🩸 Direct Coagulation Factor Inhibitors (DOACs)

🔑 Key Concept

- Directly inhibit specific clotting factors (IIa or Xa)
- Predictable effect → NO routine lab monitoring needed ❗
- Rapid onset + oral options available 💊

💡 Core Mechanism (Big Picture)

These drugs block the final steps of the coagulation cascade → prevent fibrin clot formation

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🔄 Flowchart: Where DOACs Act

Coagulation cascade → Factor Xa converts prothrombin to thrombin → Thrombin converts fibrinogen to fibrin clot

DOACs → Block Xa OR thrombin → ↓ fibrin formation → Anticoagulation 💀

📊 Master Table

Class	Drugs	Mechanism	Clinical Use	Adverse Effects
Direct thrombin (IIa) inhibitors	Dabigatran, Argatroban, Bivalirudin	Inhibit thrombin	DVT, AF, HIT	Bleeding
Factor Xa inhibitors	Apixaban, Rivaroxaban, Edoxaban	Inhibit factor Xa	DVT, PE, AF	Bleeding

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🧪 Drug-by-Drug Notes

1️⃣ Direct Thrombin (Factor IIa) Inhibitors

(Dabigatran, Argatroban, Bivalirudin)

💡 Mechanism

- Directly inhibit thrombin (Factor IIa) → Prevents fibrin formation

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🔄 Flowchart: Thrombin Inhibition

Thrombin (IIa) → Converts fibrinogen → fibrin → Clot formation

Thrombin inhibitor → Blocks thrombin → No fibrin formation → Anticoagulation

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📌 Clinical Uses

- DVT / PE treatment & prevention 🎯
- Atrial fibrillation (stroke prevention)
- HIT (important use ⚠️) → Use argatroban or bivalirudin

❗ Adverse Effects

- Bleeding 🩸

🛡️ Reversal

- Dabigatran → Idarucizumab (specific antidote)

🎯 Exam Pearls

- Used when heparin is contraindicated (HIT)
- Dabigatran = oral, others often IV

2️⃣ Factor Xa Inhibitors

(Apixaban, Rivaroxaban, Edoxaban)

💡 Mechanism

- Directly inhibit Factor Xa → Prevent conversion of prothrombin to thrombin

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🔄 Flowchart: Xa Inhibition

Factor Xa → Converts prothrombin to thrombin → Thrombin → fibrinogen to fibrin

Xa inhibitor → Blocks Xa → ↓ thrombin → ↓ fibrin → Anticoagulation

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📌 Clinical Uses

- DVT / PE treatment & prophylaxis 🎯

- Stroke prevention in atrial fibrillation

❗ Adverse Effects

- Bleeding 🩸

🛡️ Reversal

- Andexanet alfa (Xa inhibitor antidote)

🎯 Exam Pearls

- "Xaban = Xa BAN" 🧠
- Oral agents → commonly used outpatient

🔥 Comparison Table

Feature	Thrombin Inhibitors	Xa Inhibitors

Target	Factor IIa	Factor Xa
Drugs	Dabigatran, Argatroban	Apixaban, Rivaroxaban
HIT use	✅ Yes	❌ No (generally not first-line)
Reversal	Idarucizumab	Andexanet alfa

⚖️ DOACs vs Heparin vs Warfarin

Feature	DOACs	Heparin	Warfarin
Monitoring	❌ None	PTT	PT/INR
Onset	Rapid ⚡	Rapid	Slow
Route	Oral (mostly)	IV/SC	Oral

HIT risk	❌ None	✅ Yes	❌ No

🎯 Must-Know Points

- DOACs = direct factor inhibitors (IIa or Xa)
- No routine monitoring required
- Dabigatran → thrombin inhibitor → reversed by idarucizumab
- Apixaban/Rivaroxaban → Xa inhibitors → reversed by andexanet alfa
- Argatroban/bivalirudin → used in HIT

🧠 Quick Recall

Anticoagulants → DOACs: Thrombin inhibitors (dabigatran) - or - Xa inhibitors (xaban drugs)

→ Effects → ↓ fibrin formation

→ Advantages → No monitoring + Rapid action

→ Risks → Bleeding

🛑 Anticoagulation Reversal

🔑 Core Concept

Each anticoagulant has a specific reversal strategy →
Often tested in emergency bleeding scenarios 🚨

📊 Reversal Table

Anticoagulant	Reversal Agent	Key Mechanism
Heparin	Protamine sulfate	Binds and neutralizes heparin
Warfarin	Vitamin K ± FFP/PCC	Restores clotting factors

Dabigatran	Idarucizumab	Monoclonal antibody fragment
Xa inhibitors	Andexanet alfa	Modified factor Xa decoy

🧪 Mechanisms Explained

1️⃣ Heparin → Protamine Sulfate

💡 Mechanism

- Protamine = positively charged peptide
- Heparin = negatively charged molecule

🔄 Flowchart: Heparin Reversal

Heparin (negative charge) → Causes anticoagulation

Protamine sulfate (positive charge) → Binds heparin → Forms inactive complex → Neutralizes effect 🛑

🎯 Exam Pearl

- Works immediately ⚡
- Used in heparin overdose or bleeding

2️⃣ Warfarin → Vitamin K ± FFP/PCC

💡 Mechanism

- Vitamin K restores γ-carboxylation of clotting factors

🔄 Flowchart: Warfarin Reversal

Warfarin → ↓ vitamin K activity → ↓ clotting factors → Reversal:

- Vitamin K → Restores synthesis (slow ⏳)
- FFP / PCC → Provides clotting factors directly → Rapid reversal ⚡

🎯 Exam Pearls

- Vitamin K = slow but definitive
- FFP/PCC = rapid emergency reversal

3️⃣ Dabigatran → Idarucizumab

💡 Mechanism

- Monoclonal antibody fragment (Fab) → Specifically binds dabigatran

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🔄 Flowchart

Dabigatran → Inhibits thrombin

Idarucizumab → Binds dabigatran → Inactivates drug → Restores coagulation

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🎯 Exam Pearl

- Highly specific antidote

4️⃣ Factor Xa Inhibitors → Andexanet Alfa

💡 Mechanism

- Modified inactive factor Xa ("decoy")

🔄 Flowchart

Xa inhibitor (e.g., apixaban) → Blocks factor Xa

Andexanet alfa → Acts as fake Xa → Drug binds decoy instead → Real Xa becomes active → Clotting restored

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🔥 Summary Table

Drug	Reversal	Speed
Heparin	Protamine	Rapid ⚡
Warfarin	Vitamin K	Slow ⏳
Warfarin (emergency)	FFP / PCC	Rapid ⚡
Dabigatran	Idarucizumab	Rapid ⚡
Xa inhibitors	Andexanet alfa	Rapid ⚡

🧠 Quick Recall

Anticoagulant bleeding → Identify drug:

- Heparin → Protamine
- Warfarin → Vitamin K ± FFP
- Dabigatran → Idarucizumab
- Xa inhibitors → Andexanet alfa

🎯 Exam Pearls

- Protamine = charge-based neutralization
- Vitamin K = slow reversal
- FFP/PCC = rapid clotting factor replacement
- Idarucizumab = dabigatran-specific
- Andexanet alfa = Xa decoy

-> The End <-