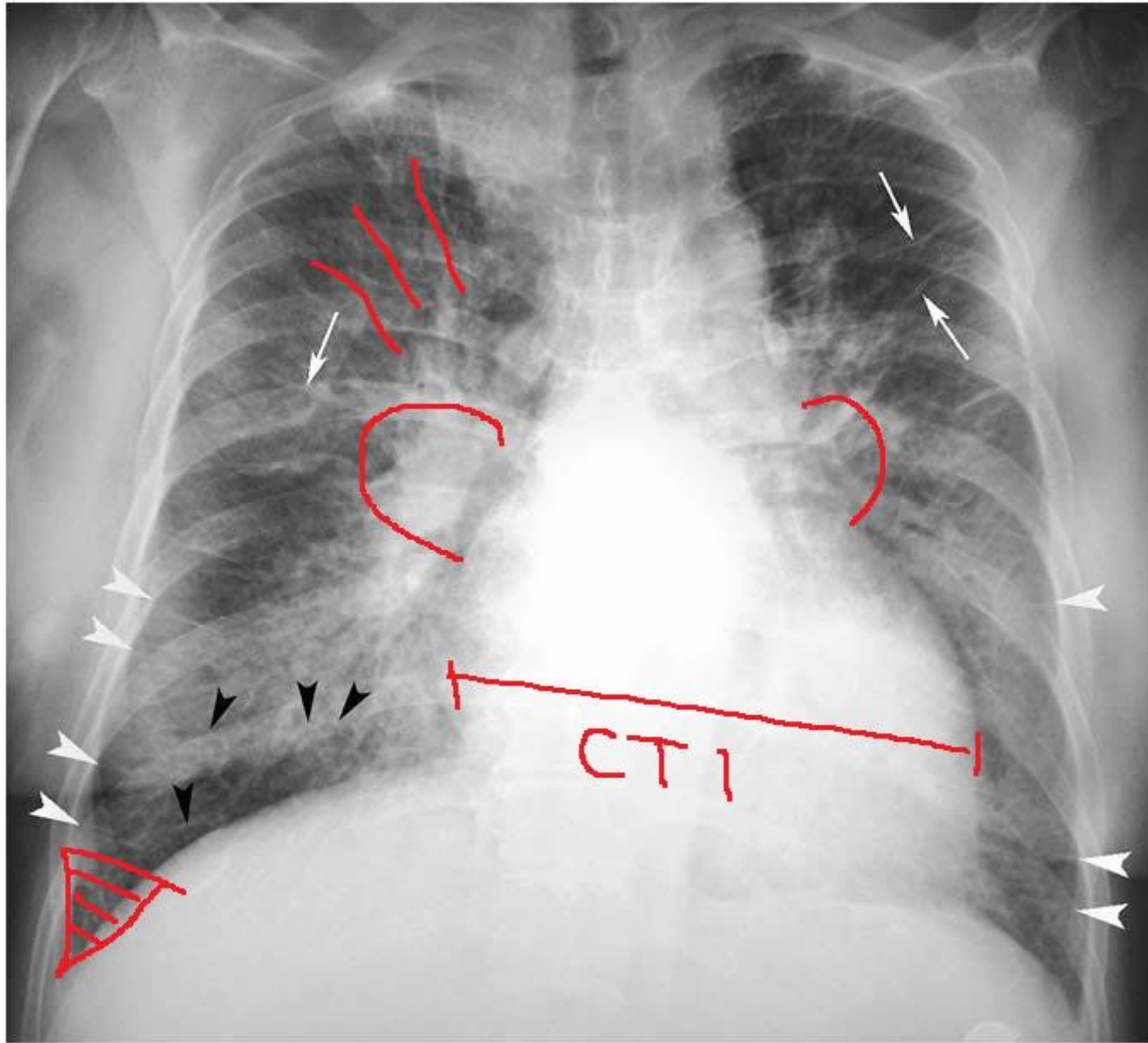
Labs

- ECG – rarely normal
- X-ray: congestion, normal heart size
- Echocardiography – heart, lungs
- BNP, NT-proBNP, troponin

