



VU medisch centrum



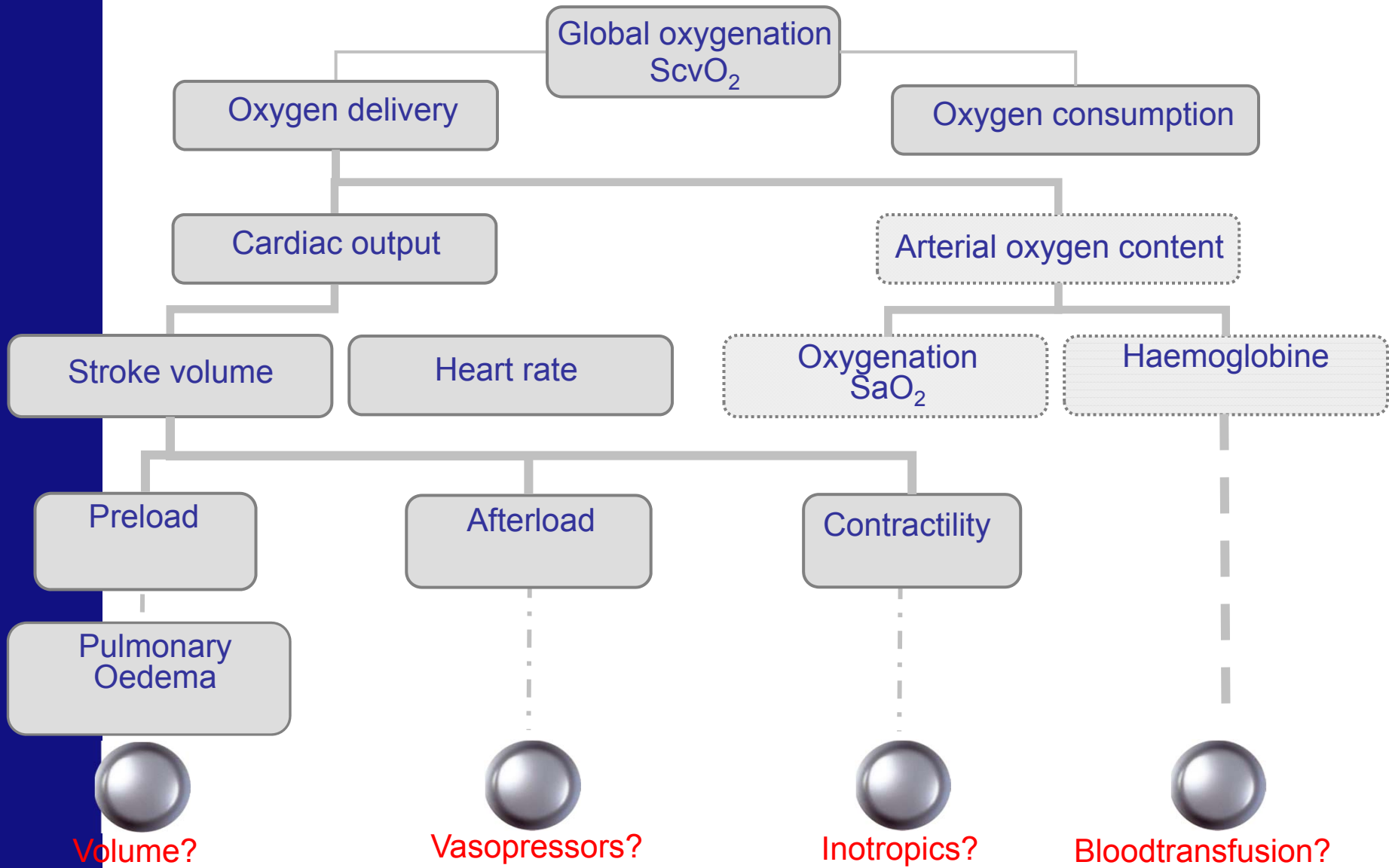
PiCCO

Topics in Intensive Care

7 en 8 december 2011

Drs. Andra de Vries

Fellow ICK VUmc





COLD System



PiCCO 1997



PiCCO plus 2002



Philips PiCCO
Module 2003



Draeger Smart
Pod 2005



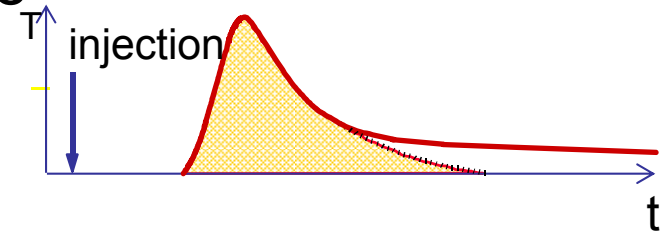
