Mean systemic filling pressure

Intensive Care Training Program
Radboud University Medical Centre Nijmegen
MSFP = \frac{\text{Stressed volume}}{\text{Venous compliance}}

Venous return = \frac{\text{MSFP} - \text{RAP}}{\text{Venous resistance}}
Importance of (Un-) stressed volume

• Stressed volume determines MSFP and directly affects venous return and CO

• Normal MSFP is 7 - 12 mm Hg and with a CVP of 2 - 3 mm Hg, the gradient for VR is 5 - 10 mm Hg

• Unstressed volume is a blood reserve that can be mobilised (GI tract) when needed
Venous return

Right Atrial Pressure at which venous return stops is the Mean Systemic Filling Pressure (✪)
Measuring MSFP

- During circulation arrest
- Alternative methods
Aortic pressure \( (t) = P_{\text{rel}} + (P_i - P_{\text{ref}}) e^{\frac{-t}{11}} \)
Estimation of MSFP

Cardiac output (l/min) vs. Central Venous Pressure (mm Hg)

Inspiratory hold (cm H$_2$O) for 12 seconds
Maas JJ. Intensive Care Med 2012;38:1452-1460
Estimating MSFP

Maas JJ. Intensive Care Med 2012;38:1452-1460
During MV

MSFP = \frac{\text{Stressed volume}}{\text{Venous compliance}}

\text{Venous return} = \frac{\text{MSFP} - \text{RAP}}{\text{Venous resistance}}
Thesis J. Maas

- Arm occlusion pressure predicts fluid responsiveness
- Existence of vascular waterfall phenomenon
- Measurement of stressed volume
- Effects of dobutamine and norepinephrine
Waterfall phenomenon

![Graph showing CO (L/min) vs. Pcv and Pa (mmHg) with points labeled Pmsf and Pcc, and curves labeled Venous Return and Ventricular Output.]}
Stressed volume

\[ C_{sys} = \frac{\Delta V}{\Delta P_{msf}} \]

\[ V_u \quad V_s \quad V \]

\[ -1500 \quad -1250 \quad -1000 \quad -750 \quad -500 \quad 0 \quad 250 \quad 500 \]

\[ P_{msf} \text{ (mmHg)} \]
Effect of NE

Increase CO

Decrease CO

A

VR and CO [l/min]

Pcv [mmHg]

B

VR and CO [l/min]

Pcv [mmHg]