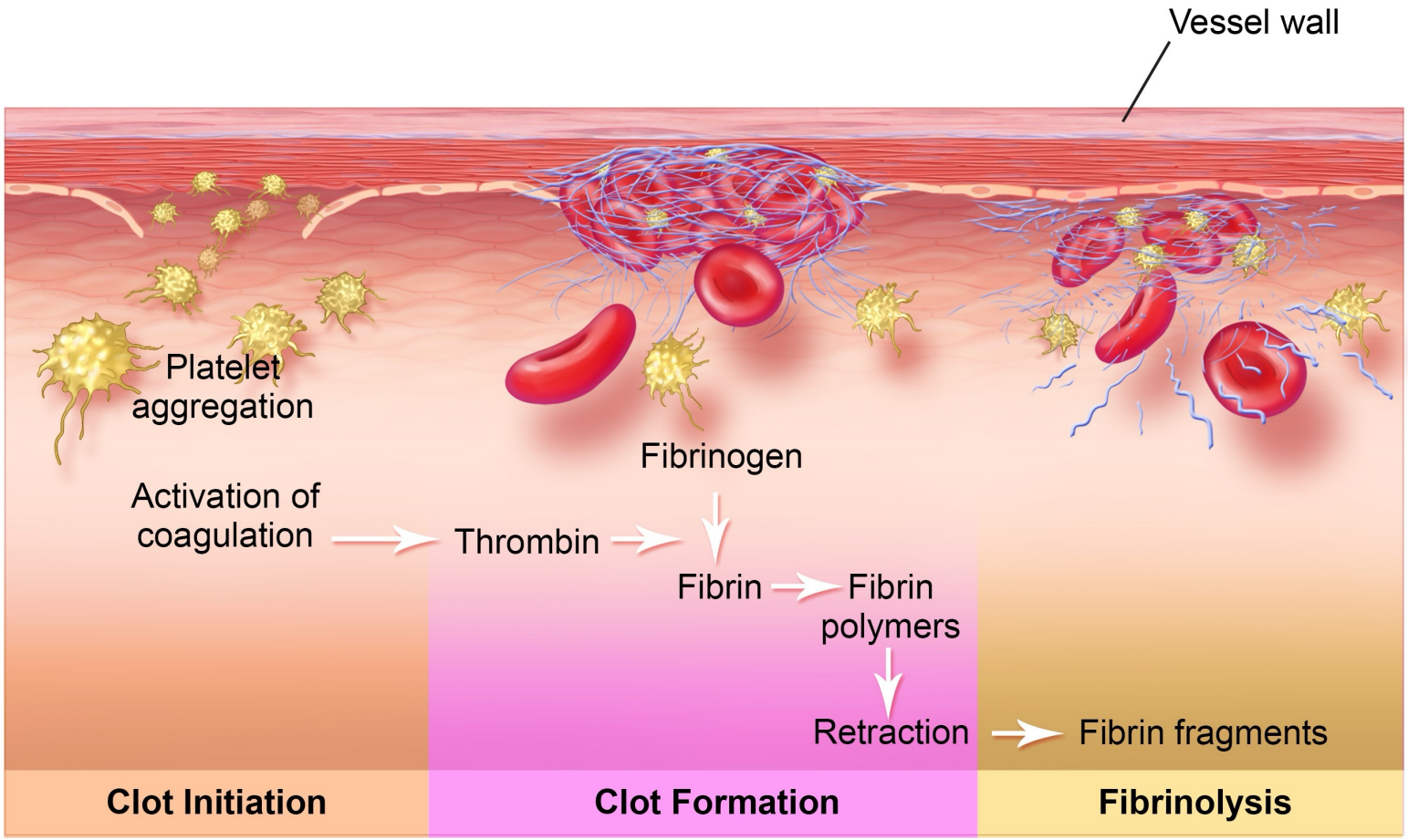
Vessel wall
Platelet aggregation
Fibrinogen
Activation of coagulation
Thrombin
Fibrin
Fibrin polymers
Retraction
Fibrin fragments
Clot Initiation
Clot Formation
Fibrinolysis

