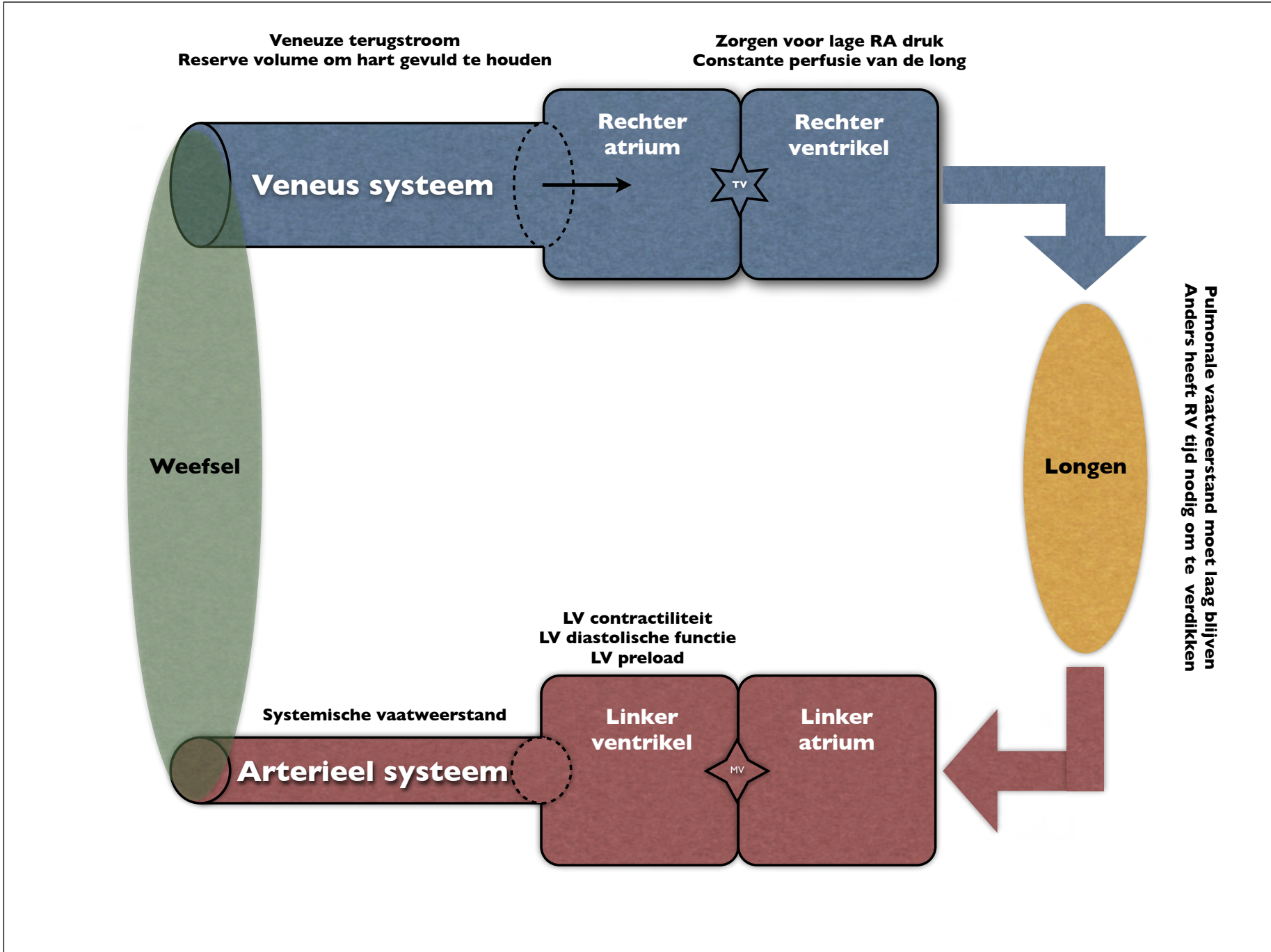


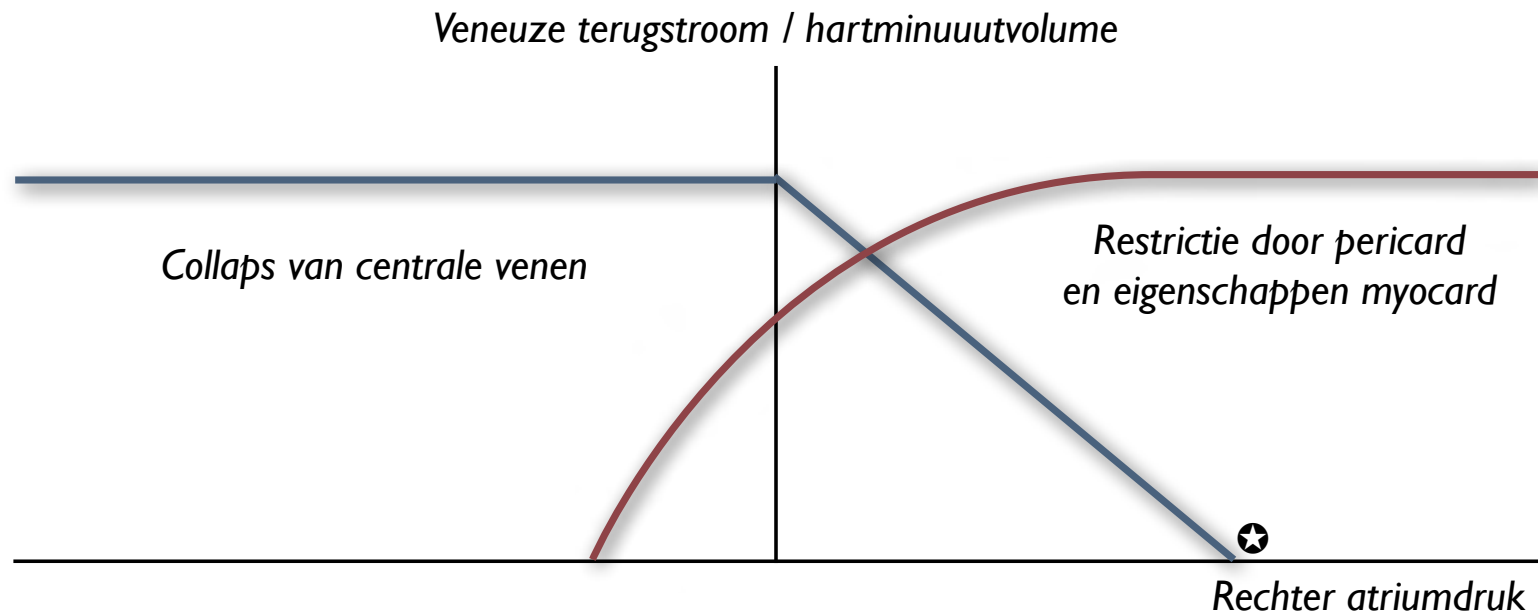
Hemodynamiek

NVIC Circulatiedagen 2011

J.G. van der Hoeven



Venous terugstroom

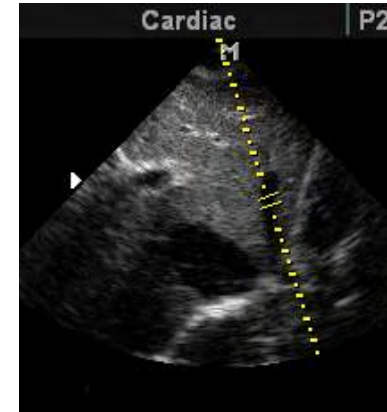
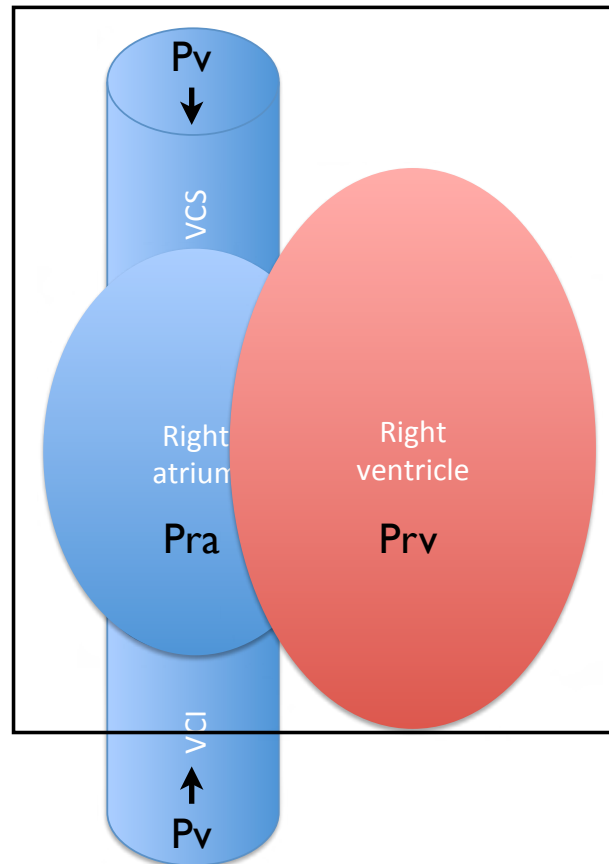
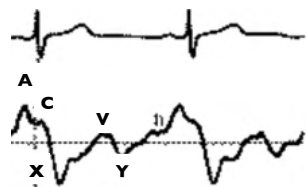
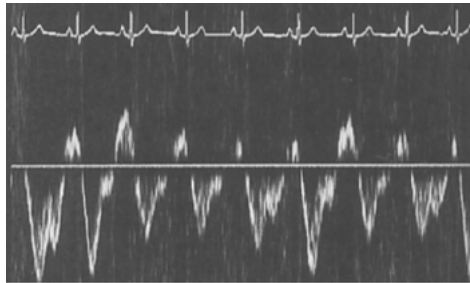


Rechter atriumdruk waarbij veneuze terugstroom stopt is de Mean Systemic Filling Pressure (★)

Veneuze terugstroom

Invloed thoracale druk (respiratie)
Invloed rechter atriumdruk

$$VR = \frac{P_v - P_{ra}}{\text{Weerstand}}$$



Determinanten van veneuze terugstroom

- Perifeer veneuze druk