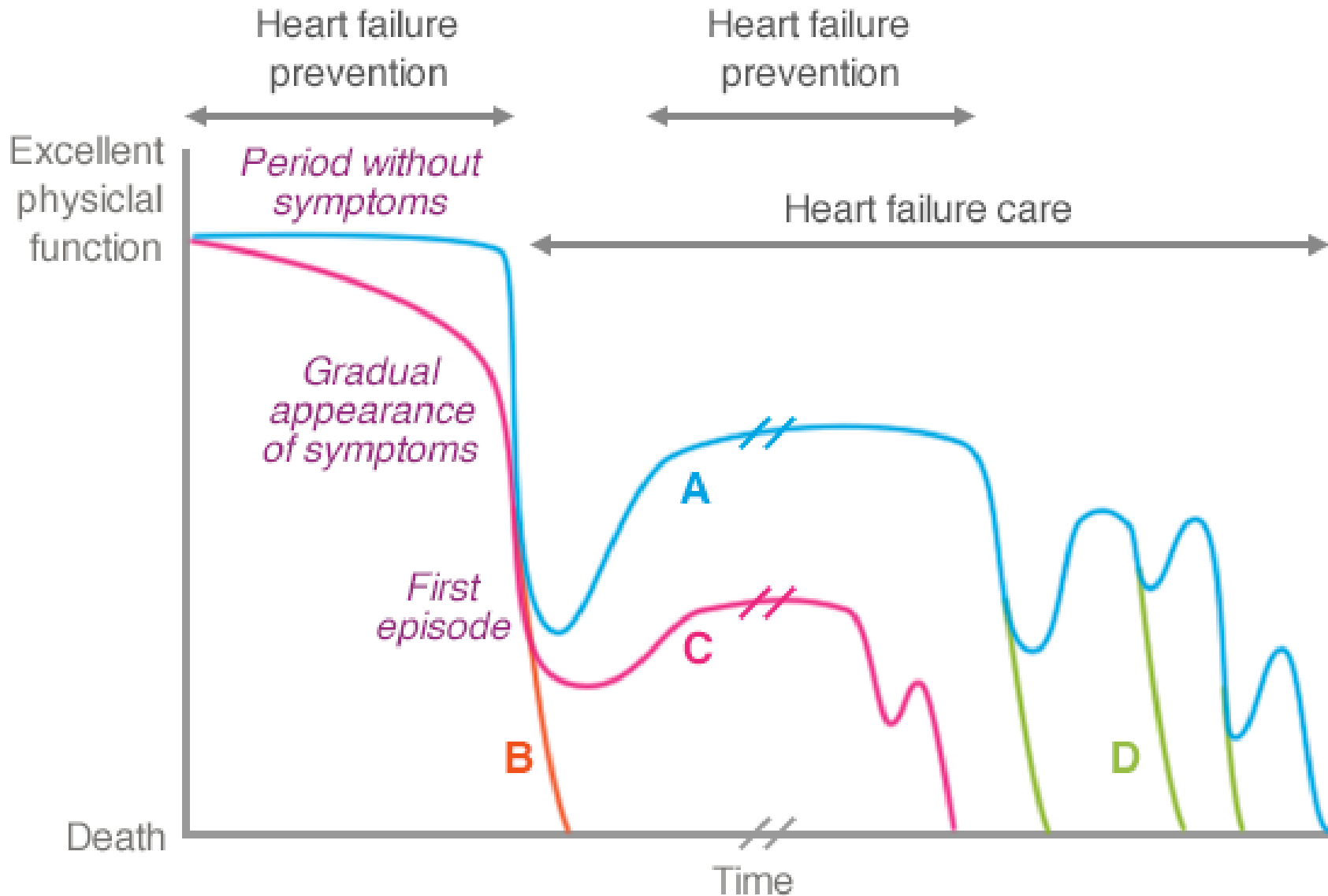
- EC
- X-ra
- BN



- EC
- X-r
- BN



Clinical course



Pulmonary aedema



Therapy of pulmonary aedema?

