

Invasive CO Measurement

Overview of mostly used methods

Thermodilution ► ICO (Intermittent CO)

Application:

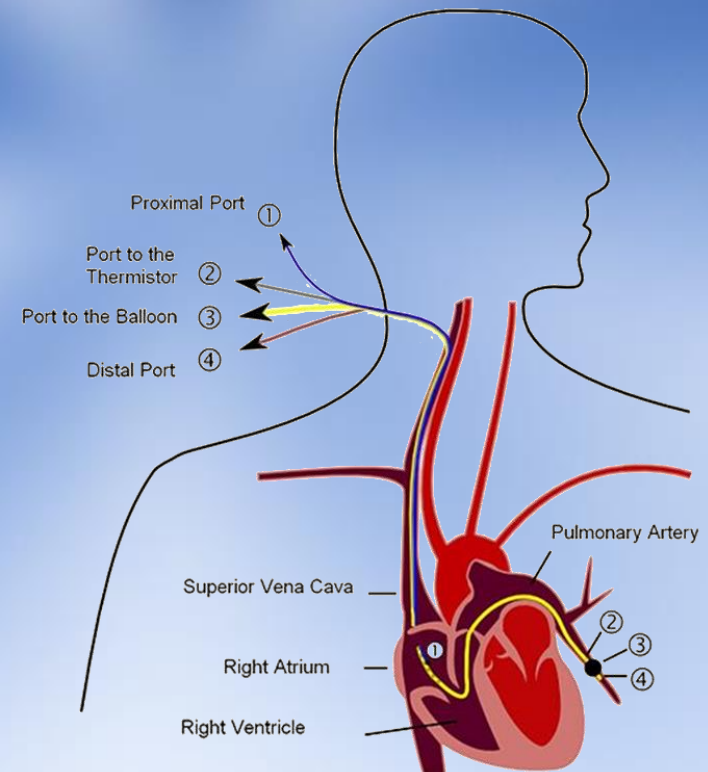
- Pulmonary artery catheter
- Bolus application with cold water (10°C, 5-10 ml) into right atrium
- Recording of temperature in the pulmonary artery

Pro:

- Very accurate
- Uncritical indicator

Contra:

- Highly invasive
- Only spot values
- Averaging over 3 measurements
- Measurement user-dependent



Thermodilution ▶ CCO (Continuous CO)

Application:

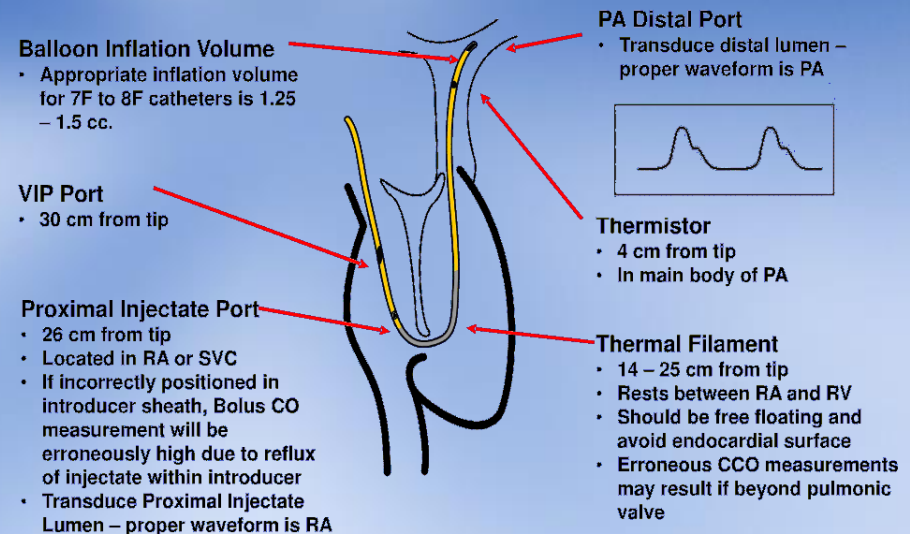
- Pulmonary artery catheter
- Heating filament positioned between RV and RA warming up the blood (max. 44°C)
- Recording of temperature in the pulmonary artery

Pro:

- Very accurate
- Uncritical indicator
- “continuous” CO (every 30-60s)
- Automatic measurement

Contra:

- Highly invasive



Arterial Pressure Wave Analysis ▶ PICCO

Application:

