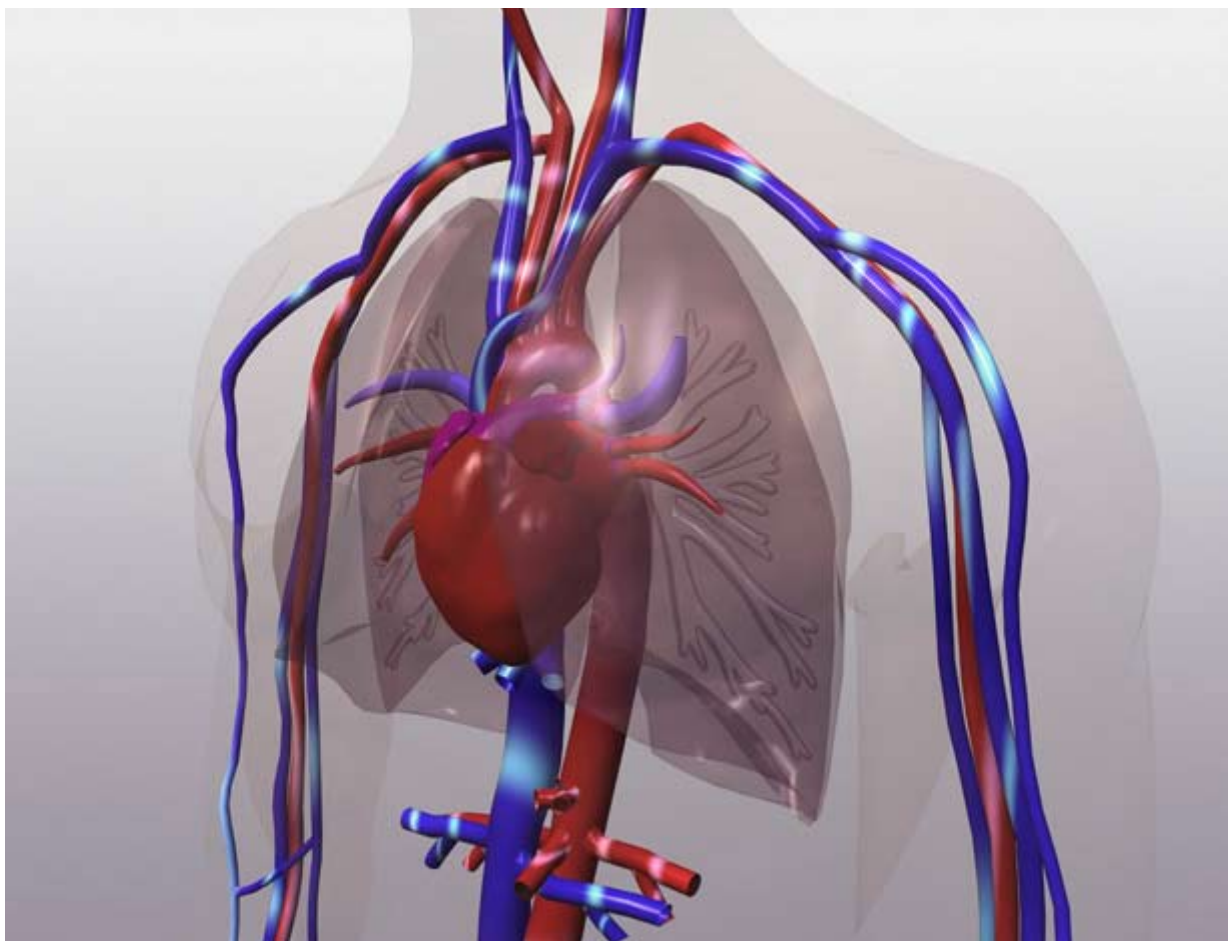


Improved perioperative outcome in cardiac surgery

“Goal-directed fluid management reduces vasopressor and catecholamine use in cardiac surgery patients”

Goepfert MSG, Reuter DA, Akyol D, Lamm P, Kilger E, Goetz AE
Intensive Care Med 2007, 33:96-103