PiCCO₂
2007



Pulse-induced Contour Cardiac Output

- Transpulmonale thermodilutie

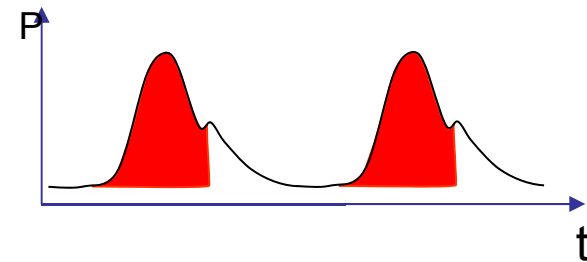
- *Statische parameters*
Bolus moment



- Arteriele drukcurve analyse

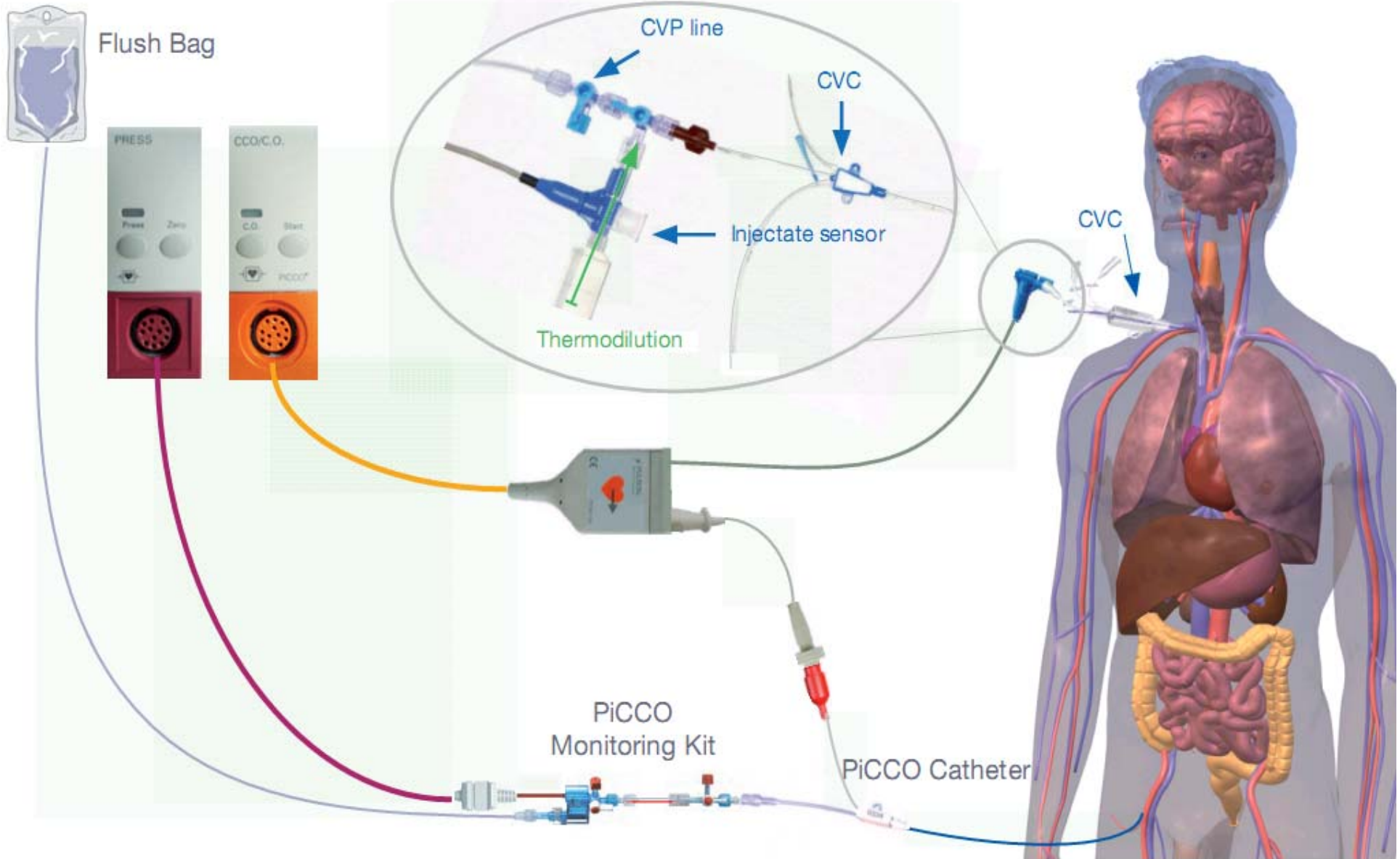
- *Dynamische parameters*
Continue (beat to beat)

