



# Extracorporeal Life Support (ECLS)

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## Discussant

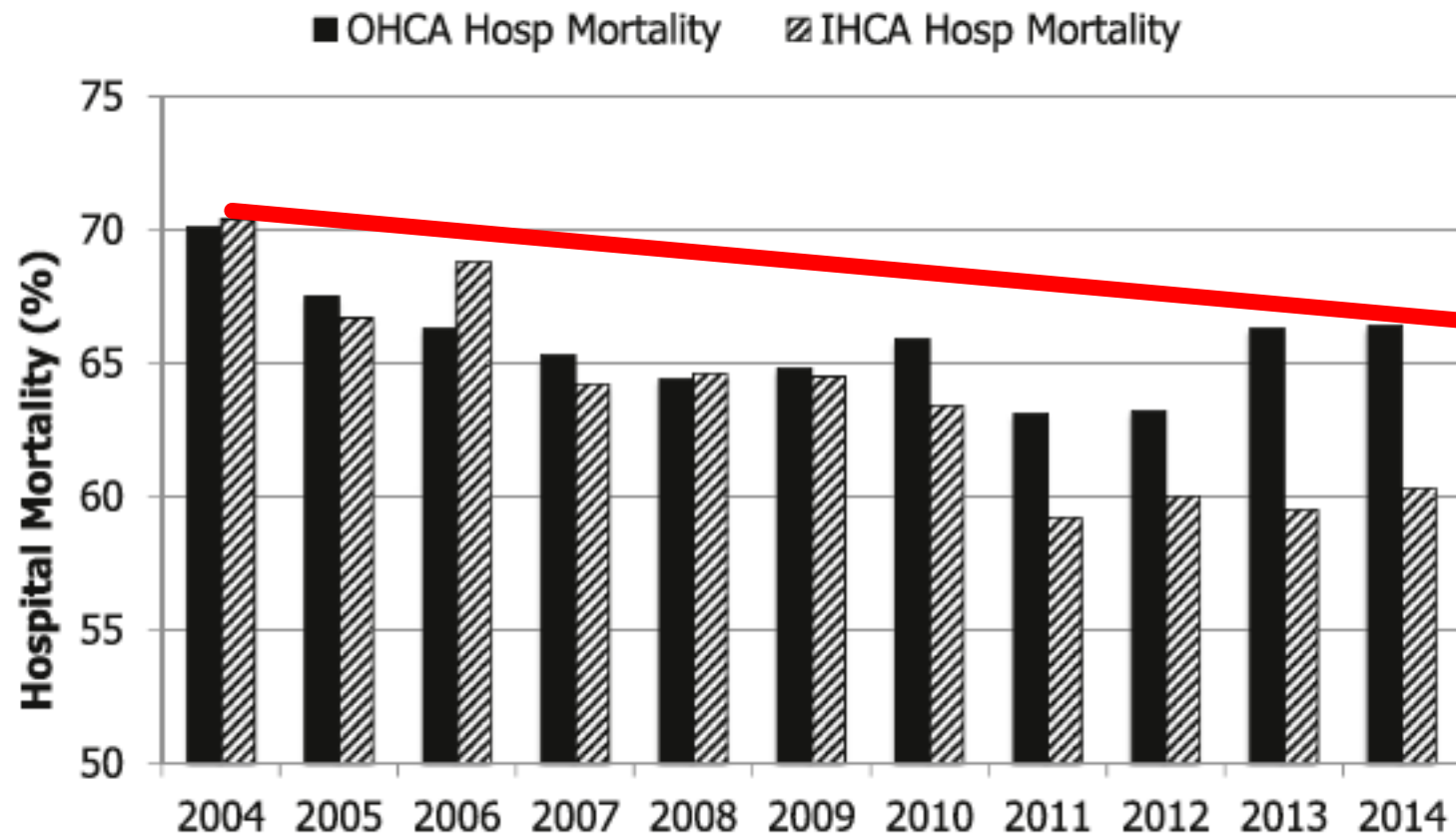
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ADRIANO PERIS- CURE INTENSIVE DEL TRAUMA E SUPPORTI EXTRACORPOREI  
AOUC- FIRENZE



