

Exercise walk-through

11.4

Cardiovascular and renal drugs

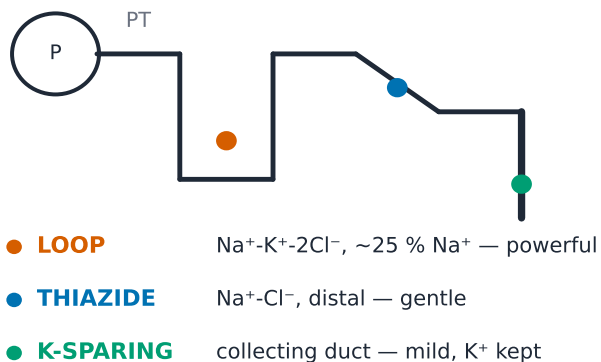
University Medicine

Cardiovascular and renal drugs: named steps

- 1 Pressure** Diuretics (volume) · ACE inhibitors (bradykinin cough) · ARBs · CCBs · β_1 blockers.
- 2 Nephron** Loop $\text{Na}^+ - \text{K}^+ - 2\text{Cl}^-$ (~25 % Na^+) · thiazide distal · K-sparing collecting duct - electrolytes follow the site.
- 3 Clotting** Heparin immediate (aPTT); warfarin blocks NEW factor carboxylation (INR, days); DOACs one factor, unmonitored.

Diuretic action sites on the nephron

three diuretic sites down the nephron — the fraction of Na^+ falls as you go



anticoagulants — mechanism sets the monitor

heparin: immediate, IV — aPTT

warfarin: blocks vitamin-K factor CARBOXYLATION — stored factors must decay first; INR, days to onset

direct oral anticoagulants: one factor (Xa or thrombin), predictable kinetics, mostly unmonitored

ACE inhibitor cough = bradykinin not degraded

Three **diuretic** sites down the nephron; the monitor follows the mechanism.

Exercises 2.1-2.3

2.1 Which antihypertensive class causes a dry bradykinin cough? [3]

2.2 Which nephron segment does the thiazide act on? [3]

2.3 Which test monitors warfarin? [3]

Exercises 2.1-2.3

2.1 Which antihypertensive class causes a dry bradykinin cough? [3]

2.1

- ACE inhibitors – bradykinin not degraded ✓.
-

2.2 Which nephron segment does the thiazide act on? [3]

2.2

- The distal convoluted tubule ($\text{Na}^+ \text{-} \text{Cl}^-$) ✓.
-

2.3 Which test monitors warfarin? [3]

2.3

- The INR (prothrombin effect, not dose) ✓.

Exercise 3.1

3.1 Three illustrative diuretics at their sites: loop, thiazide, K-sparing.

For each, state the transport target and rank the Na^+ effect (loop $\sim 25\%$ $>$ thiazide $>$ K-sparing) ✓. Predict the electrolyte fingerprint of the loop agent (K^+ loss, Ca^{2+} loss via downstream flow) versus the K-sparing agent (K^+ retained) ✓. [8]

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3.1

- Loop: $\text{Na}^+ - \text{K}^+ - 2\text{Cl}^-$ in the thick ascending limb, $\sim 25\%$ of Na^+ – strongest ✓.
- Thiazide: $\text{Na}^+ - \text{Cl}^-$ distal – gentler ✓.
- K-sparing: collecting duct – mildest ✓.
- Loop fingerprint: K^+ and Ca^{2+} lost with the flow ✓.
- K-sparing: K^+ retained ✓.

Exercise 3.2

3.2 A fictional patient on warfarin starts an illustrative course of an enzyme-inhibiting antibiotic; a second starts an enzyme inducer.

Predict each INR direction (inhibitor $\rightarrow$ INR rises; inducer $\rightarrow$ INR falls) with the kinetic reason (substrate cleared slower vs faster) ✓. Explain why warfarin's onset lags days regardless (stored factors must decay; it blocks carboxylation of NEW factors) ✓. [7]

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3.2

- Inhibitor: warfarin cleared slower $\rightarrow$ INR rises ✓.
- Inducer: faster clearance $\rightarrow$ INR falls ✓.
- Onset lag: existing factors circulate until they decay – warfarin blocks only NEW synthesis ✓.
- Monitoring interval follows interaction risk ✓.