THIS IS WHY with Dr. Busti

THROMBOSIS
TYPES OF THROMBUS & CHARACTERISTICS

Characteristic	Arterial Thrombosis	Venous Thrombosis
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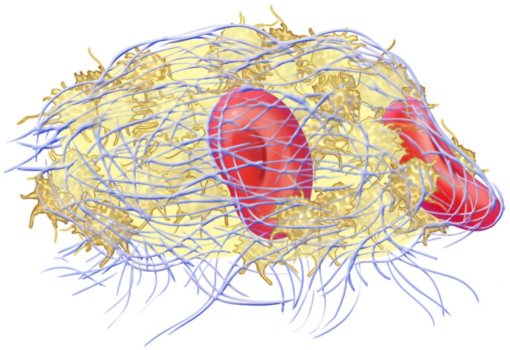
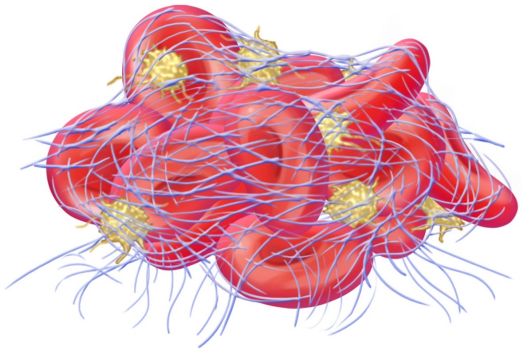
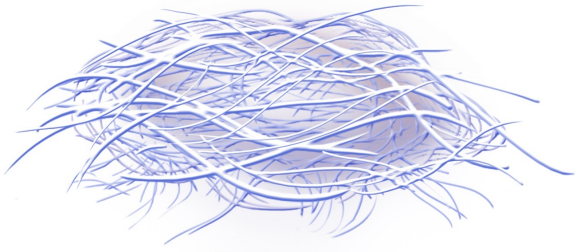
Red thrombus