- Veneuze compliantie
- Weerstand voor veneuze terugstroom
- Rechter atriumdruk

Hoe maak ik veneuze terugstroom groter?

- Perifeer veneuze druk verhogen - **volume**
- Veneuze compliantie verlagen - **vasopressor**
- Veneuze weerstand verlagen - **vaatverwijder?**
- RAP verlagen - **inotropica, vaatverwijder**

Noradrenaline en preload

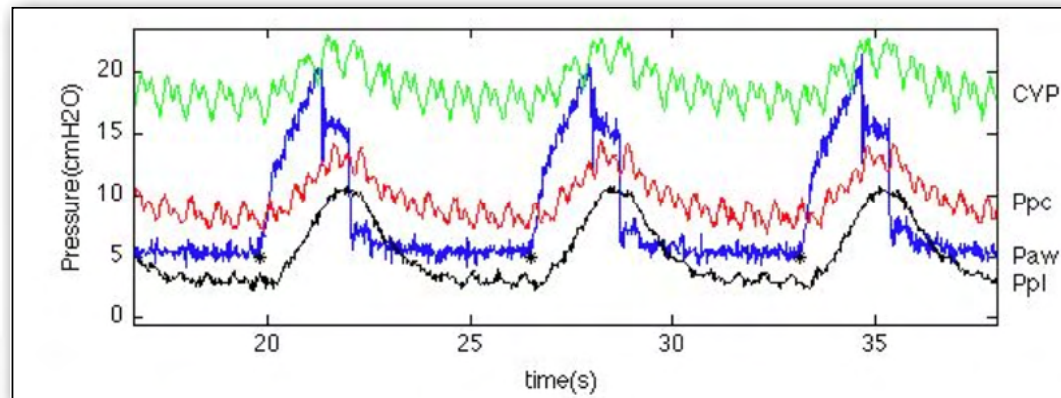
Septische shock
N = 105

	Voor	Na
CI (l/min/m ²)	3.2 ± 1.0	3.6 ± 1.1
GEDVI (ml/m ²)	694 ± 148	742 ± 168

Afname SVV van 13 ± 6 to 9 ± 5%

Alleen patiënten met lage EF (< 45%) en toename MAP > 75 mm Hg toonden geen toename CI