calibratie





VU medisch centrum



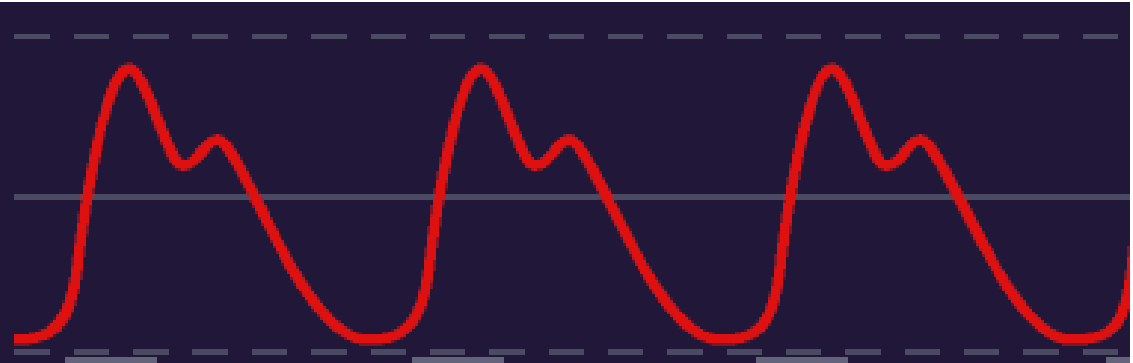


VU medisch centrum



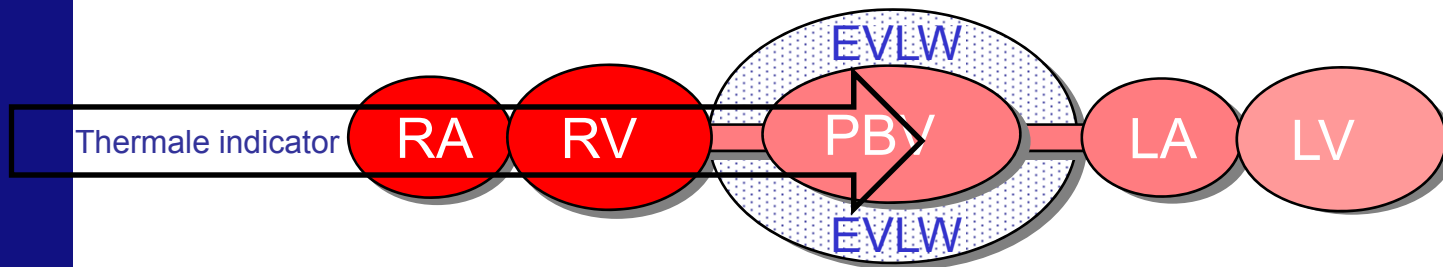
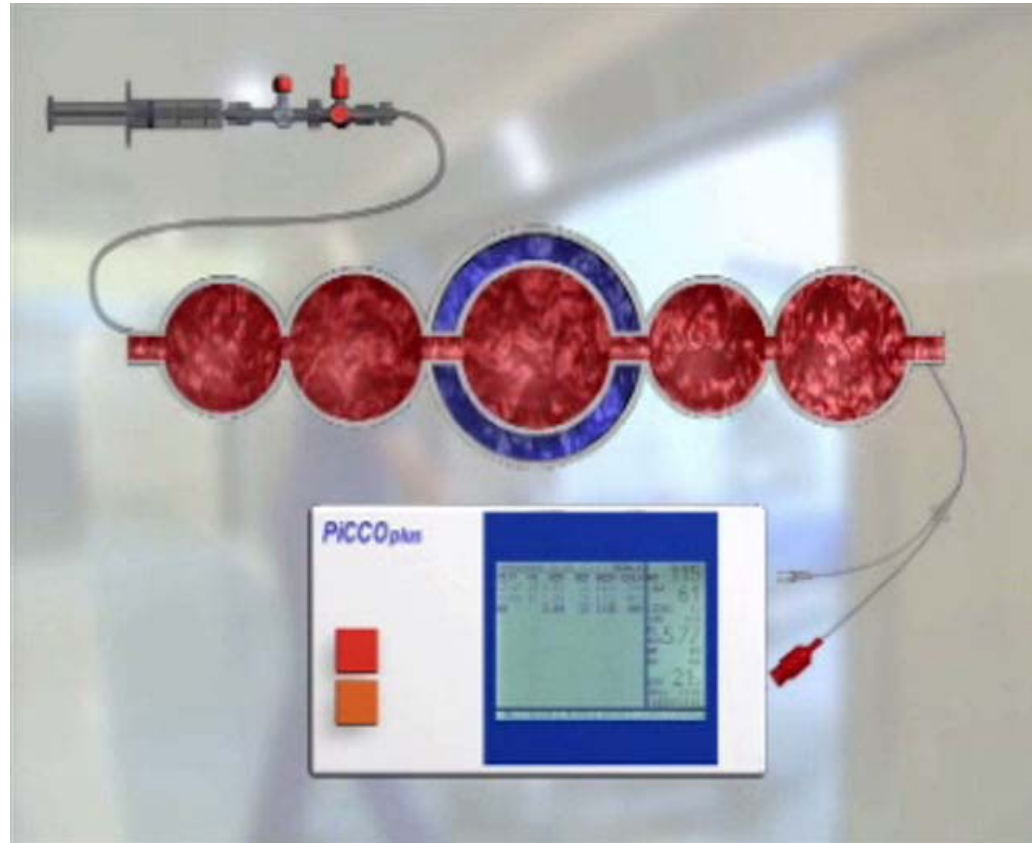
HR 86
AP 132/71
MAP 91
CVP 9