# PLANNING

1. Basics of ECLS oriented to OHCA
2. ECLS: missing link or process
3. Point of view
4. Reengineering or not
5. Final remarks



**Fig. 4** Ultimate acute hospital mortality (2004–2014). *IHCA* in-hospital cardiac arrest, *OHCA* out of hospital cardiac arrest

Intensive Care National Audit & Research Centre (ICNARC) Case Mix Programme Database (CMPD) for the period 1 January 2004 to 31 December 2014.

# 1. Basics of ECLS oriented to OHCA

## For the lung

Acute Respiratory Failure

## For the heart

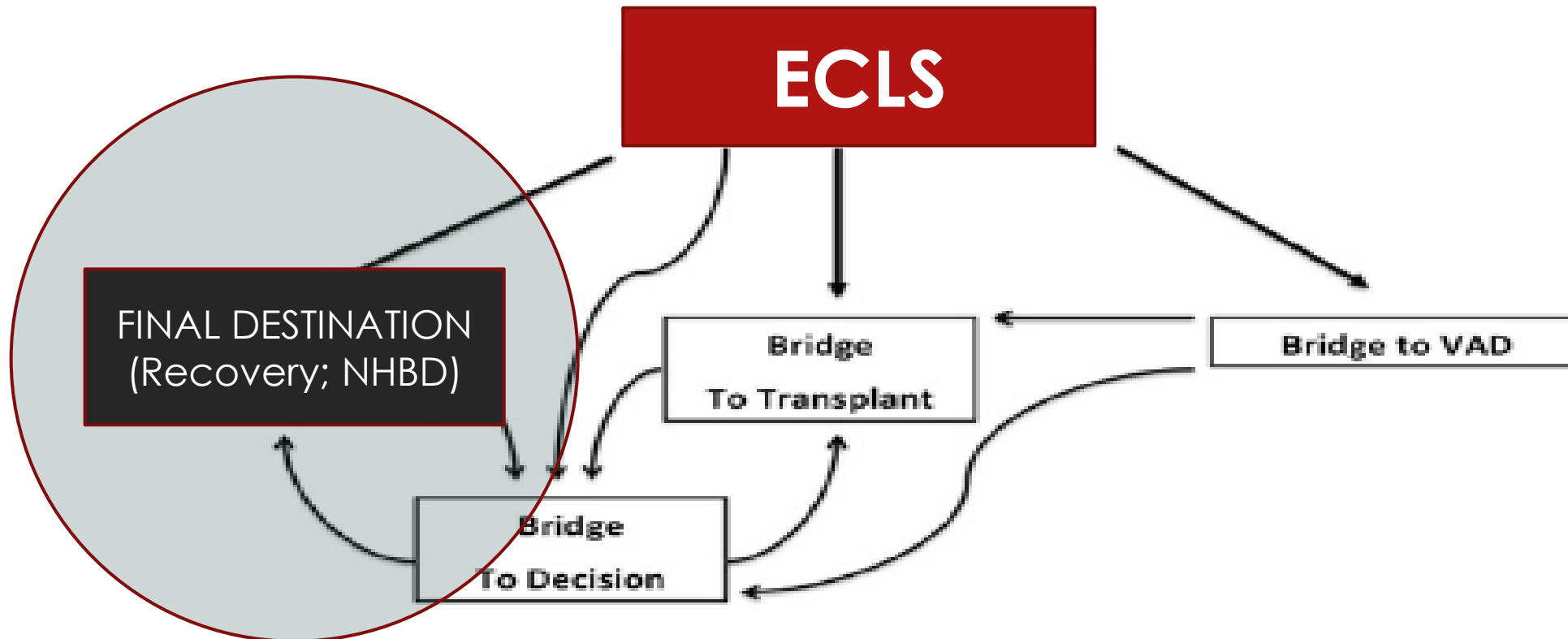
Cardiac arrest

Cardiac Shock

# 1.1 Basics of ECLS oriented to CA

- ▶ **ECLS to assist CPR** (ECPR) both in hospital cardiac arrest (IHCA) and in out-of-hospital cardiac arrest (OHCA)
- ▶ Probability to ROSC decreases with the duration of CPR