Intrathoracale druk tijdens beademing

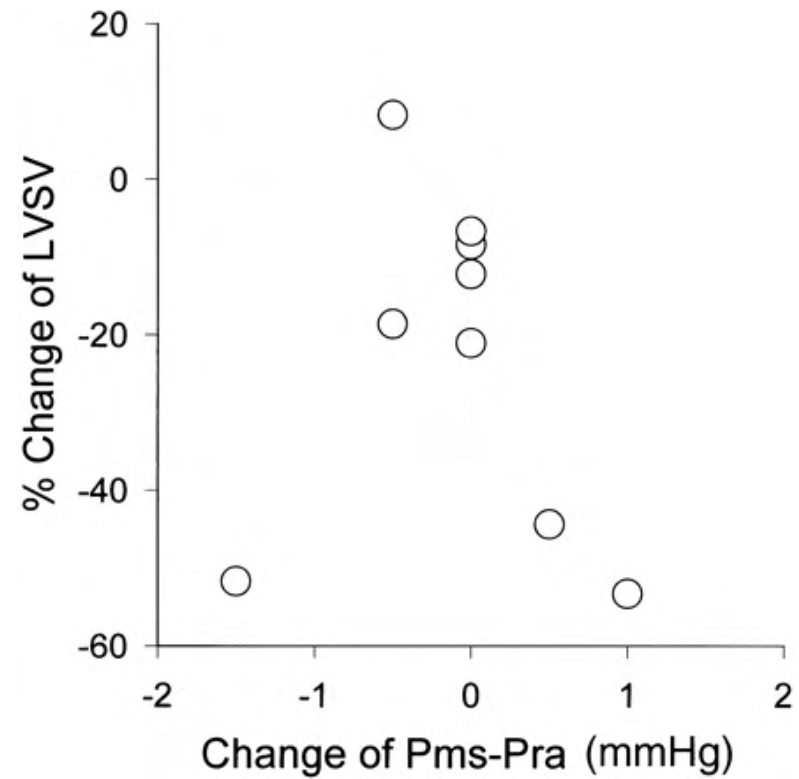
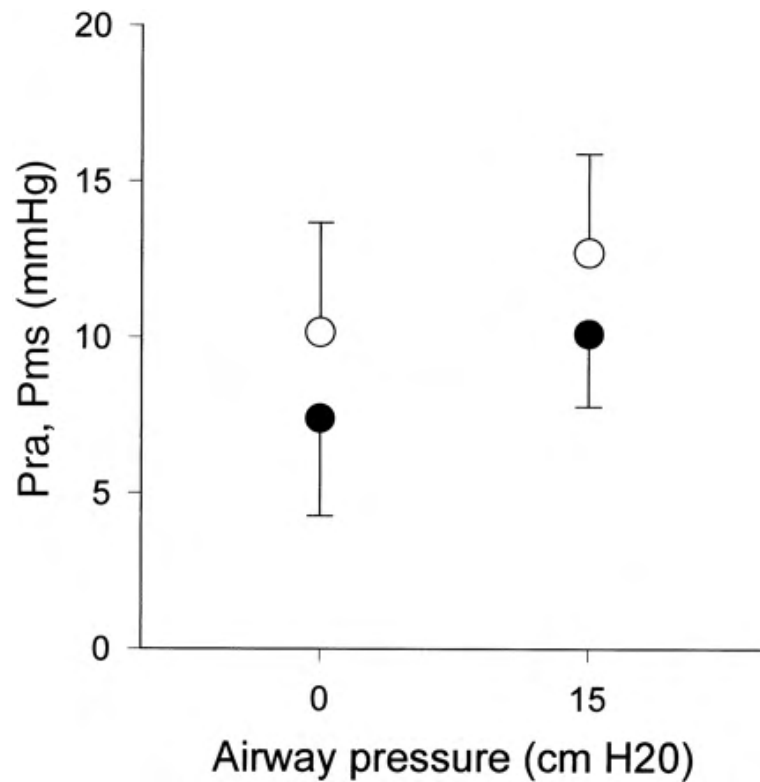


Tidal Volume (ml/Kg)	Δ Airway Pressure (cmH ₂ O)	Δ Pleural Pressure (cmH ₂ O)	Δ Pericardial Pressure (cmH ₂ O)
4	11.7±0.6	3.6±1.1 (31%)	1.2±0.4 (10%)
6	14.6±2.0	5.4±1.3 (37%)	1.9±0.6 (13%)
8	17.1±2.6	7.2±1.4 (41%)	2.7±0.9 (16%)
10	19.0±3.6	9.0±1.3 (47%)	3.7±1.4 (19%)

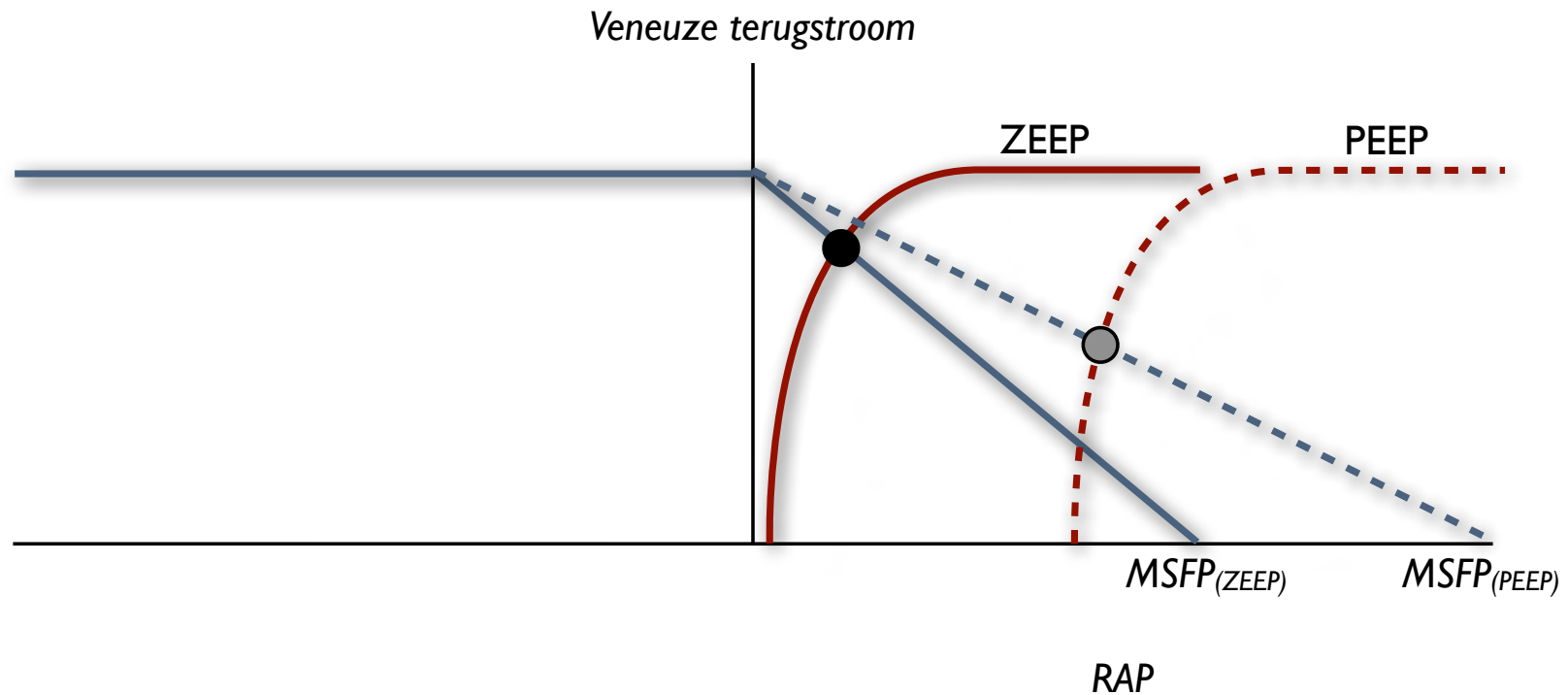
Wat gebeurt er tijdens beademing / PEEP?