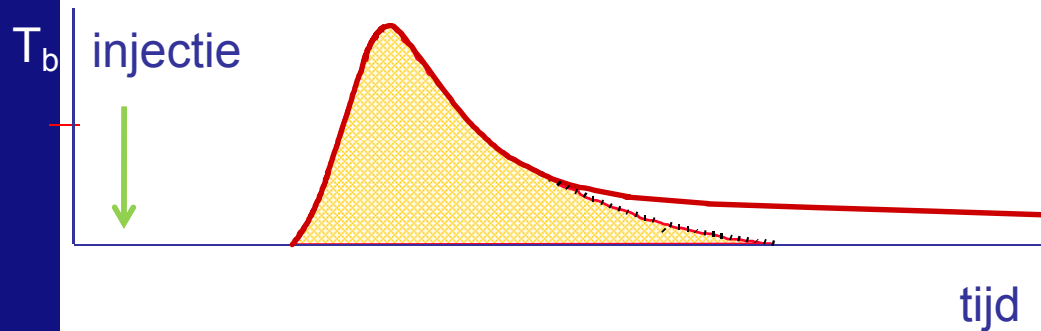
140
AP
70





Thermodilutie proces





CO calculatie:
oppervlakte onder de
thermodilutie curve

$$CO_{TDA} = \frac{(T_b - T_i) \cdot V_i \cdot K}{\int \Delta T_b \cdot dt}$$

T_b

= bloed temperatuur

T_i

= injectaat temperatuur

V_i

= injectaat volume

$\int \Delta T_b \cdot dt$

= oppervlakte onder de thermodilutie curve

K

= correctie constante, opgemaakt uit specifiek gewicht
en specifiek temperatuur van bloed en injectaat



Parameter berekening

Voor de calculatie van volumes...