White thrombus





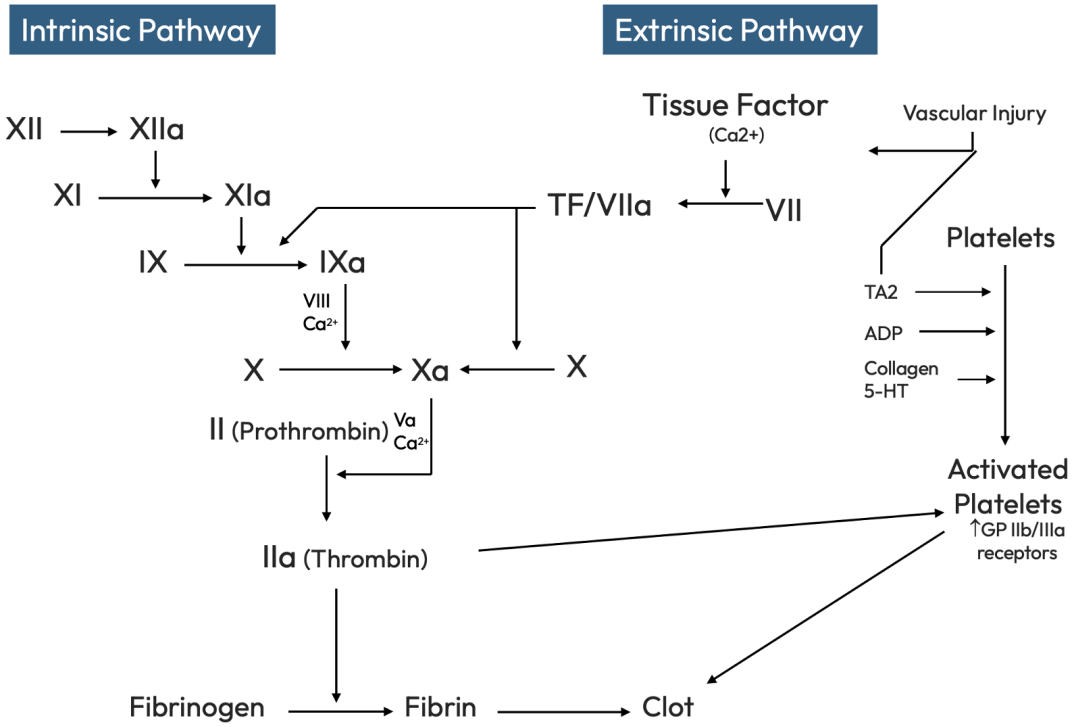
Fibrin deposits



THIS IS WHY with Dr. Busti

THROMBUS / CLOT FORMATION

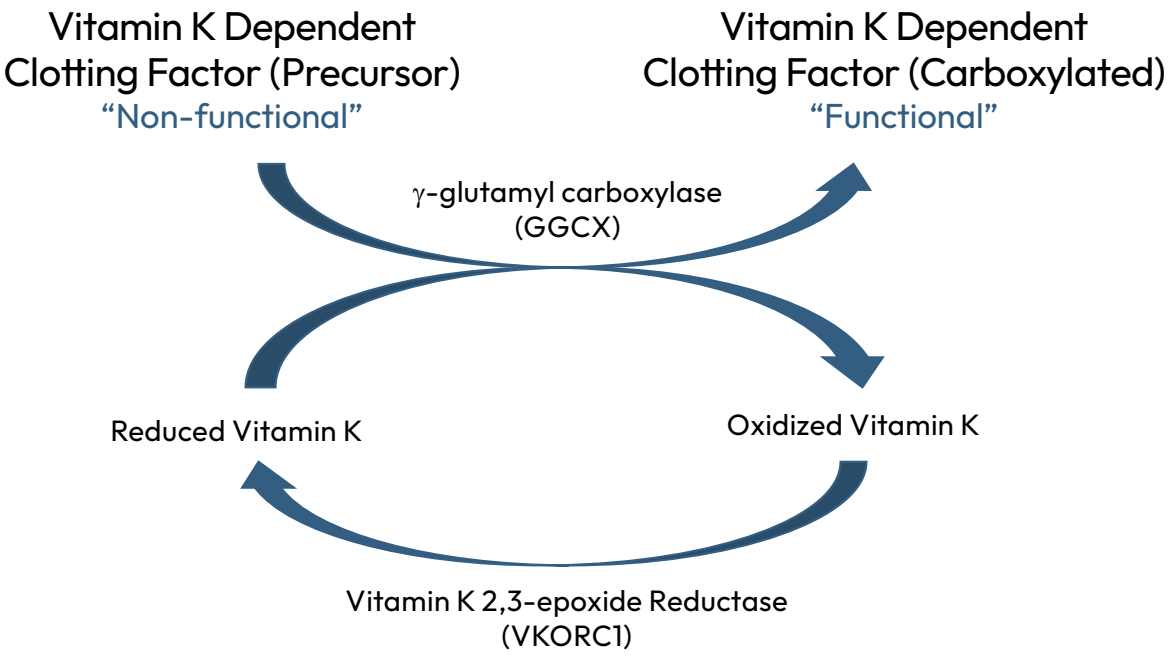
NORMAL PHYSIOLOGY



THIS IS WHY with Dr. Busti