- Afname RV preload a.g.v. \uparrow pleura druk
- Toename RV afterload a.g.v. toename transpulmonale druk behalve:
 - ▶ Wanneer longcapaciteit toeneemt van RV \rightarrow FRC
 - ▶ Wanneer hypoxische pulmonale vasoconstrictie wordt opgeheven
- Afname in LV afterload

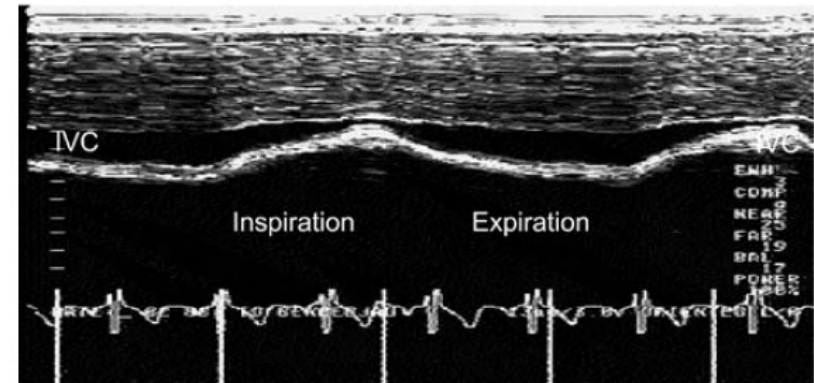
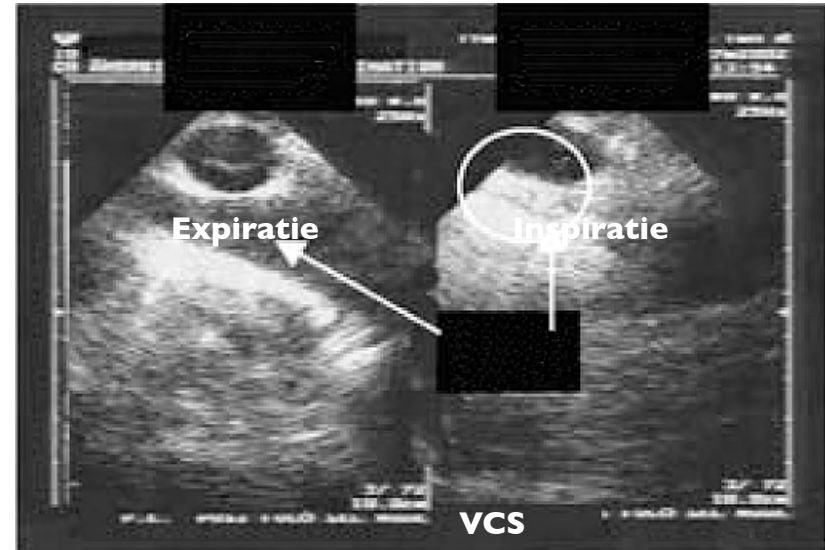
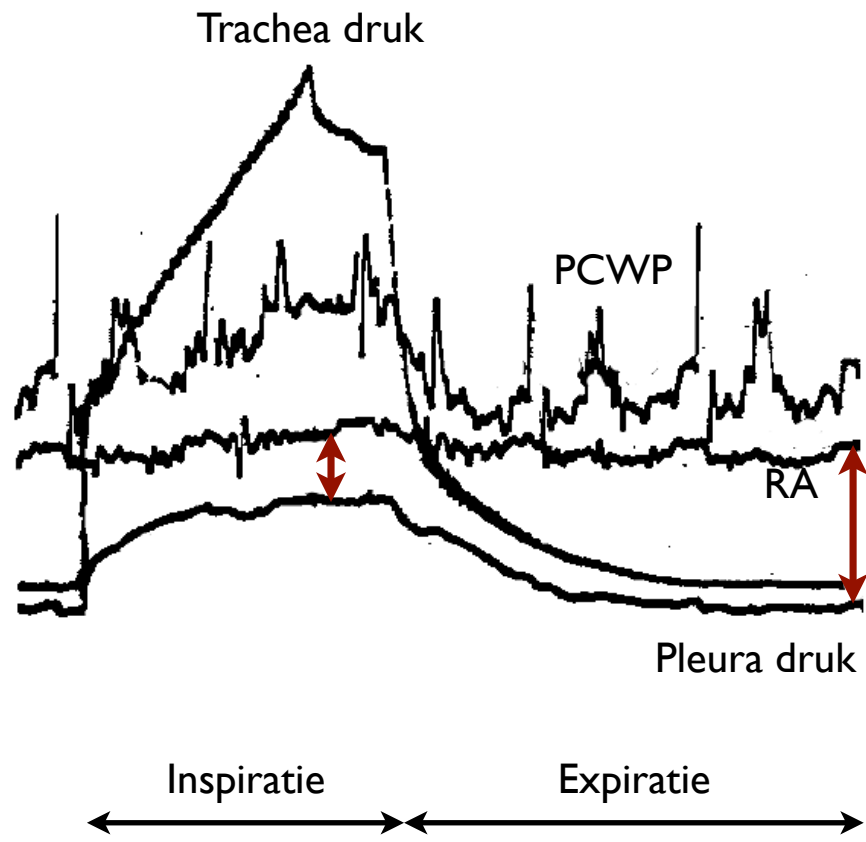
Toename in MSFP bij ↑ pleura druk