MTt: Mean Transit time

tijd wanneer helft van de indicator het punt van detectie in de arterie is gepaseerd

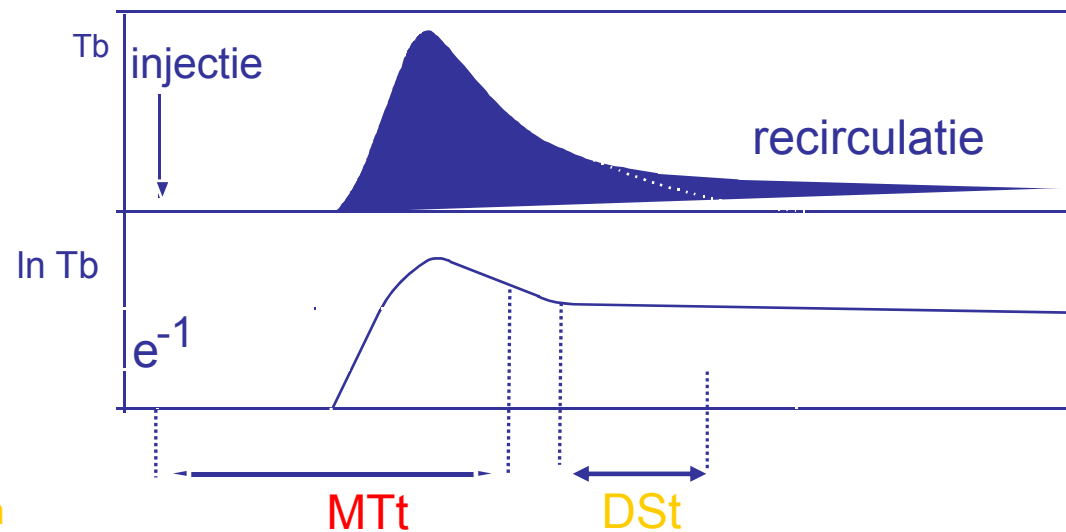
...en...