Therapy of pulmonary aedema

- Oxygen
- Morphin
- Vasodilatation (blood pressure control)
- Furosemide
- Therapy of the cause

Classifications

INTERMACS level	NYHA Class	Description	Device
1. Cardiogenic shock "Crash and burn"	IV	Haemodynamic instability in spite of increasing doses of catecholamines and/or mechanical circulatory support with critical hypoperfusion of target organs (severe cardiogenic shock).	ECLS, ECMO, percutaneous support device
2. Progressive decline despite inotropic support "Sliding on inotropes"	IV	Intravenous inotropic support with acceptable blood pressure but rapid deterioration of renal function, nutritional state, or signs of congestion.	ECLS, ECMO, LVAD
3. Stable but inotrope dependent "Dependent stability"	IV	Haemodynamic stability with low or intermediate doses of inotropics, but necessary due to hypotension, worsening of symptoms, or progressive renal failure.	LVAD
4. Resting symptoms "Frequent flyer"	IV ambulatory	Temporary cessation of inotropic treatment is possible, but patient presents with frequent symptom recurrences and typically with fluid overload.	LVAD
5. Exertion intolerant "Housebound"	IV ambulatory	Complete cessation of physical activity, stable at rest, but frequently with moderate fluid retention and some level of renal dysfunction.	LVAD
6. Exertion limited "Walking wounded"	III	Minor limitation on physical activity and absence of congestion while at rest. Easily fatigued by light activity.	LVAD / Discuss LVAD as option
7. "Placeholder"	III	Patient in NYHA Class III with no current or recent unstable fluid balance.	Discuss LVAD as option

Cardiogenic shock

- Acute HF in naive patients
- Myocardial injury
- Arrhythmia
- Valvular disease
- Obstructive shock
- Tamponade
- ...