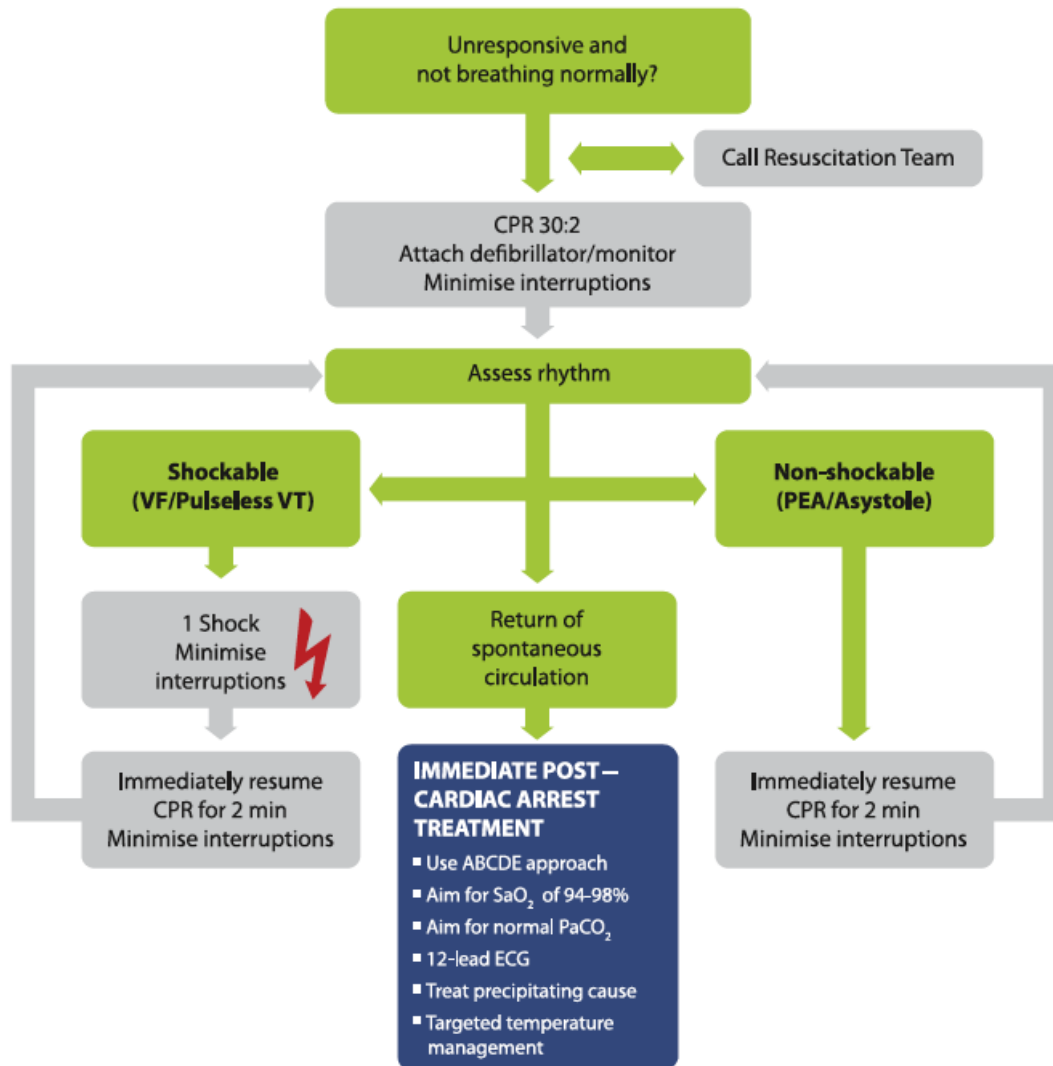
## 1.2 ECLS: missing link or process





# 2. ECLS: missing link or process

## Advanced Life Support



## ECLS

## ERC 2015: ALS ALGORITHM

### DURING CPR

- Ensure high quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (intravenous or intraosseous)
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks

### TREAT REVERSIBLE CAUSES

- |                               |                                    |
|-------------------------------|------------------------------------|
| Hypoxia                       | Thrombosis – coronary or pulmonary |
| Hypovolaemia                  | Tension pneumothorax               |
| Hypo-/hyperkalaemia/metabolic | Tamponade – cardiac                |
| Hypothermia/hyperthermia      | Toxins                             |

### CONSIDER

- Ultrasound imaging
- Mechanical chest compressions to facilitate transfer/treatment
- Coronary angiography and percutaneous coronary intervention
- Extracorporeal CPR

## 2.1 ECLS: missing link or process



ECLS



## 2.2 ECLS: missing link or process

### Variable entry criteria

- ▶ Initial conventional CPR is failing
- ▶ Standard ALS measures are not successful
- ▶ ECLS to take time (CAAn/PCI)
- ▶ VA-ECMO after successful resuscitation
- ▶ Refractory cardiogenic shock when all else fails

## 2.3 ECLS: missing link or process

### Propensity studies: which patient for ECLS

The propensity score reflects the probability of receiving ECLS therapy

- ▶ location of the arrest (IHCA versus OHCA)
- ▶ witnessed or unwitnessed arrest
- ▶ presumed cardiac origin
- ▶ duration of CPR

Subjects with similar clinical characteristics

## 2.4 ECLS: missing link or process

### Results.....

#### Propensity Score (IHCA)

- ▶ Short- and long-term benefits over CCPR irrespective of ROSB/ROSC.
- ▶ No difference in survival or neurological when administered after ROSB/ROSC following prolonged CPR

(Lin, 2010)

#### Meta-analysis (generic)

*“continuous field of cardiac failure, ranging from cardiogenic shock to cardiac arrest”*

- ▶ Refractory cardiac arrest: increased survival and favourable neurological outcomes in the ECLS
- ▶ Cardiogenic shock: increased survival with ECLS compared with IABP.
- ▶ ECLS as an adjuvant therapy for not only IHCA, but also for OHCA.

(Wang, 2014; Ouweneel, 2016)