DSt: Down Slope time

exponentiëel downslope tijd van de thermodilutie curve

...zijn zeer belangrijk

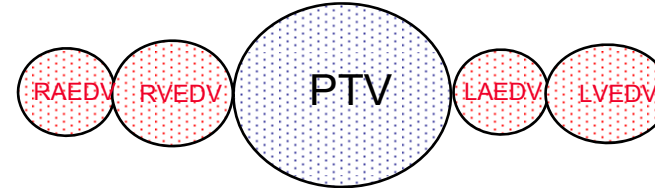
Advanced Thermodilution Curve Analysis



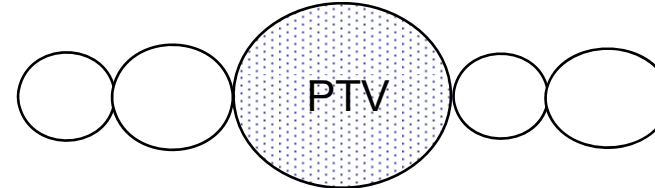


Parameter berekening

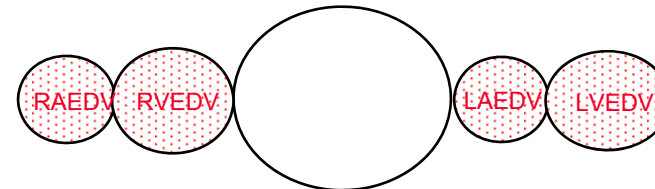
$$ITTV = CO * MTt_{TDa}$$



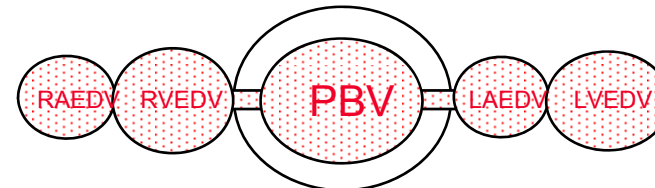
$$PTV = CO * DSt_{TDa}$$



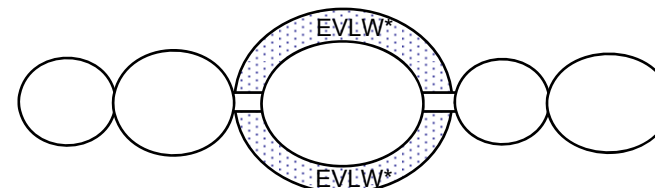
$$GEDV = ITTV - PTV$$



$$ITBV = 1.25 * GEDV$$

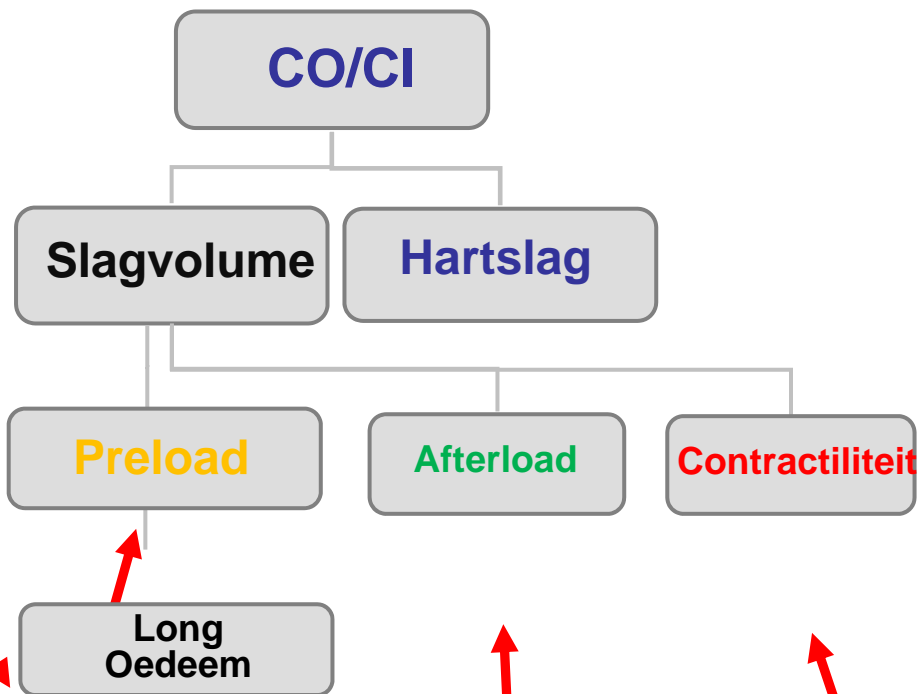
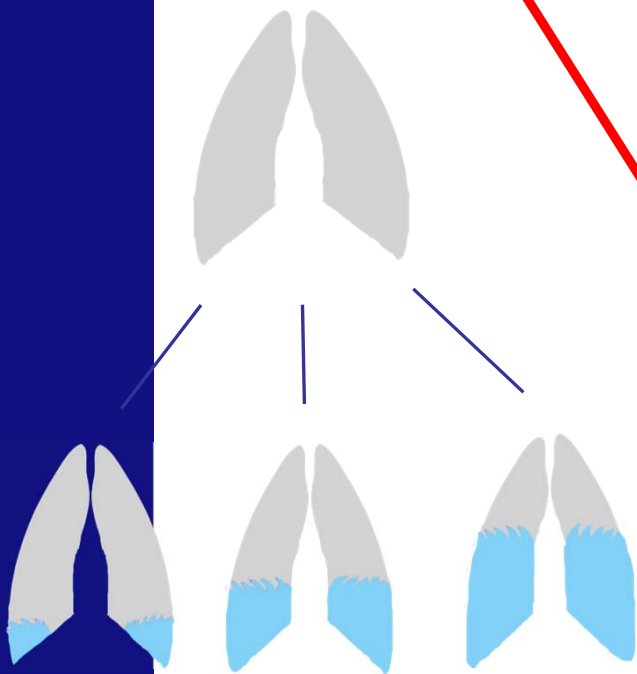


$$EVLW = ITTV - ITBV$$





•EVLW = long oedeem
gemeten aan het bed



GEDVi = totale
hoeveelheid bloed
in het hart
(vullingsvolume)

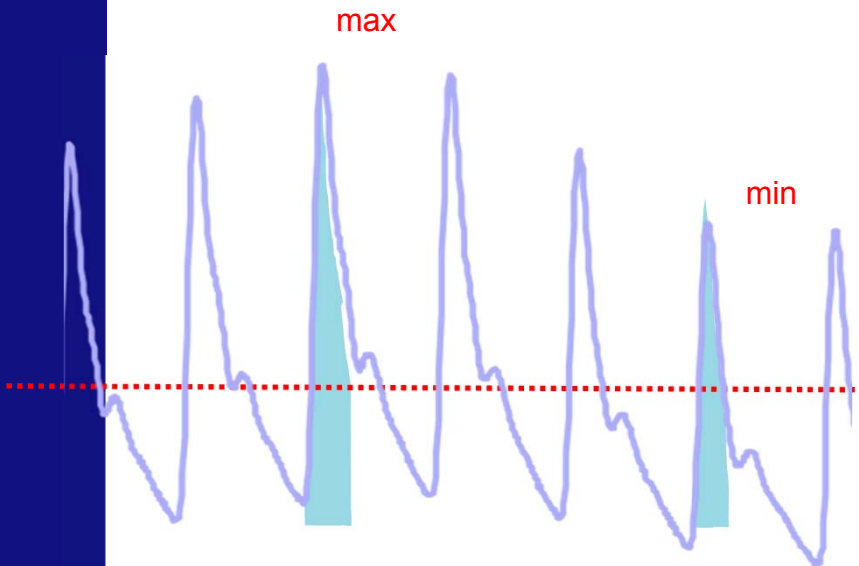
SVRI = weerstand
waartegen het hart
moet pompen