CLOTTING FACTOR SYNTHESIS & ACTIVATION

NORMAL PHYSIOLOGY



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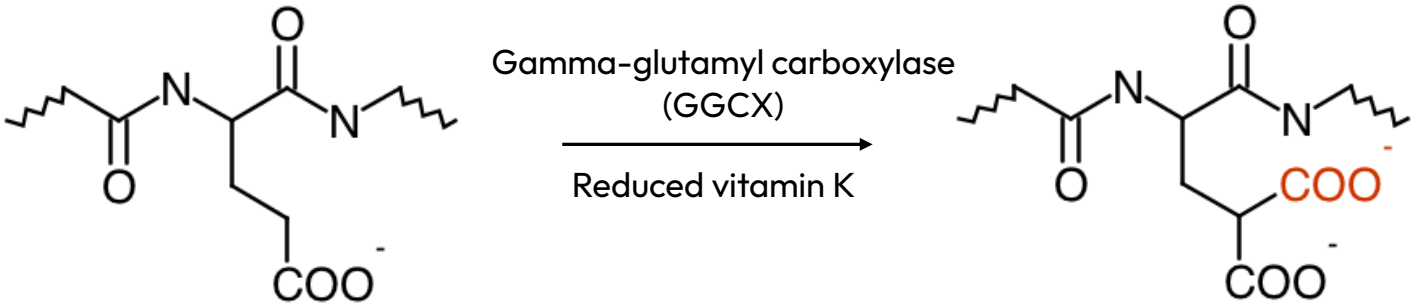
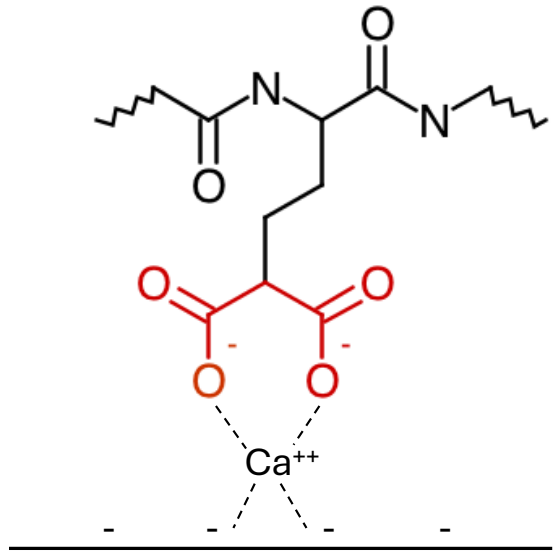
CLOTTING FACTOR ACTIVATION