Diagnosis

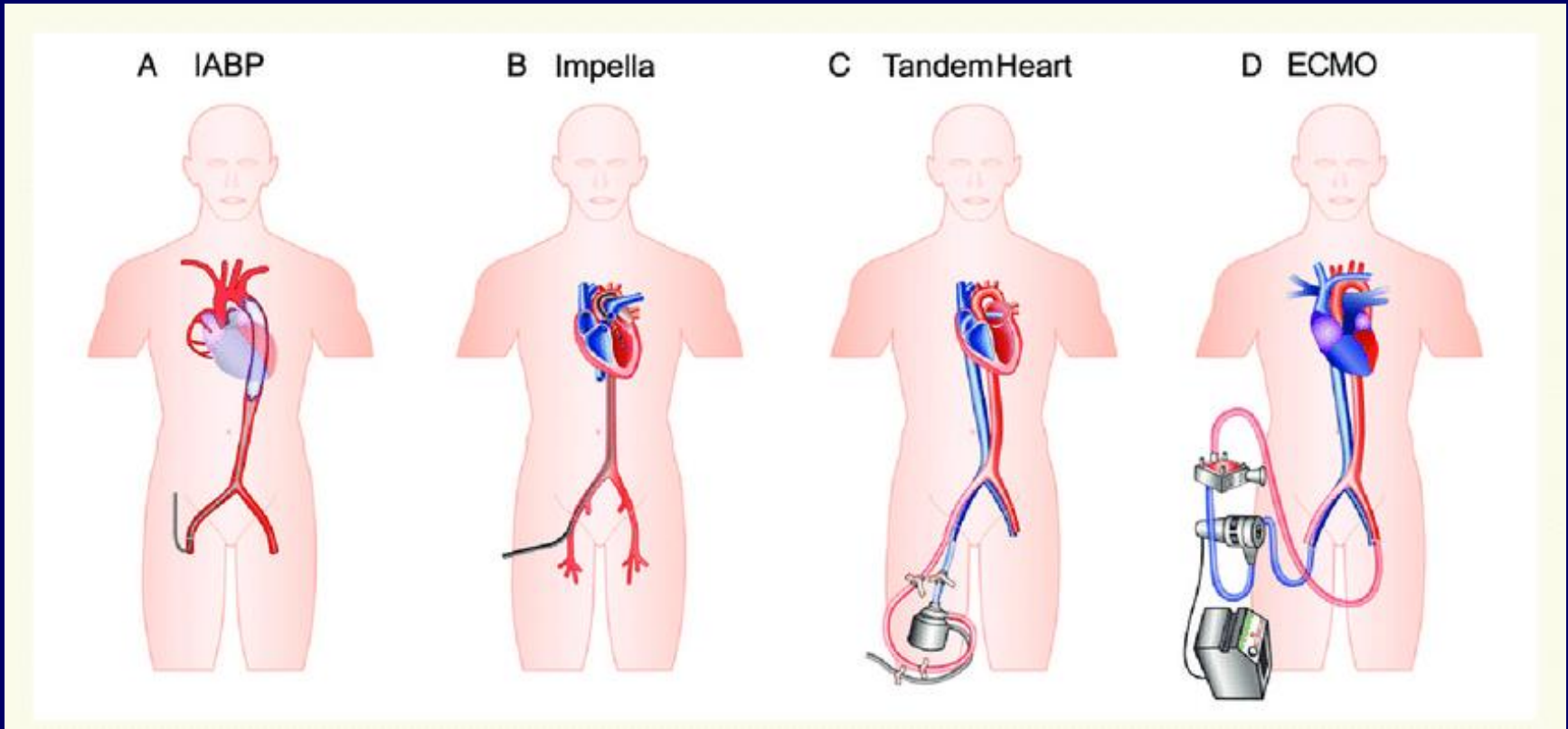
Pharmacotherapy of cardiogenic shock

- Inotropes: noradrenalin, dobutamin, adrenalin, milrinon, levosimendan
- Ultrafiltration
- Furosemide
- Therapy of the cause

MCS

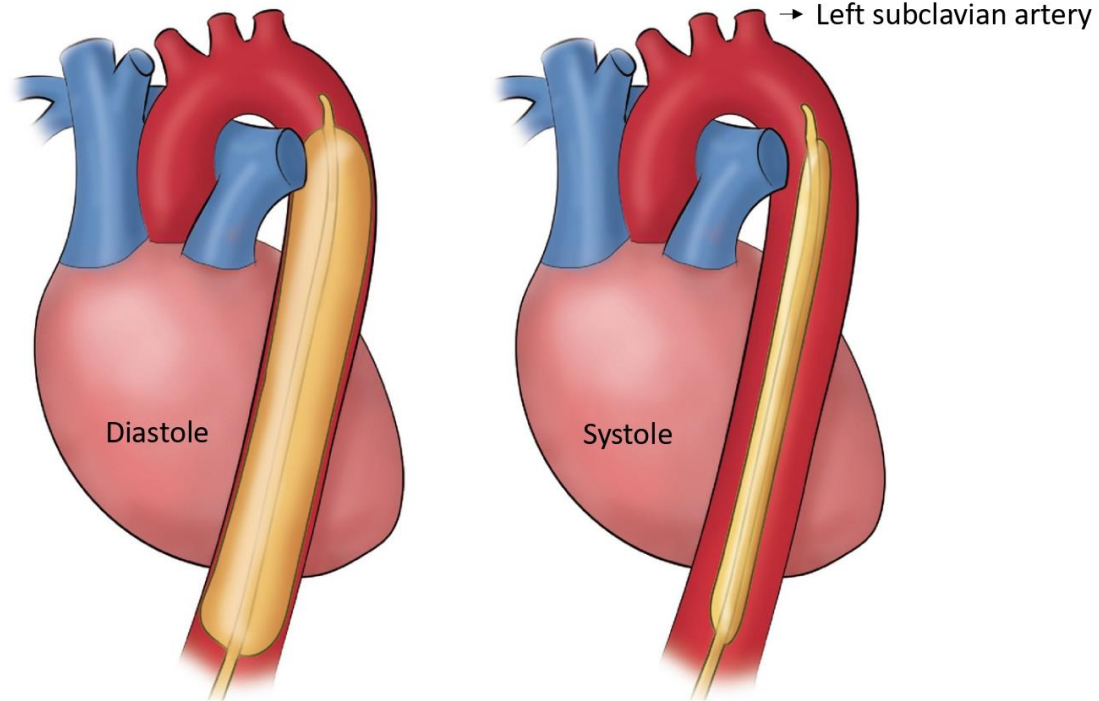
- Intra-aortic balloon counterpulsation
 - LVAD
 - Total artificial heart
 - ECMO
 - Impella
-
- Bridge to recovery/decision/transplantation
 - Destination therapy