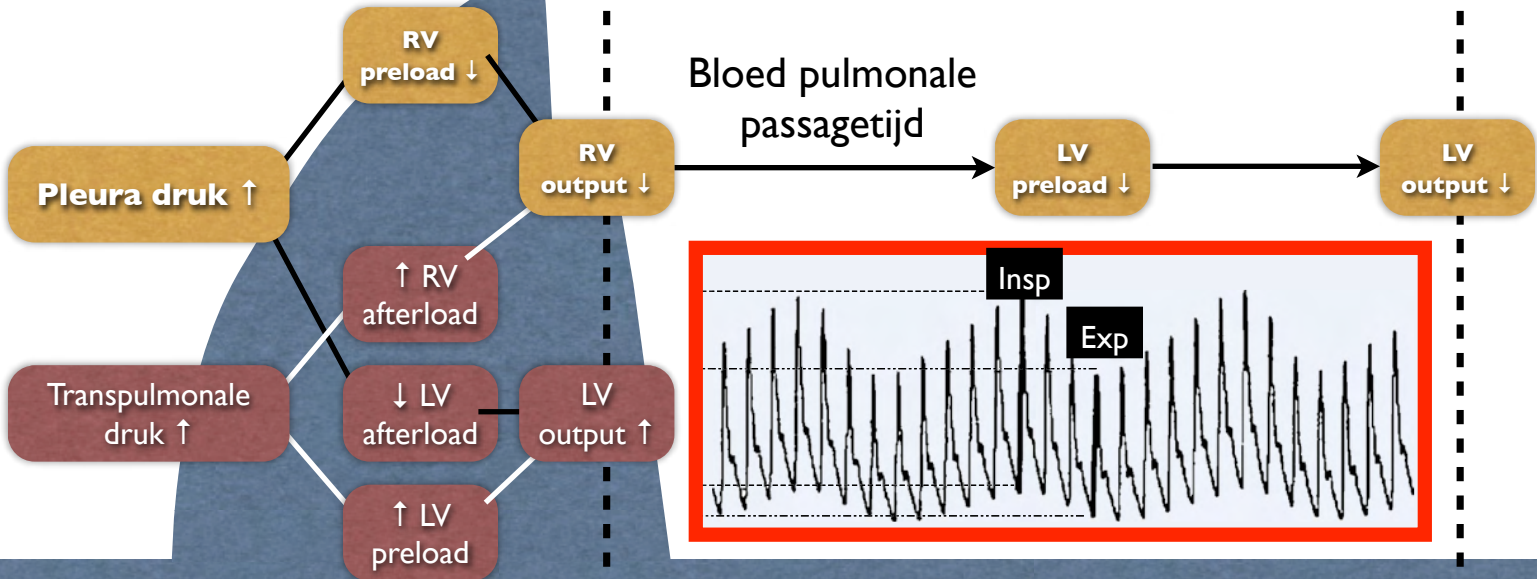
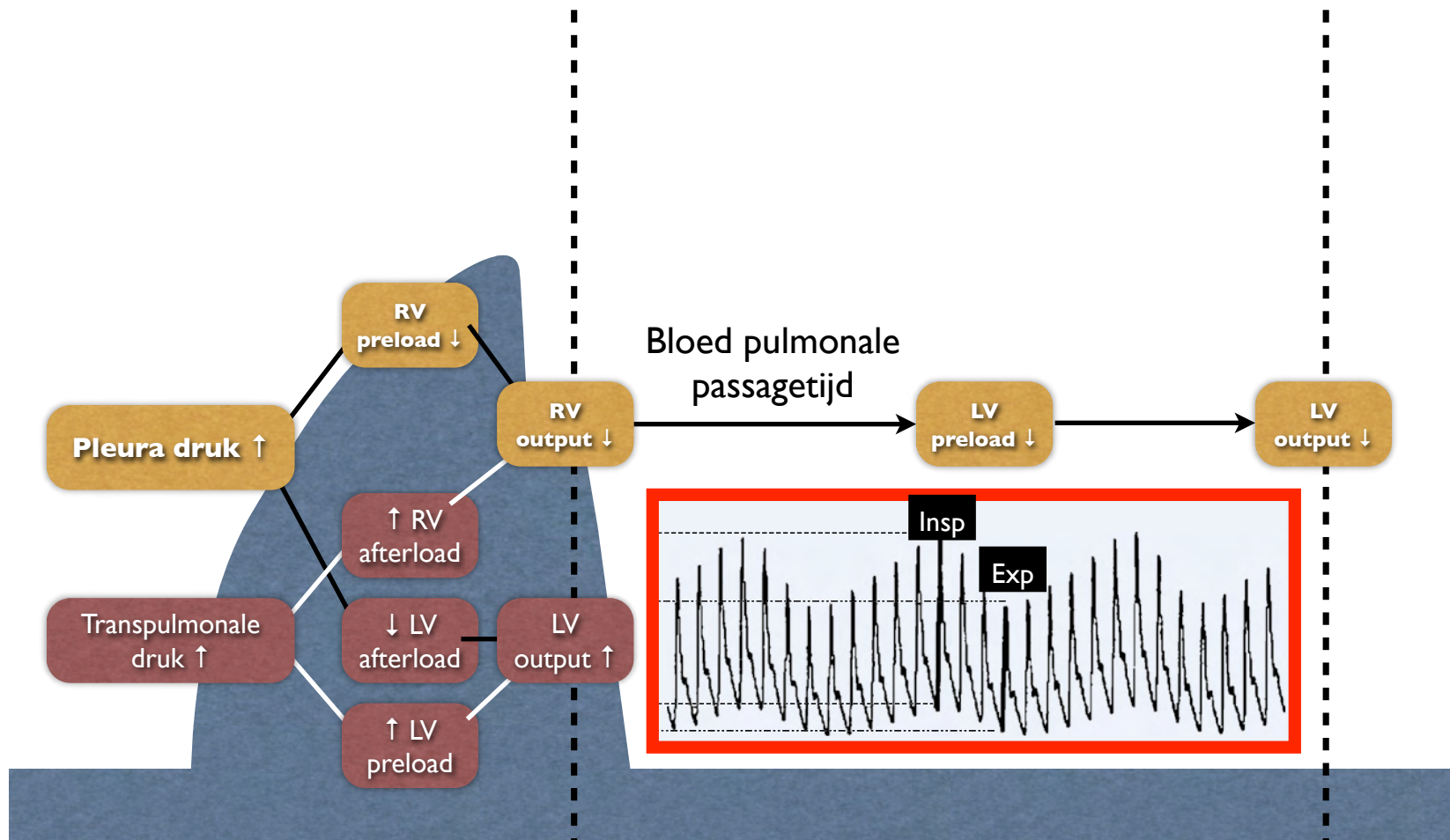