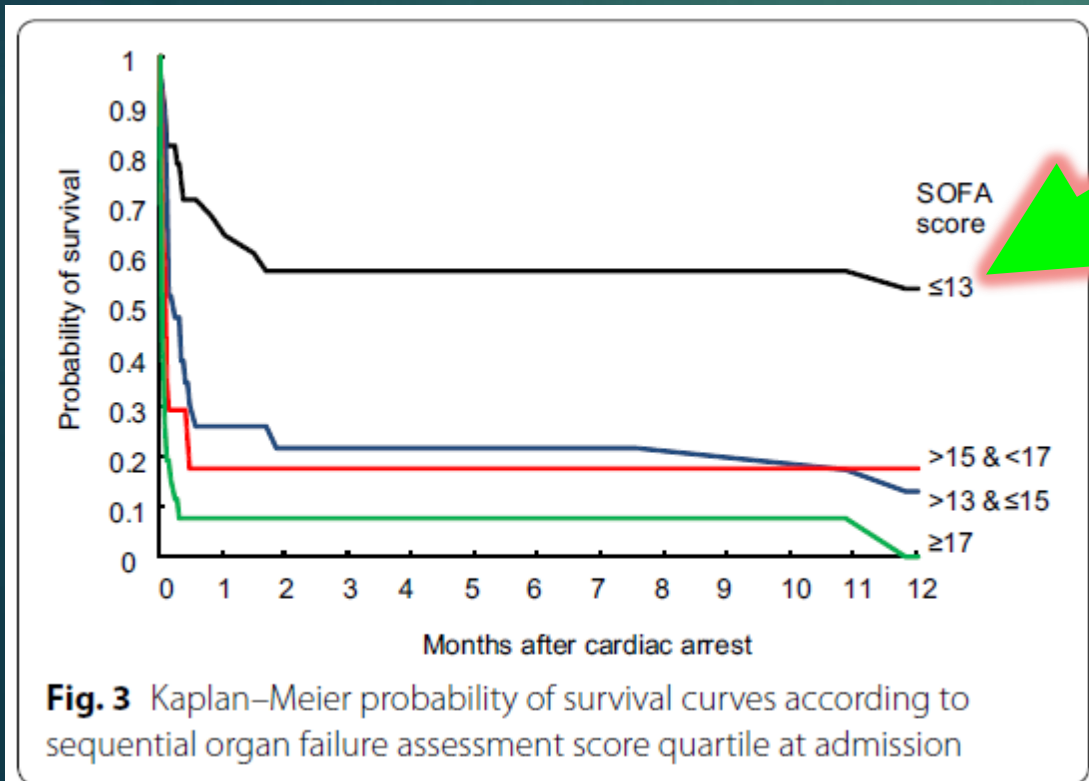
# 3. POINT OF VIEW

## Situations perceived as favorable in ECLS

- ▶ Witnessed cardiac arrest
- ▶ Shockable rhythms
- ▶ High quality cpr
- ▶ Little comorbidity
- ▶ Severe hypothermia
- ▶ Poisoning
- ▶ Myocardial infarction
- ▶ Pulmonary embolism

