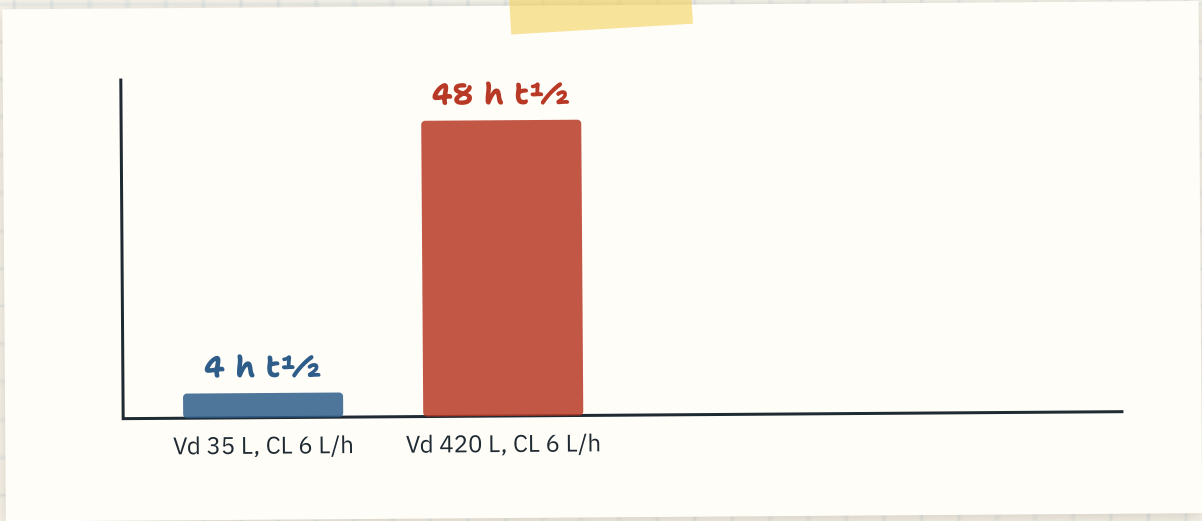
Clearance and half-life

Half-life sets the clock for steady state



Step by step

1. Elimination rate = CL × concentration
2. Bigger Vd or lower CL: longer half-life
3. Steady state: about 4–5 half-lives
4. Washout: the same 4–5 half-lives

HALF-LIFE

$$t1/2 = 0.693 \times Vd / CL$$

0.693 = ln 2; k = CL / Vd, so t1/2 = 0.693 / k

Half-lives	Gap closed
1	50%
2	75%
3	87.5%
4	93.75%
5	about 97%

Gap closed after n half-lives

Rule of thumb

Double Vd or halve CL: half-life doubles

Dose sets the level, not the time

Exam traps

- Half-life is not a measure of clearance.
- A bigger dose does not shorten the time to steady state.
- Steady state and washout both take about four to five half-lives.

Clearance and half-life: t½ = 0.693 × Vd / CL

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/pharmacology-principles-autonomic/clearance-half-life-steady-state

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