Veneuze terugstroom tijdens beademing/PEEP



Collaps vena cava

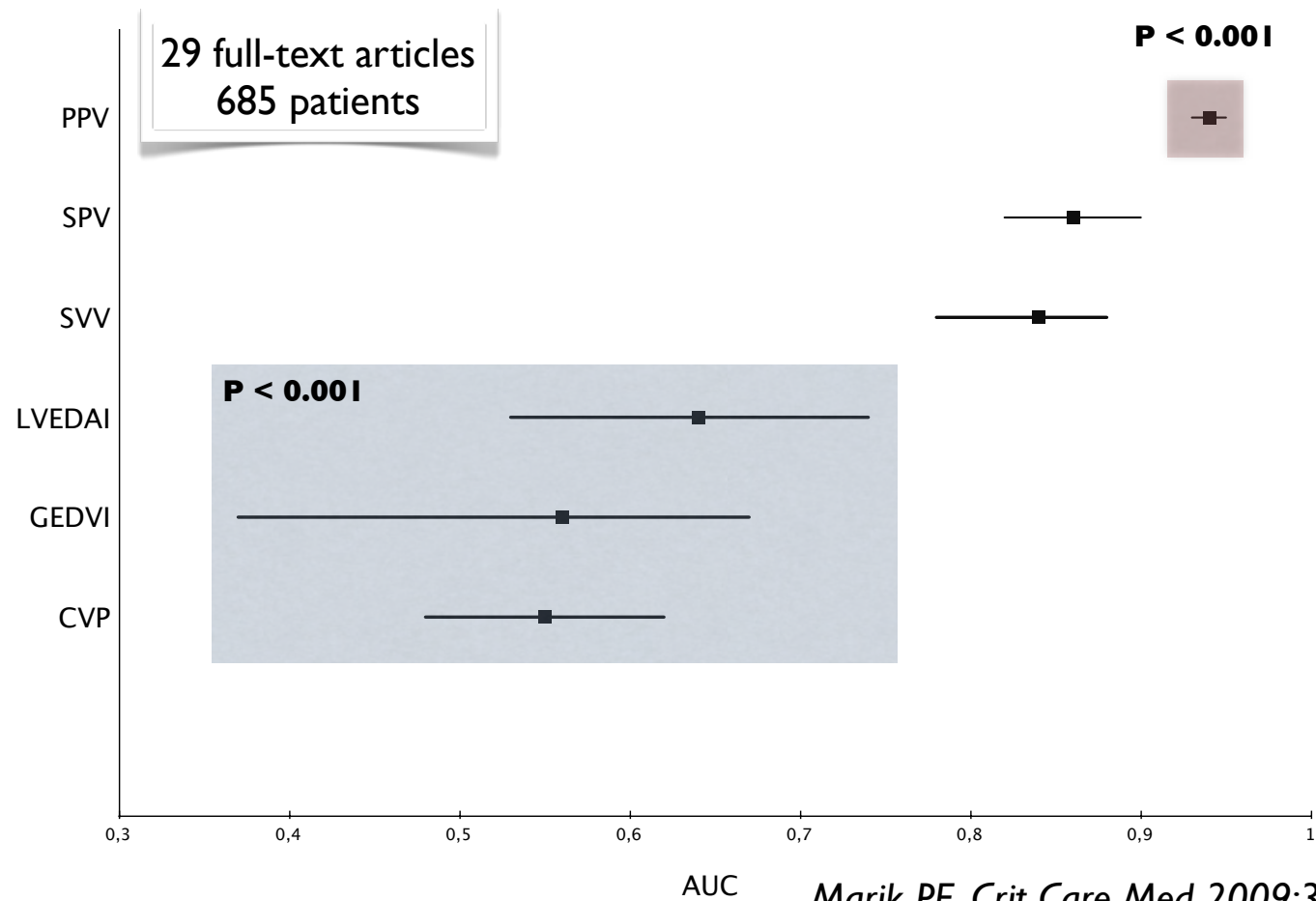




SP, PP en aorta stroom snelheid
maximaal aan einde inspiratie

SP, PP en aorta stroom snelheid
minimaal tijdens expiratie

Arterial waveform derived variables

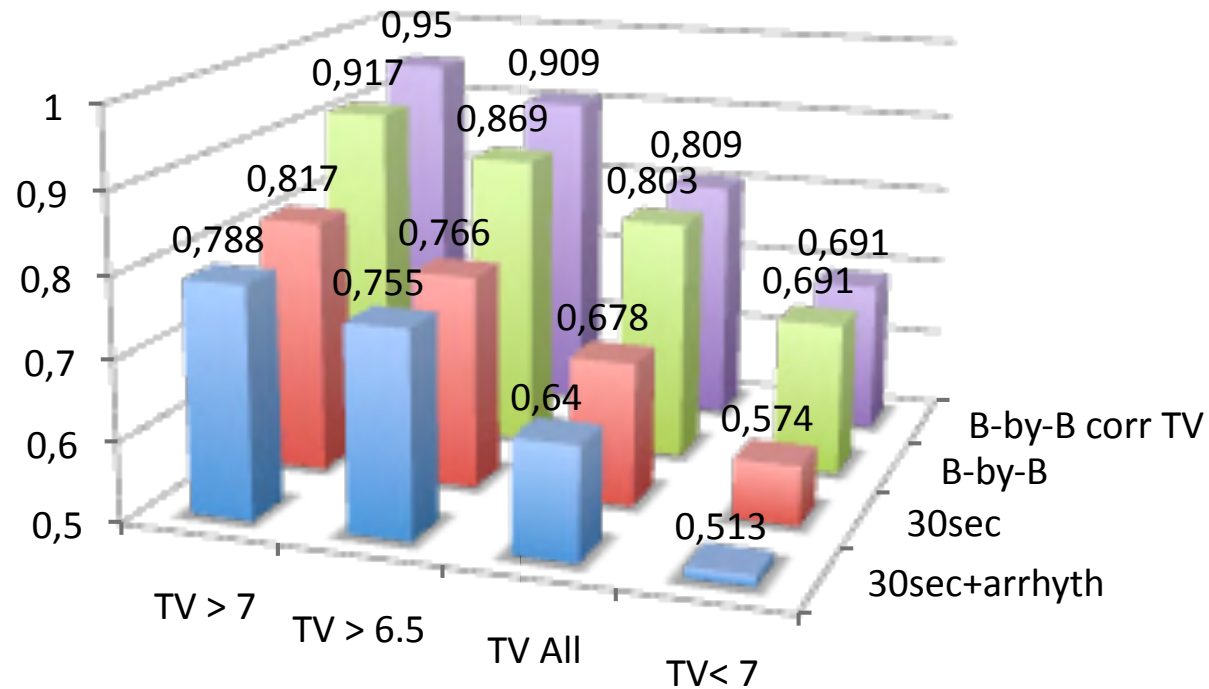


Important conditions

- Passive mechanical ventilation
- Tidal volume ≥ 8 ml/kg
- No arrhythmia's
- No pulmonary hypertension
- No right ventricular failure