MCS



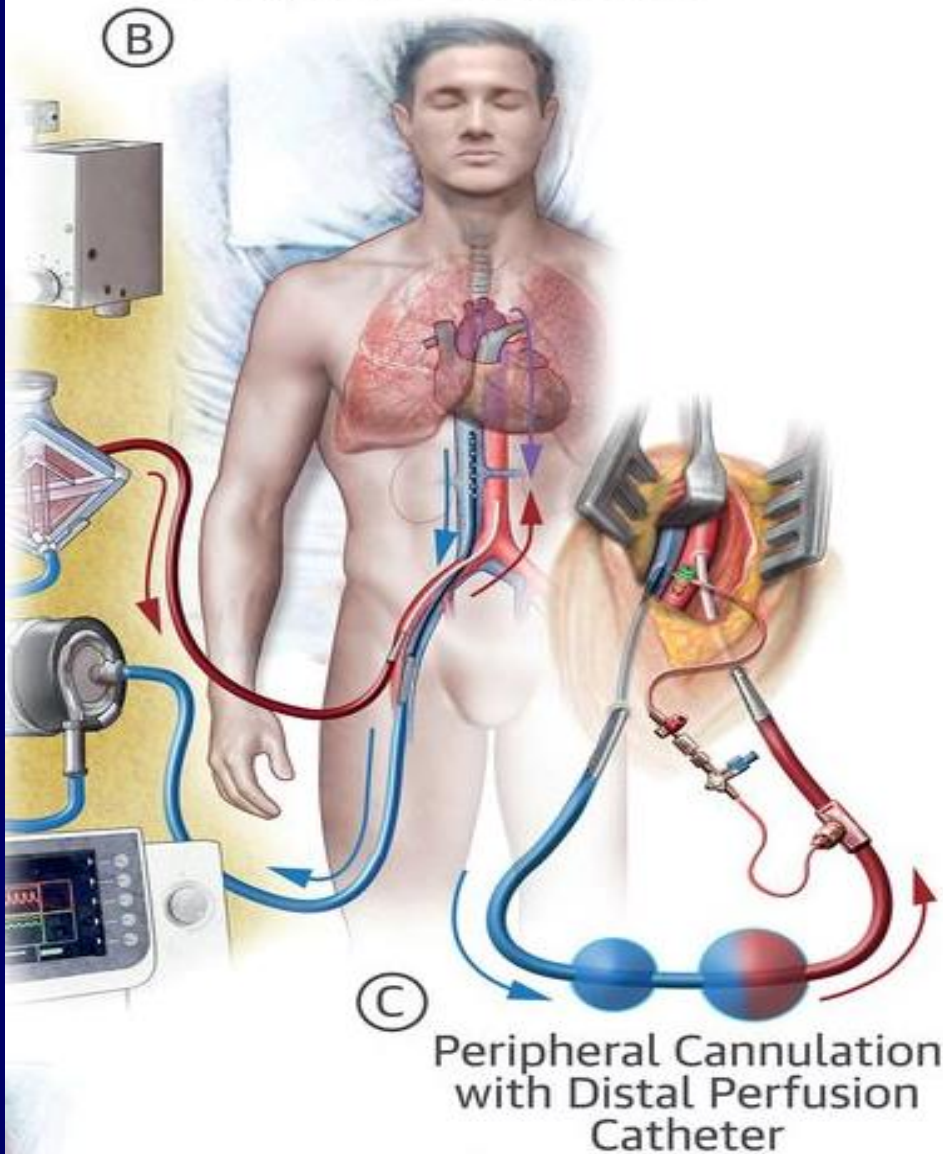
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- Destination therapy