# 3.1 POINT OF VIEW

## ECLS vs Multiorgan Dysfunction in refractory cardiogenic shock post-cardiac arrest



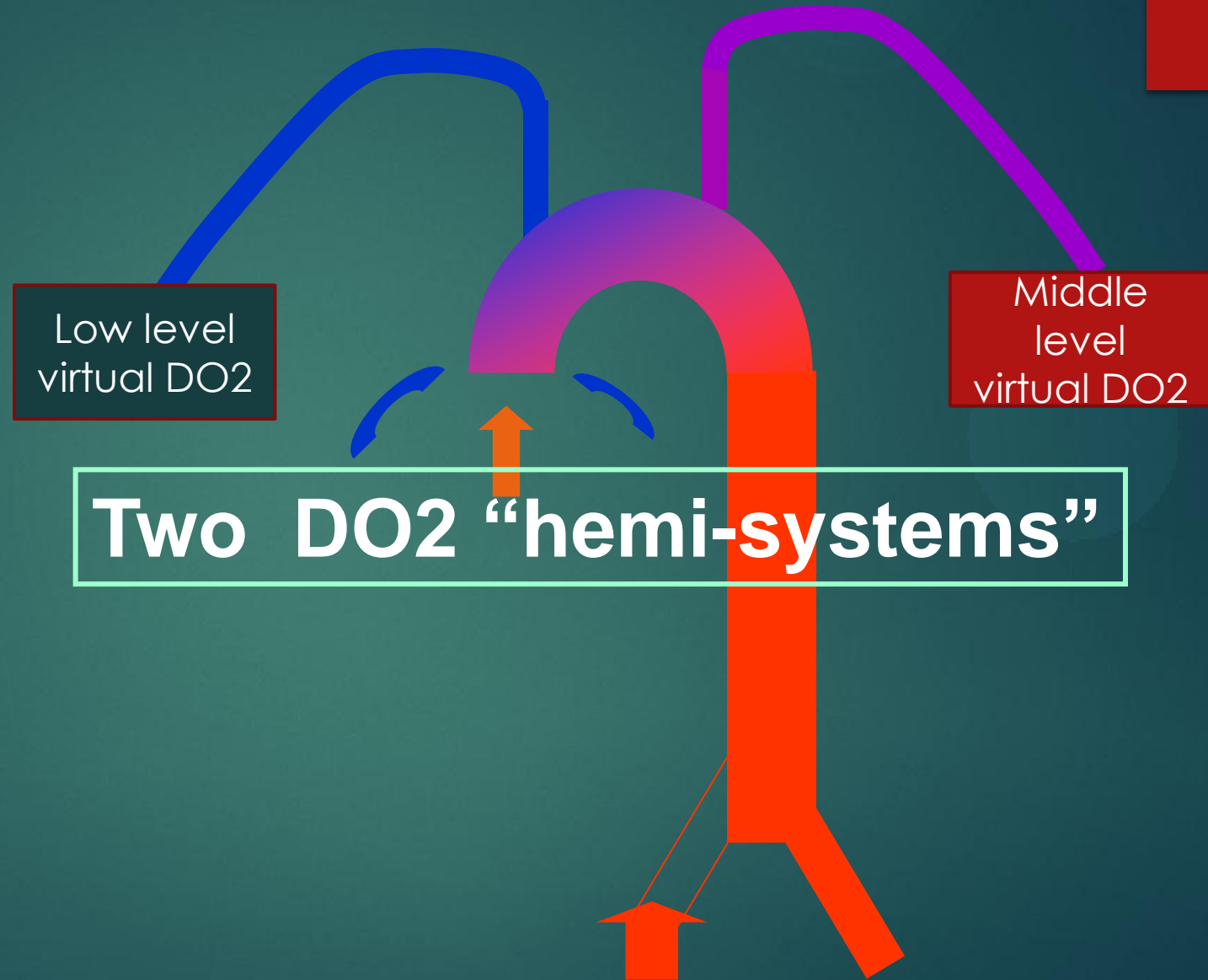
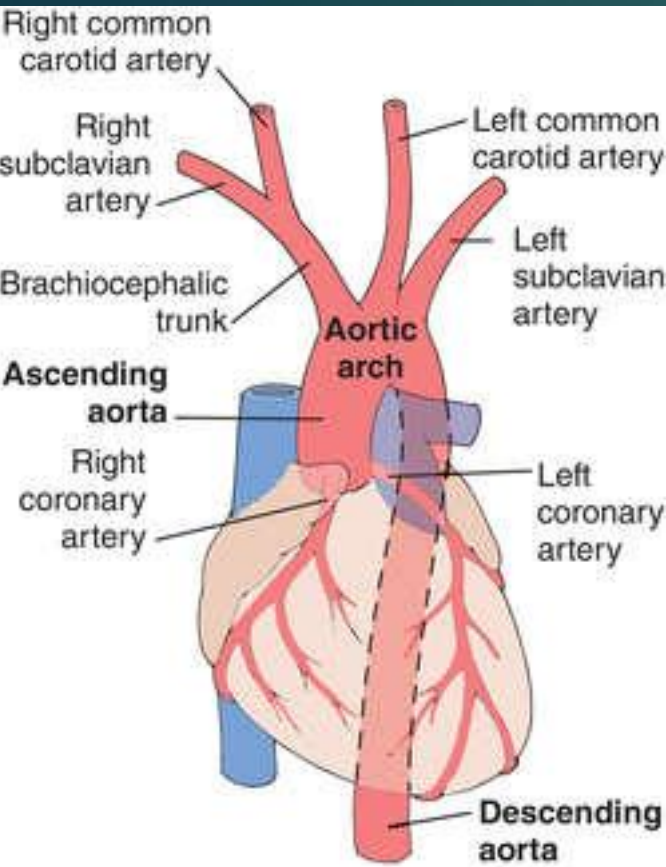
(Pineton, 2016)