CFi = efficiëntie
van het hartspier

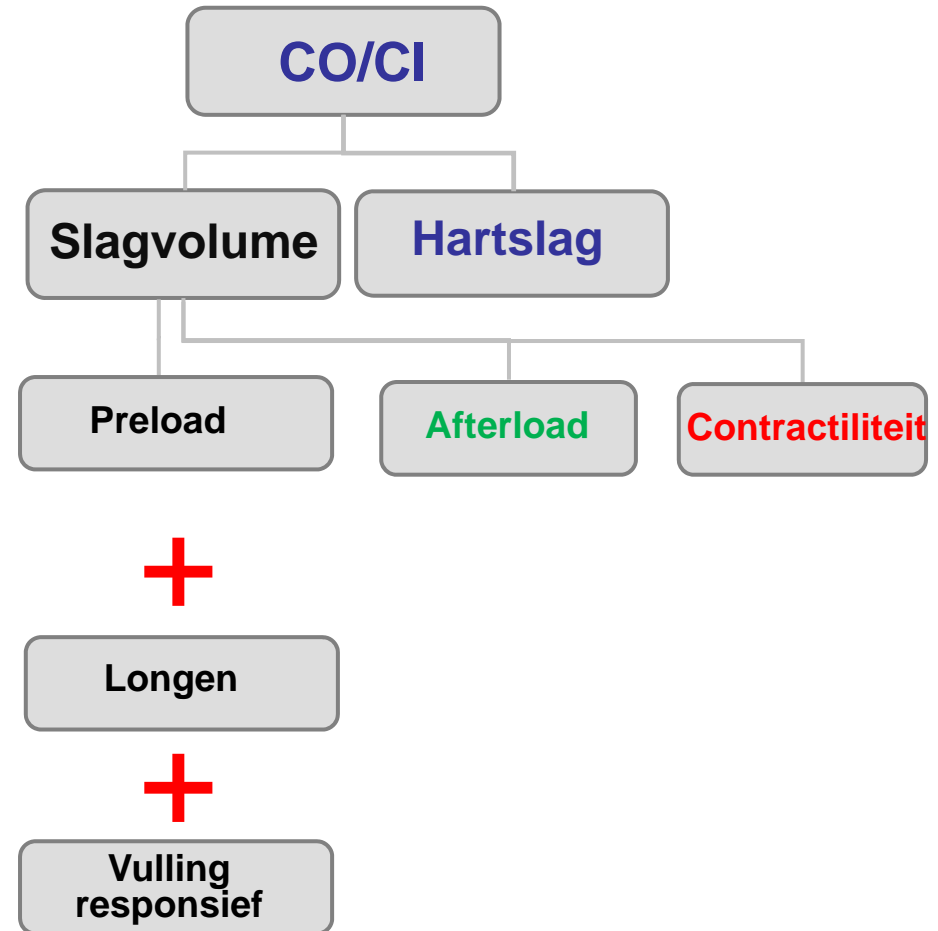


PREDICTING FLUID RESPONSIVENESS WITHOUT GIVING FLUIDS !

SVV = Slag Volume Variatie



Alleen mogelijk bij patienten tijdens gecontroleerde mechanische ventilatie en met normaal sinus ritme





VU medisch centrum



SVV





- Thermodilutie curve

- *Cardiac Output*
- *Global End-Diastolic Volume*
 - preload
- *Intrathoracic Blood Volume*
- *Extravascular Lung Water*
- *Global Ejection Fraction*
 - contractiliteit