IABC



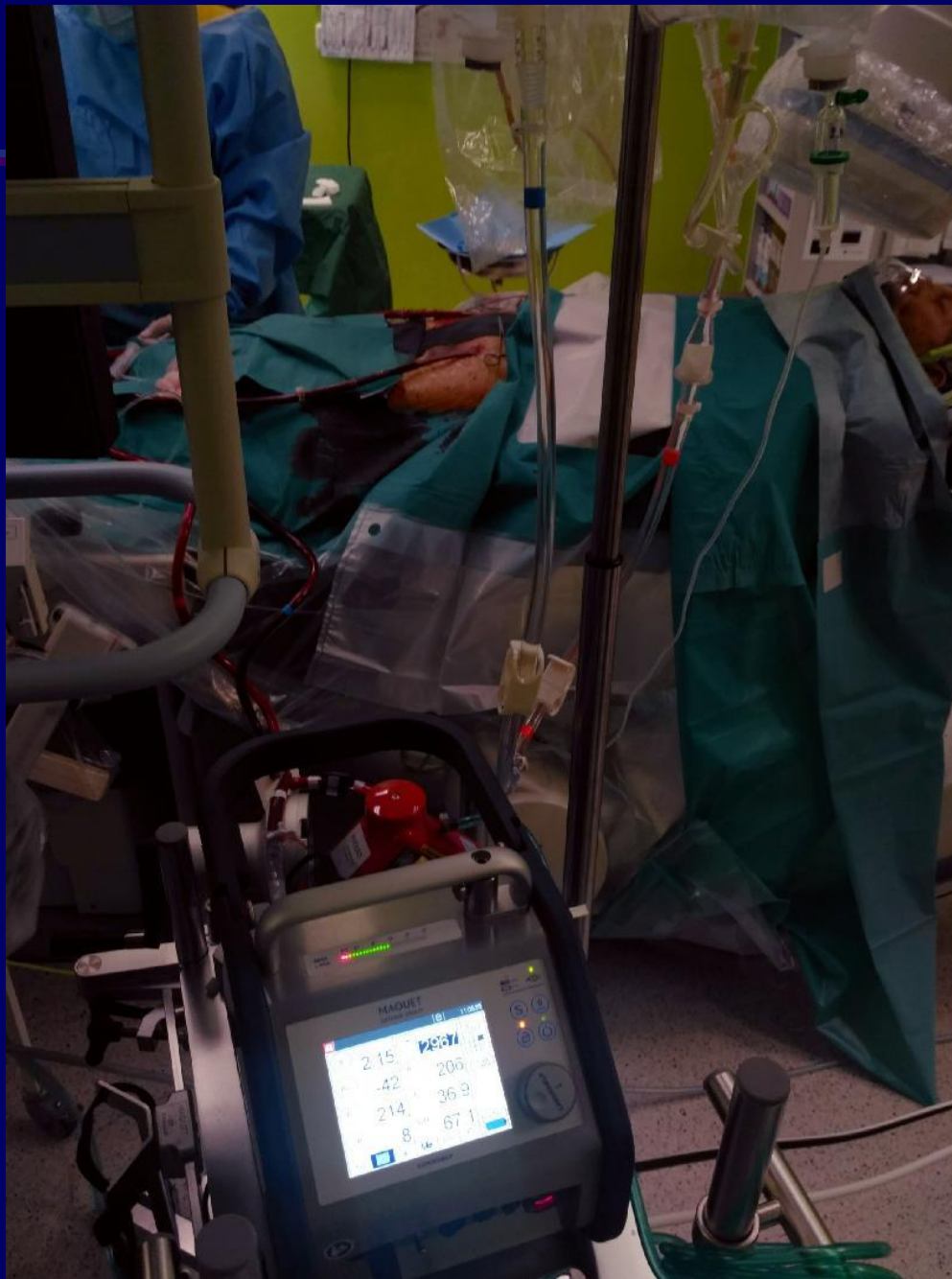
ECMO

Peripheral Cannulation

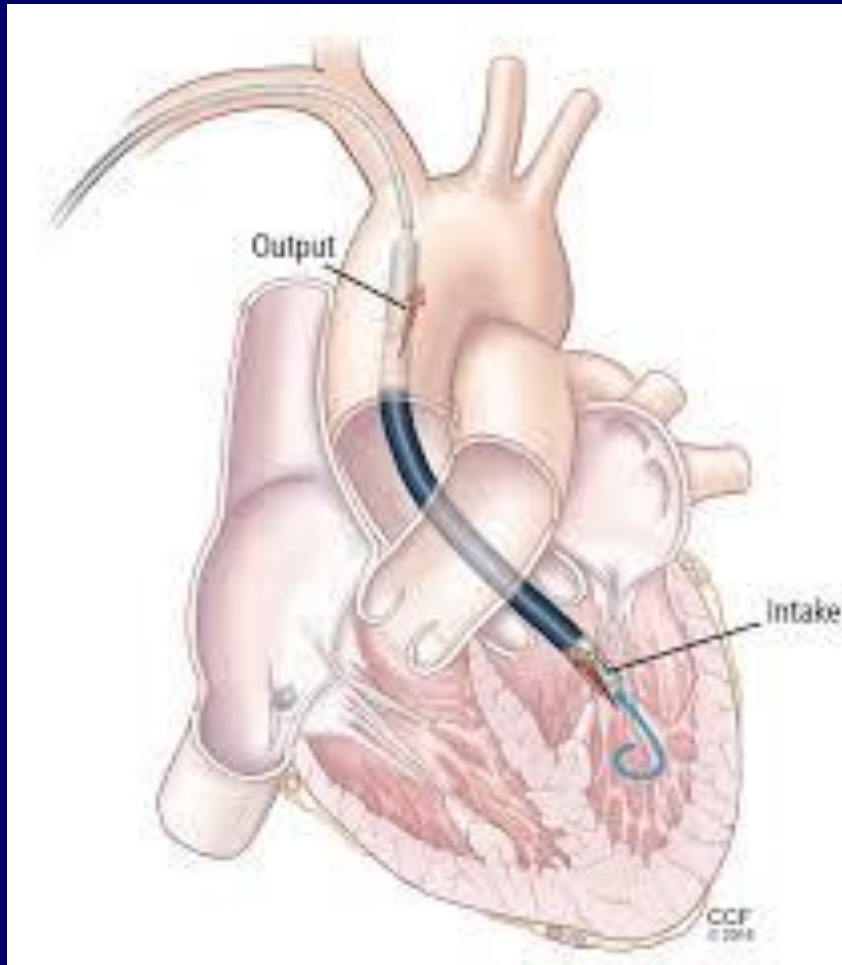


ECMO

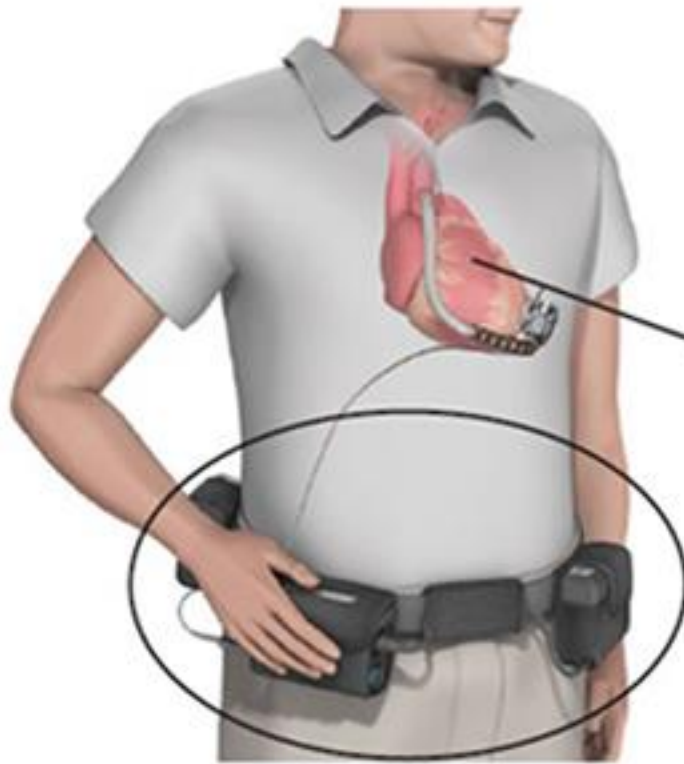




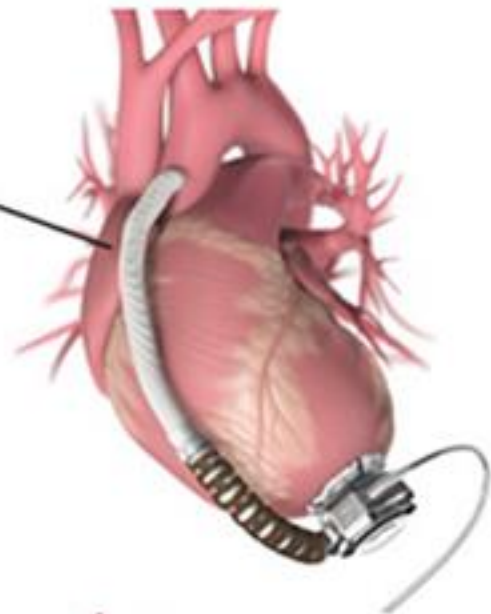
Impella



LVAD



External components



Internal components

Transplantation

- Age?
- Life expectancy (except heart)
- Spiroergometry VO_2max

- Imunosuppression
- Rejection, infection
- Vasculopathy of the graft

Conclusions

- Acute HF in naive patients
- Acute decompensation of chronic HF
- Fluid and perfusion status
- Cause of HF/decompensation
- Early goal directed echocardiography
- Early therapy
- Early recognition of therapy failure



Your blood pressure

is a little high

Thanks for the attention