## 3.2 POINT OF VIEW ON ECLS

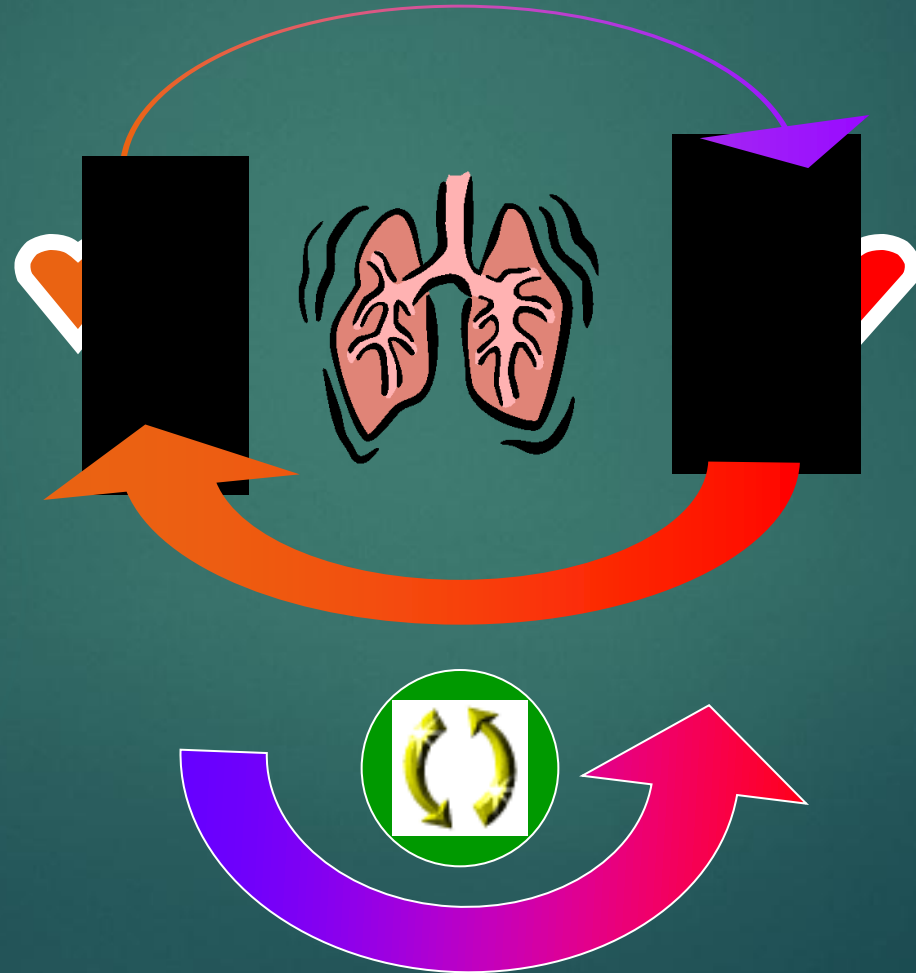
1. Adequate global oxygen delivery ( $CO \times CaO_2$ ) needs to be upgraded to a more extensive multiple organ support concept
2. PreHosp/Hosp interface: transition from one phase of central low flow (preH) towards a phase of compartmental flow (inH)

# 3.3 POINT OF VIEW



# 3.4 POINT OF VIEW

## Veno-Arterial By-Pass with Reduced Pulmonary Flow



# 3.5 POINT OF VIEW

Anticipates ECLS in Preh

- ▶ Flow maintenance
- ▶ Screening for ECLS
- ▶ Limit target organ hypoxemia
- ▶ Save target vessels
- ▶ If ROSC manage CO<sub>2</sub>

## 4. REENGINEERING OR NOT

- ▶ ECLS systems are not available everywhere
- ▶ ECLS is intended to gain time



# 4.1 NEED REENGINEERING OR NOT

## ECLS what changes in hospital

- ▶ Reproducibility of fast-track
- ▶ Strong preH system conditioning
- ▶ Process-outcome
- ▶ Widespread path-technology

## What asks ECLS team to 118

- ▶ **Sharing propensity score approach**
- ▶ **Sharing Health Technology Assessment**
  - Flow maintenance
  - Limit target organ hypoxemia
  - Control CO<sub>2</sub> if ROSC
- ▶ **Adapting Skills**

# 5. Final remarks

- ▶ ECLS: process that starts from the territory
- ▶ Main theme: flow continuity
- ▶ Consensus on patient recruitment in prehospital phase
- ▶ ECLS anticipation