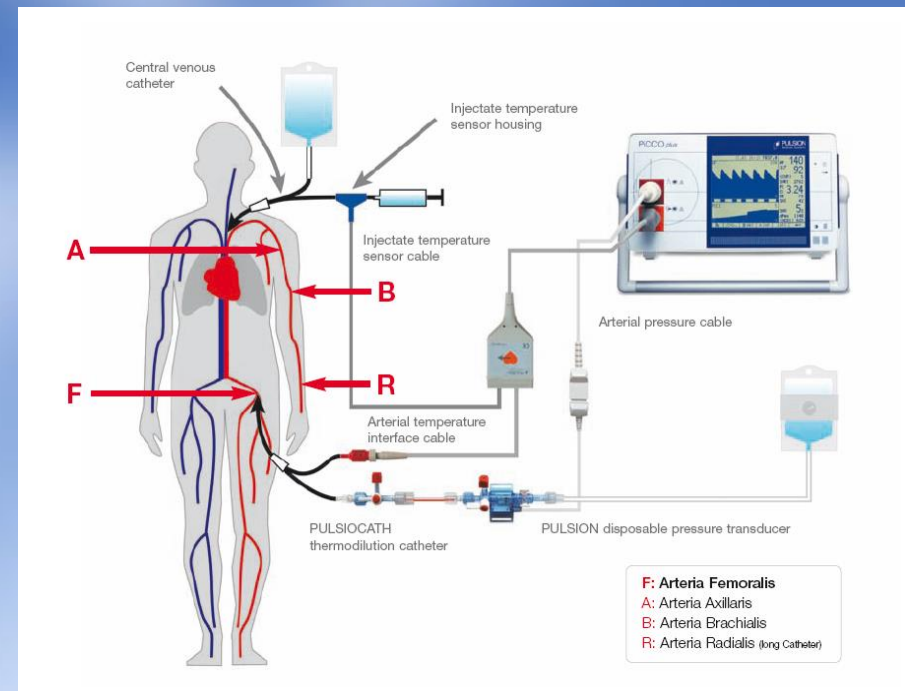
- Arterial and venous entry
- Continuous measurement of arterial pressure curve
- Bolus application of cold water (8°C >15 ml) into venous entry, recording of temperature in arterial entry for calibration

Pro:

- Accurate
- Uncritical indicator
- Less invasive
- Continuous CO

Contra:

- Addition of measurement error
- Recalibration necessary if the vascular resistance changes
- Accuracy of bolus application depending on user



Arterial Pressure Wave Analysis ▶ LiDCO

Application:

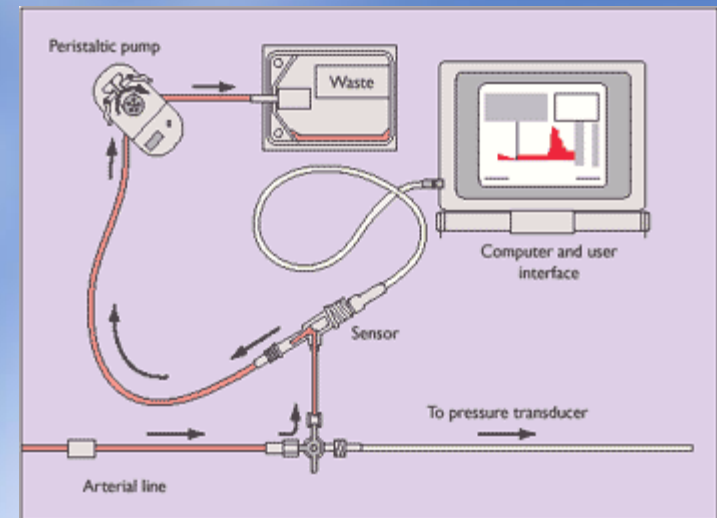
- Arterial and venous entry
- Continuous measurement of arterial pressure curve
- Bolus application of isotonic lithium chloride into venous entry, recording of lithium concentration in arterial entry for calibration

Pro:

- Accurate
- Continuous CO
- Less invasive
- No indicator loss during measurement cycle

Contra:

- Addition of measurement error
- Indicator toxic when used in higher dose
- Recalibration necessary if the vascular resistance changes



Arterial Pressure Wave Analysis ▶ FloTrac

Application:

- Arterial entry
- Continuous measurement of arterial pressure curve
- No calibration necessary

Pro:

- Easy to use
- Continuous CO
- Less invasive

Contra:

- Low accuracy
- Few studies



Trans Oesophageal Cardiac Output (TEE)

Application:

- Doppler probe in the oesophagus measures blood velocity profile in the descending aorta
- CO is calculated based on the blood velocity and the estimated vessel cross sectional area

Pro:

- Continuous CO
- Minimal invasive

Contra:

- Not adequate for long term measurement
- Skilled operator needed
- Patient must be sedated
- High variations in accuracy