NORMAL PHYSIOLOGY



CLOTTING FACTOR ACTIVATION & BINDING

NORMAL PHYSIOLOGY

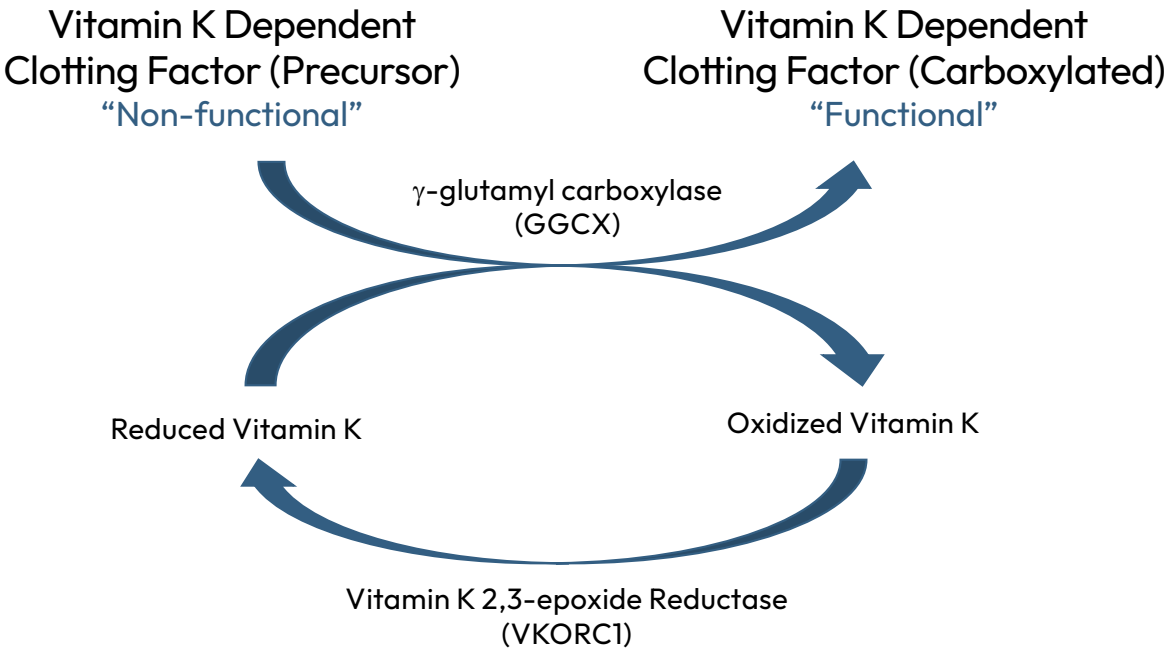


Membrane bilayer
(negatively charged undersurface)