- Faster recovery
- Reduced ventilation time
- Decreased use of vasopressors/inotropes

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Background

- Cardiac output optimization is important for adequate O₂ delivery
- Therapy options: volume / catecholamines / red blood cells
- Volumetric preload parameters and lung water measurement are reliable tools for safe and effective cardiac output optimization

Methods

- 40 elective cardiac surgery patients (bypass) with PiCCO guided management (PiCCO group) vs. 40 conventionally treated patients (control group)
- PiCCO group: measurement of Cardiac Output (CO), Global End-Diastolic Volume Index (GEDI) and Extravascular Lung Water Index (ELWI)
- Control group: recording of central venous pressure and arterial blood pressure
- Investigated outcome criteria:
 1. Time until “fit for ICU discharge”
 2. Duration of mechanical ventilation
 3. Catecholamine requirement
 4. Fluid balance

Materials

PiCCO group:

- PiCCO catheter (5F femoral line) and triple lumen CVC, PiCCO *plus* monitor V 5.1
- Recording of Cardiac Output (CO), Global End-Diastolic Volume Index (preload), and Extravascular Lung Water Index (pulmonary edema)

Control group:

- 20G radial artery catheter and triple lumen CVC

Both groups received the same anesthesia and cardiopulmonary bypass technique.

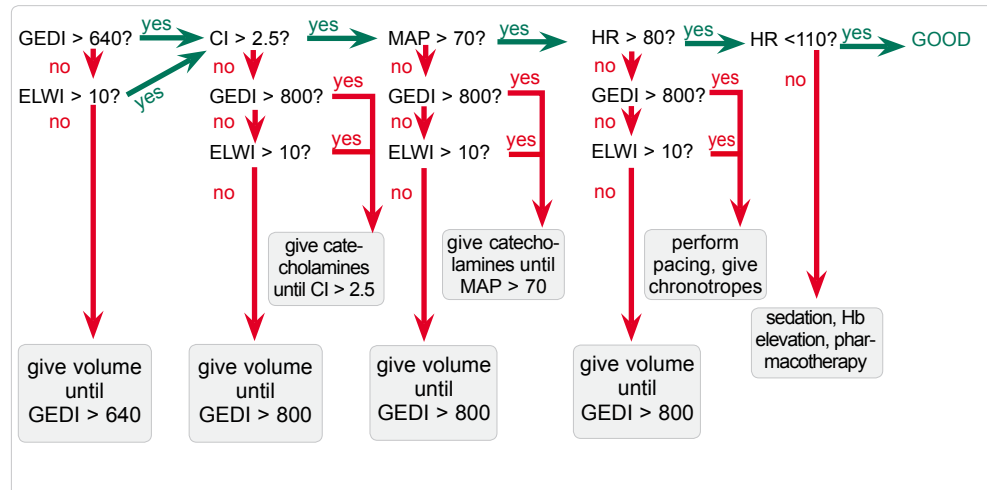
Haemodynamic management during surgery

Control group

Routine clinical practice:

- CVP
- MAP
- Clinical evaluation

PiCCO group





Haemodynamic ICU management

Control group

Routine clinical practice:

- CVP
- MAP
- Clinical evaluation

Baseline:

80ml/h cristalloids for 1st 24 hrs in ICU

PiCCO group

- PiCCO algorithm-driven fluid management
- use of HES 6% 130/0.4 for volume therapy

Baseline:

80ml/h cristalloids for 1st 24 hrs in ICU

Both groups received same ventilation and sedation techniques as well as same transfusion triggers.

