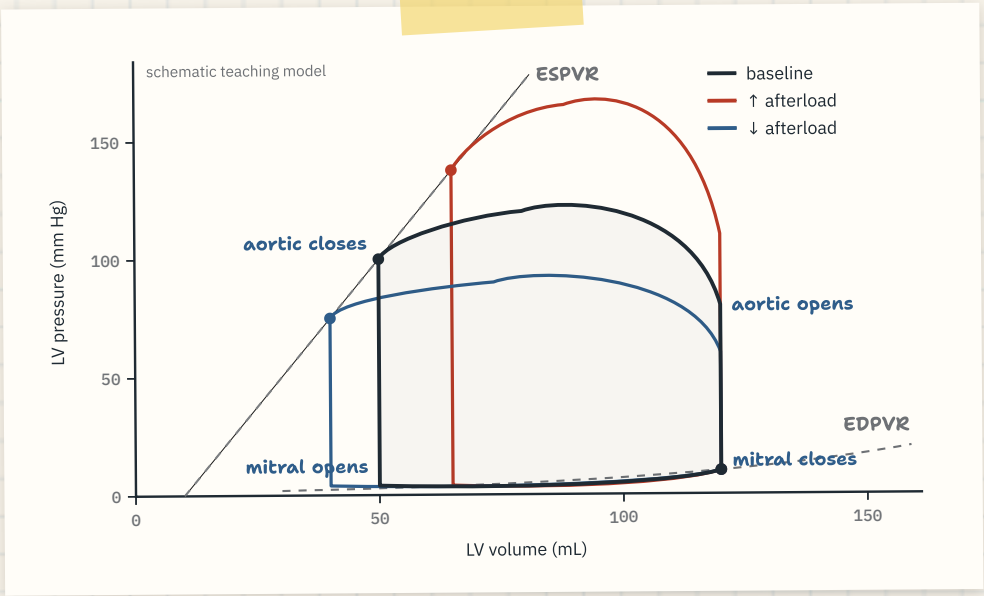
Afterload on the PV loop

The Ea line slides the end-systolic point along a fixed ESPVR



Step by step

1. Afterload = load against ejection; wall stress σ ∝ P × r / h
2. Draw Ea from EDV on the volume axis to the end-systolic corner
3. Ejection ends where Ea meets the ESPVR
4. ↑ Afterload: Ea steeper → point up and right → ↑ ESV, ↓ SV
5. ↓ Afterload: Ea flatter → point down and left → ↓ ESV, ↑ SV

Loop	ESV	SV	EF
Baseline	50 mL	70 mL	≈ 58%
↑ Afterload	≈ 65 mL	≈ 55 mL	≈ 46%
↓ Afterload	≈ 40 mL	≈ 80 mL	≈ 67%

Fixed EDV 120 mL (teaching model)

ARTERIAL ELASTANCE

Ea = Pes / SV

Line from (EDV, 0) to the end-systolic corner; set mostly by peripheral resistance and heart rate.

Taller and narrower

More afterload: more pressure, less blood out.

Afterload slides along the ESPVR; it does not move it (idealised model).

Exam traps

- Afterload is not simply blood pressure; arterial pressure is only the bedside estimate.
- If EDV moved, it is preload, not afterload.
- Smaller ESV at a higher end-systolic pressure on a steeper ESPVR is more contractility, not less afterload.
- In vivo, EDV creeps up and partly rescues SV; in heart failure afterload matters much more.

Afterload on the pressure-volume loop

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/cardiovascular/afterload-pressure-volume-loop

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