*l = index, gemeten waarden
geïndexeerd naar lengte en
gewicht*

- Arteriële druk curve

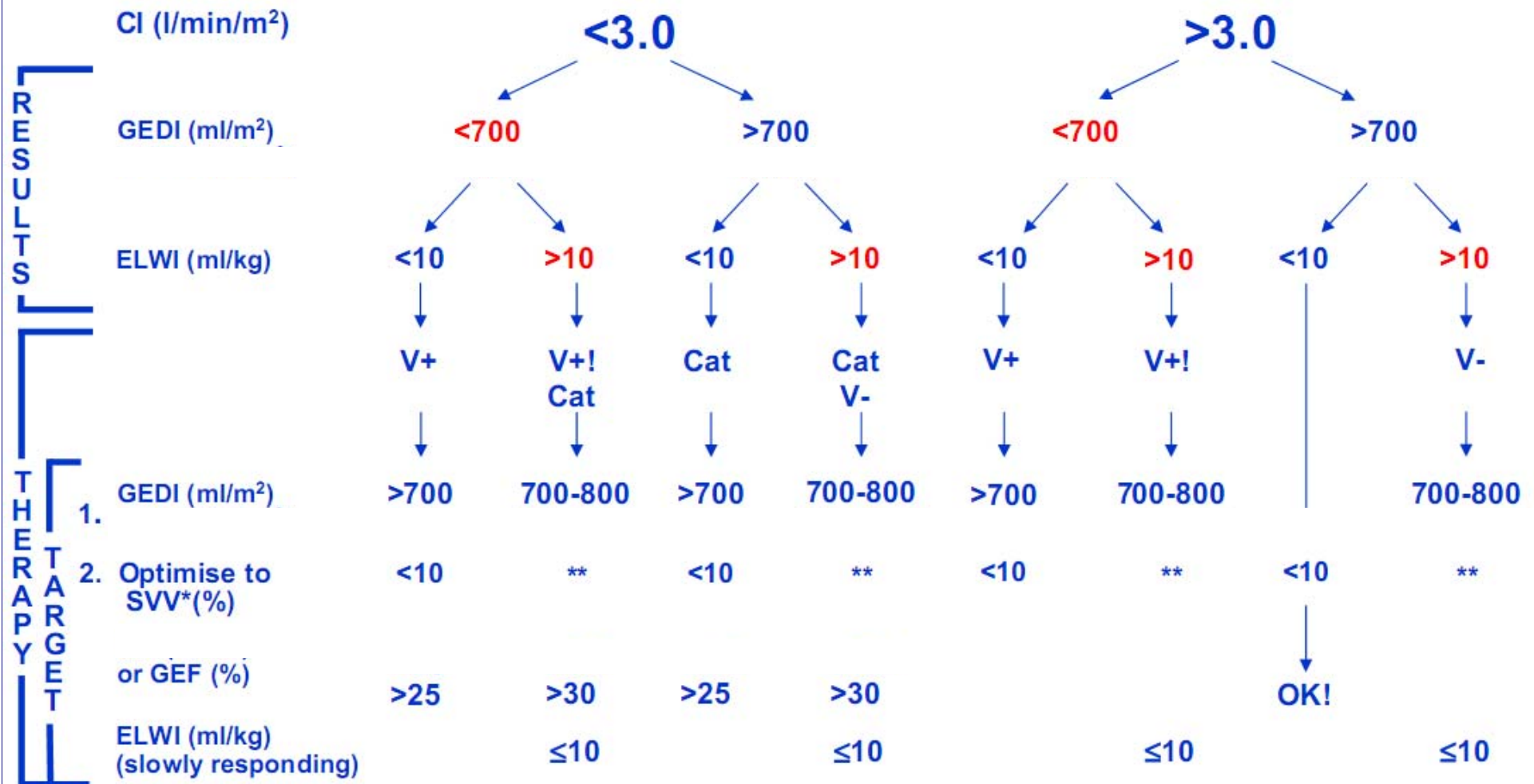
- *Pulse Continuous Cardiac Output*
- *Arterial Blood pressure*
- *Heart Rate*
- *Stroke Volume*
- *Stroke Volume Variation*
- *Pulse Pressure Variation*
- *Systemic Vascular Resistance*
 - afterload



- Pro: less influenced by respiratory cycle
- Con: intracardiac shunts, aortic aneurysms, aortic stenosis, pneumonectomy, during extracorporeal circulation
- Position (line and patient)
- Calibration (regular)



Beslissingsboom



V+ = volume loading (! = cautiously) V- = volume contraction Cat = catecholamine / cardiovascular agents

* SVV only applicable in ventilated patients without cardiac arrhythmia

Without any guarantee