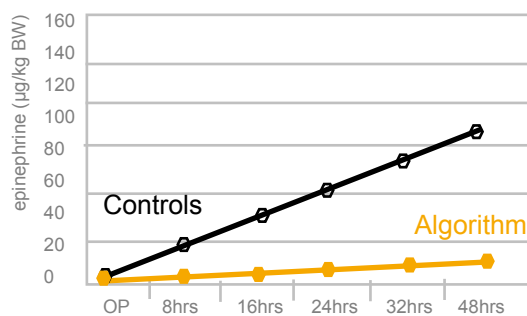
Results

Outcome:

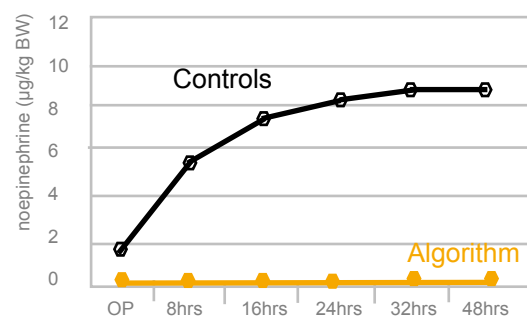
| | Control group | PiCCO group | |
|------------------------------------|-----------------|-----------------|-------|
| Fit for ICU discharge | later (33h) | sooner (25h) | -26 % |
| Duration of mechanical ventilation | longer (15,4 h) | shorter (12,6h) | -18 % |

Vasopressors and inotropes

“Catecholamine and vasopressor support was significantly higher in the control group, during both surgery and ICU therapy.”



Total cumulative amount of epinephrine therapy during surgery and intensive care unit treatment. All values are expressed as mean. p<0.01



Total cumulative amount of norepinephrine therapy during surgery and intensive care unit treatment. All values are expressed as mean. p<0.01

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STUDY SUMMARY

Fluid management

The treatment group received more colloids, both during surgery and during the ICU stay

| | Control group | PiCCO group |
|--------------------------------|---------------|-------------|
| Colloids (surgery and ICU) | 5514 ml | 6918 ml |
| Fluid balance (during surgery) | 5052 ml | 5663 ml |

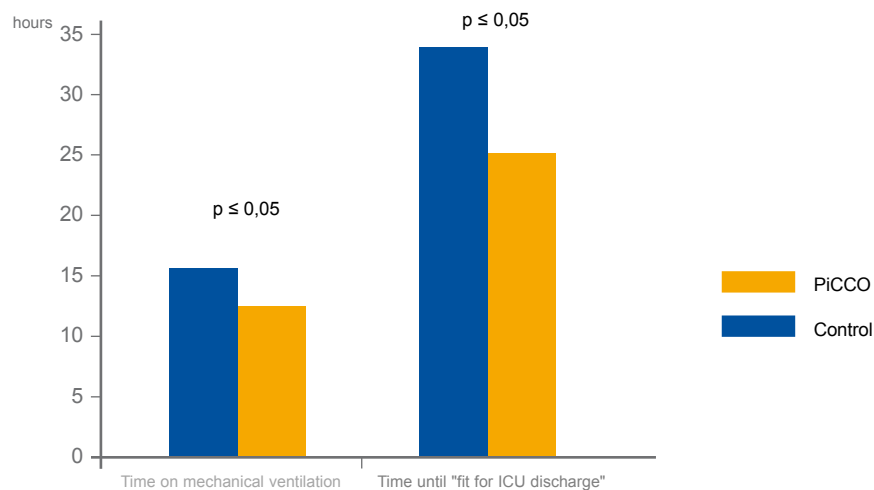
The total amount of cristalloids did not differ significantly between the two groups

NB: during the first 8 postoperative hours, blood lactate was significantly lower in the treatment group

Conclusions

- PiCCO parameter guided early perioperative haemodynamic optimization improved outcome
- PiCCO-Technology allowed optimization of cardio-vascular performance by providing all the determinants of cardiac output (preload, afterload, contractility and heart rate)
- Fluid overloading could be avoided by simultaneously monitoring volumetric cardiac preload (GEDI) alongside Extravascular Lung Water (ELWI)

PULSION Comment on Cost Effectiveness



Patients in the protocol arm with their therapy based on the PiCCO parameters were able to be extubated 3 hours earlier and were ready for discharge 8 hours sooner. This means that the intensive care costs can be effectively reduced.