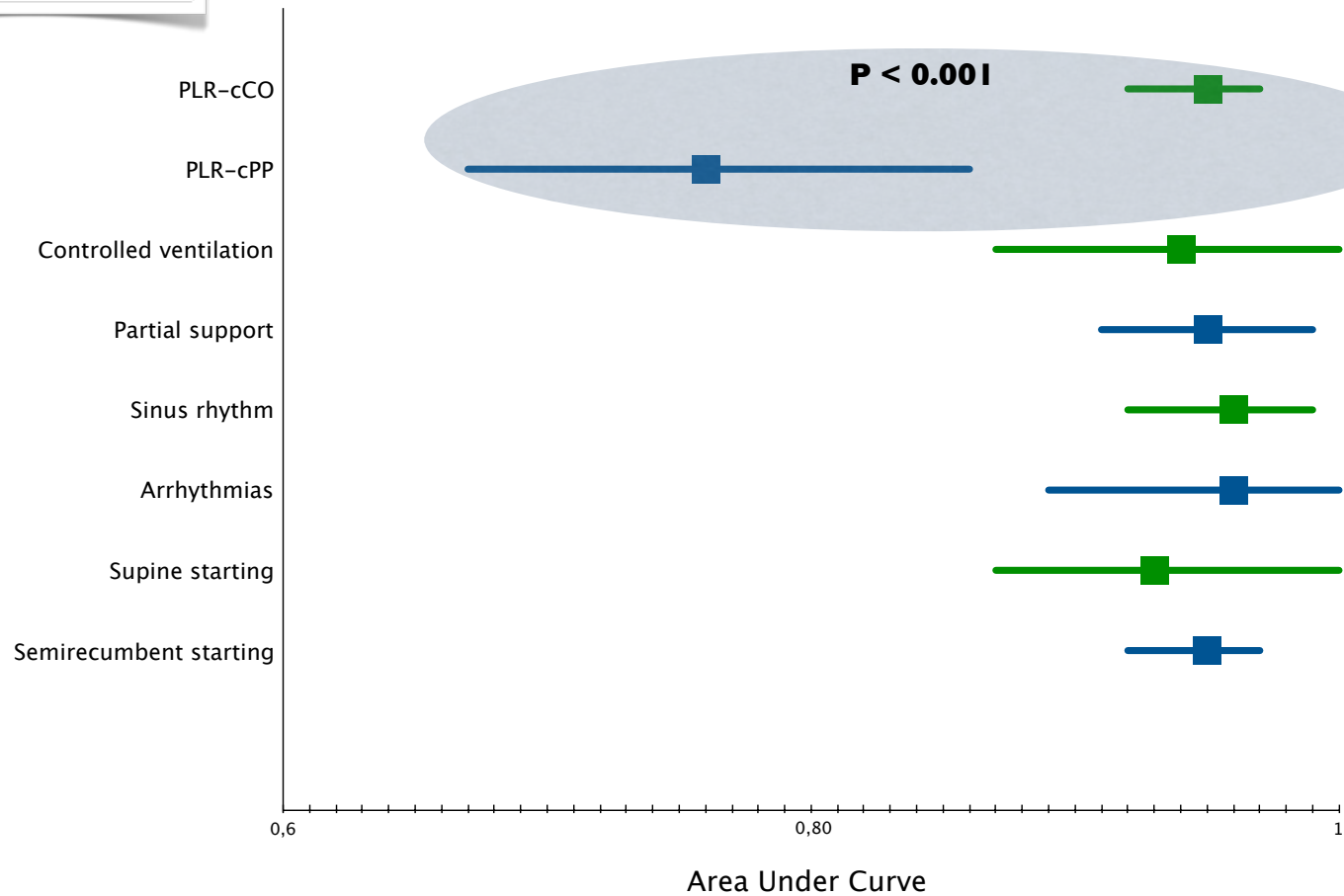
Important conditions

Area under ROC curve PPV

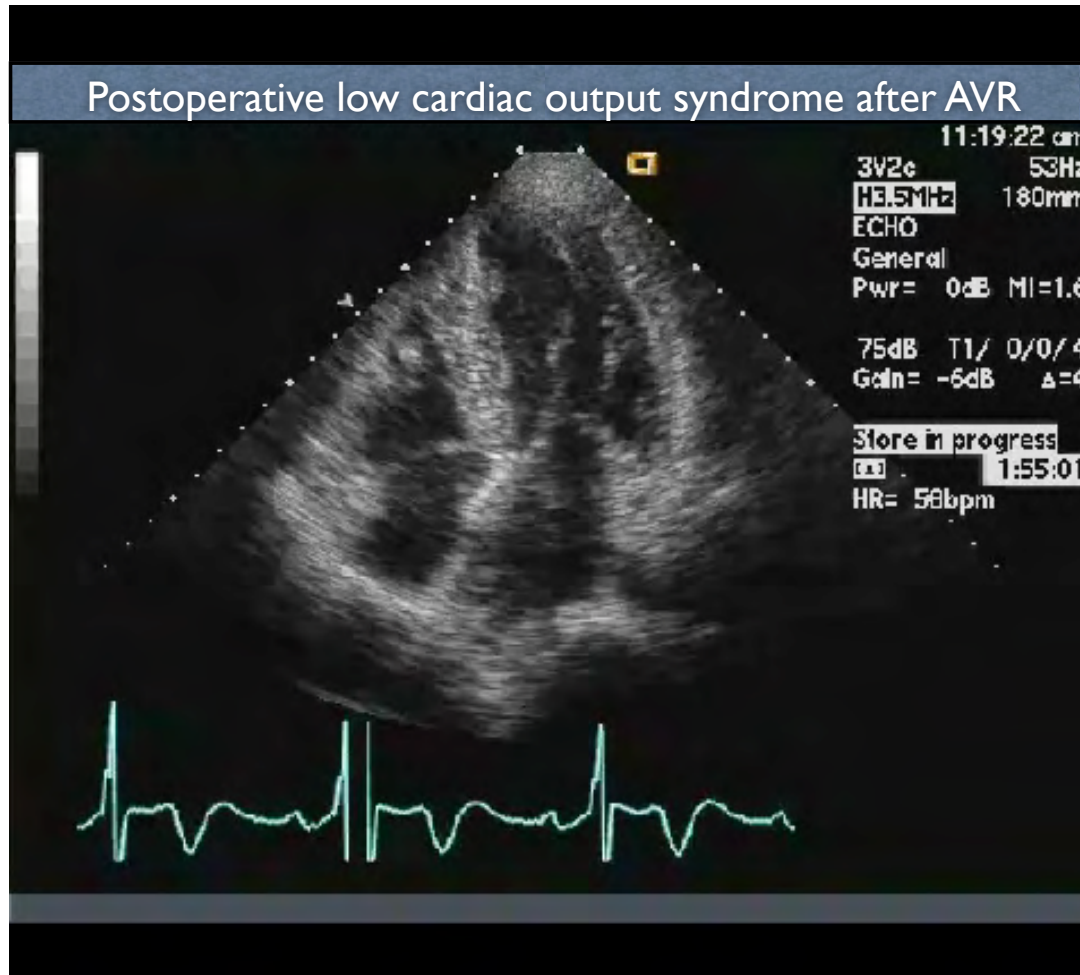


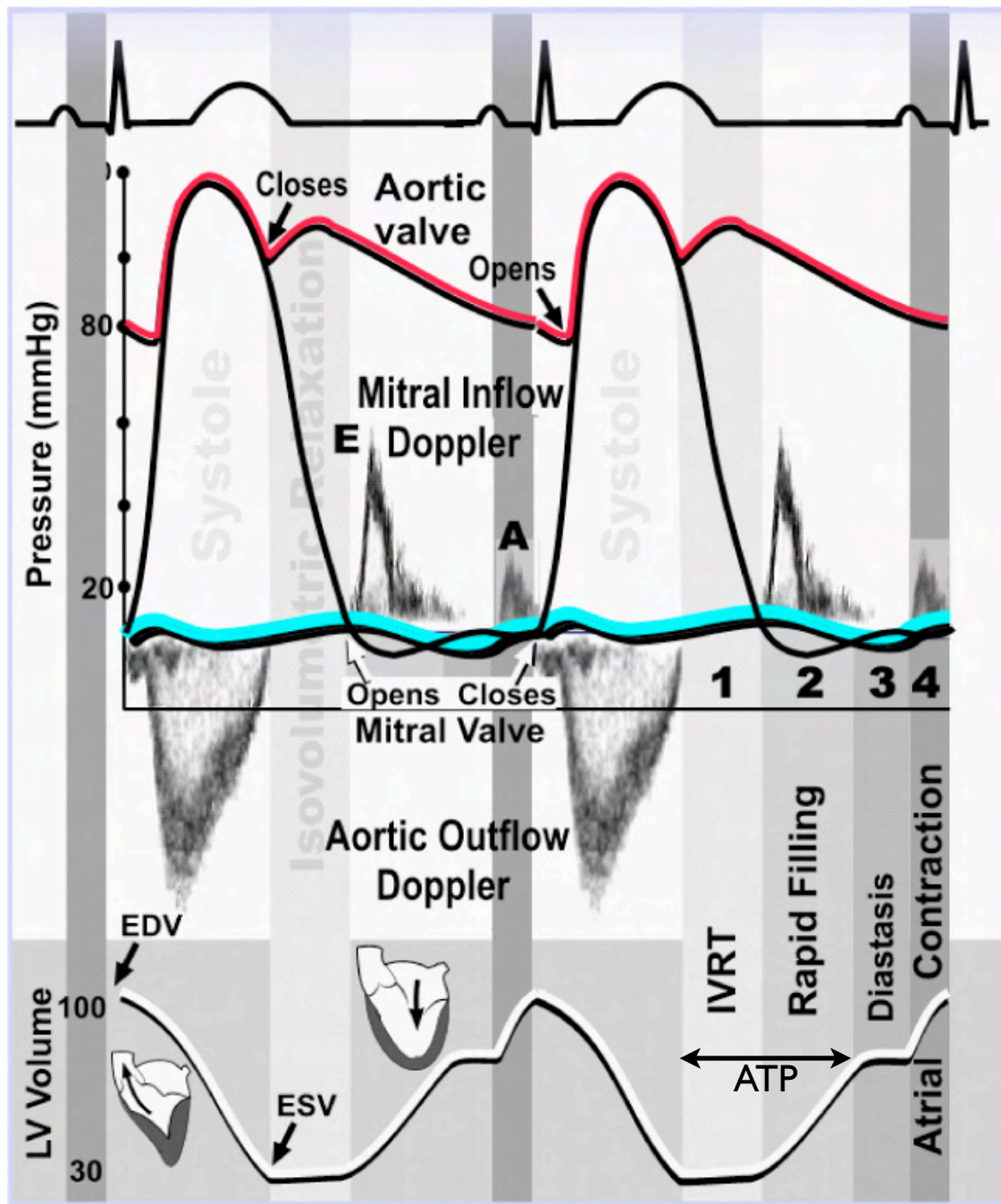
Predictive value of PLR test

9 full-text articles
353 patients



Postoperative low cardiac output syndrome after AVR





20 - 50% of LV filling

Diastolische dysfunctie

- Ischemie en sepsis
- Boezemfibrilleren - bundeltakblok
- Linker ventrikel hypertrofie
- Afterload toename bij falend hart
- Inotropica

Behandeling

- Behouden van sinus ritme
- Preventie van ischemie
- Kleine vloeistofbolussen
- Tragere hartfrequentie (β -blokkade)
- Als inotropica nodig zijn: levosimendan of fosfodiësterase remmer