THIS IS WHY with Dr. Busti

CLOTTING FACTOR SYNTHESIS & ACTIVATION

NORMAL PHYSIOLOGY



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THROMBUS / CLOT FORMATION

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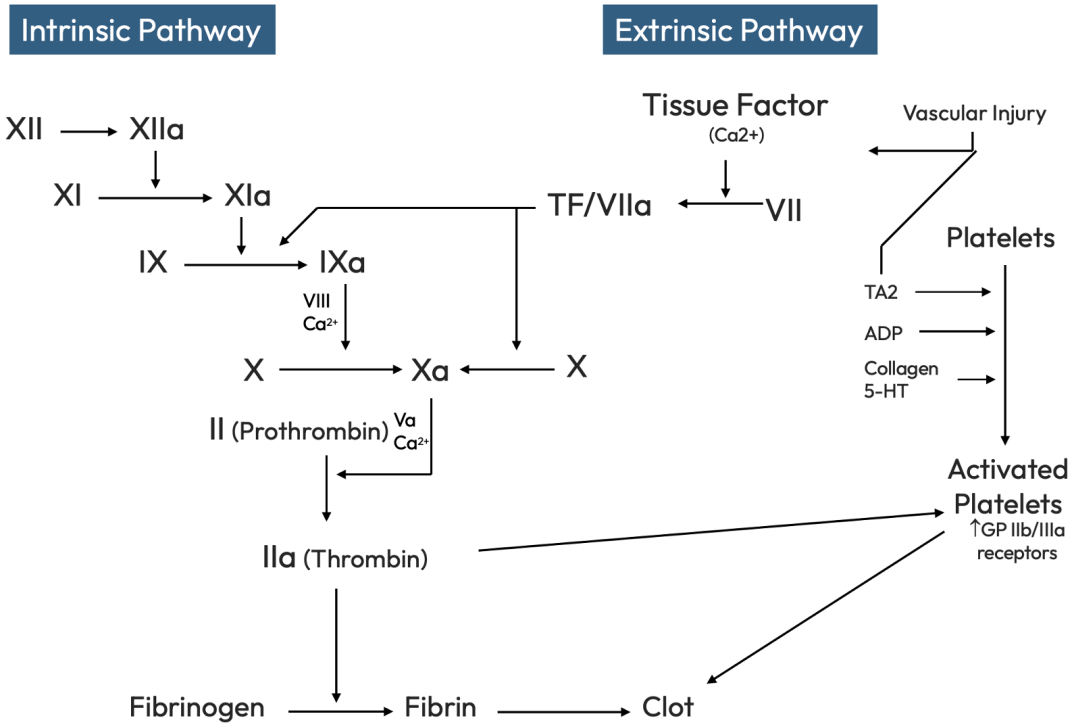
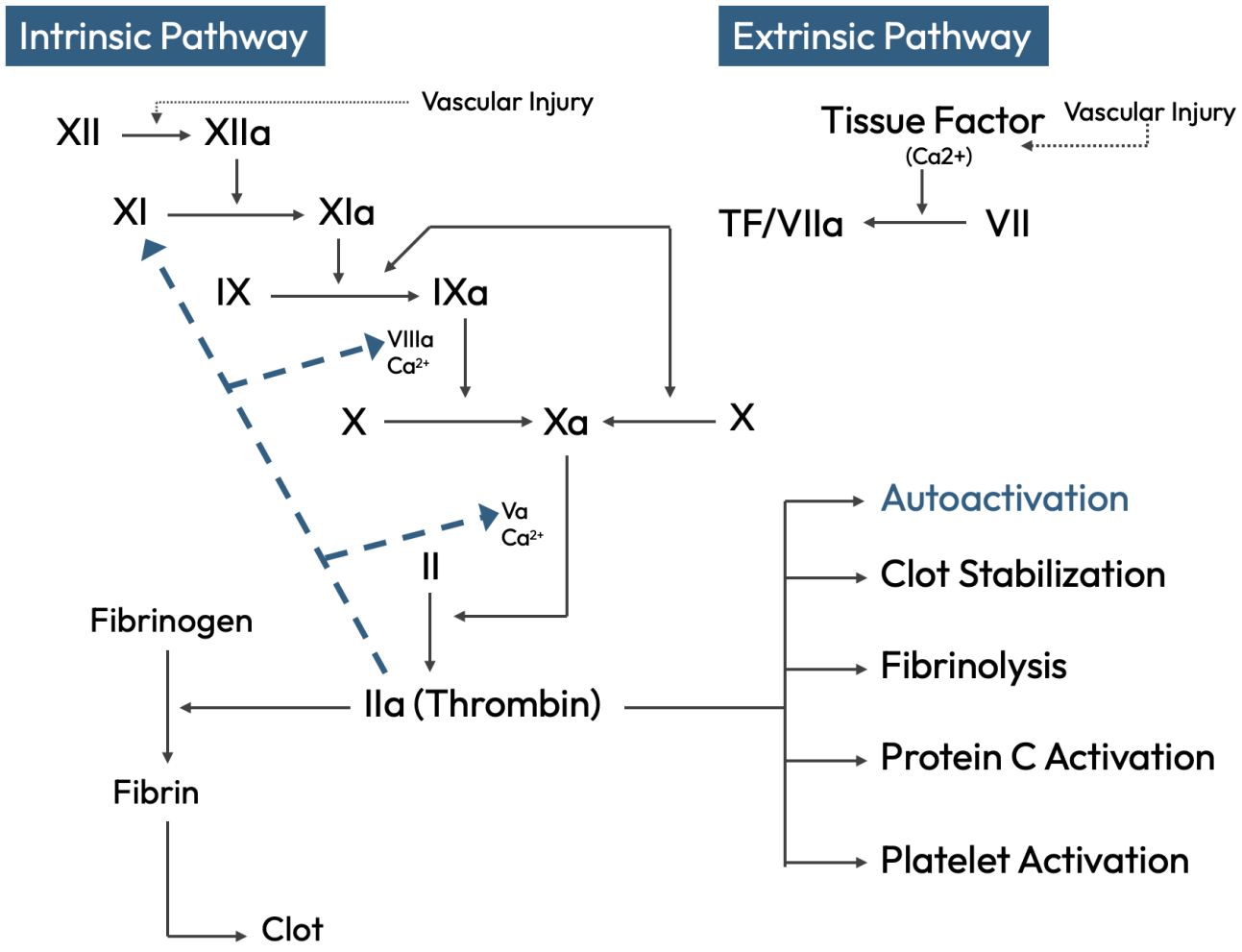
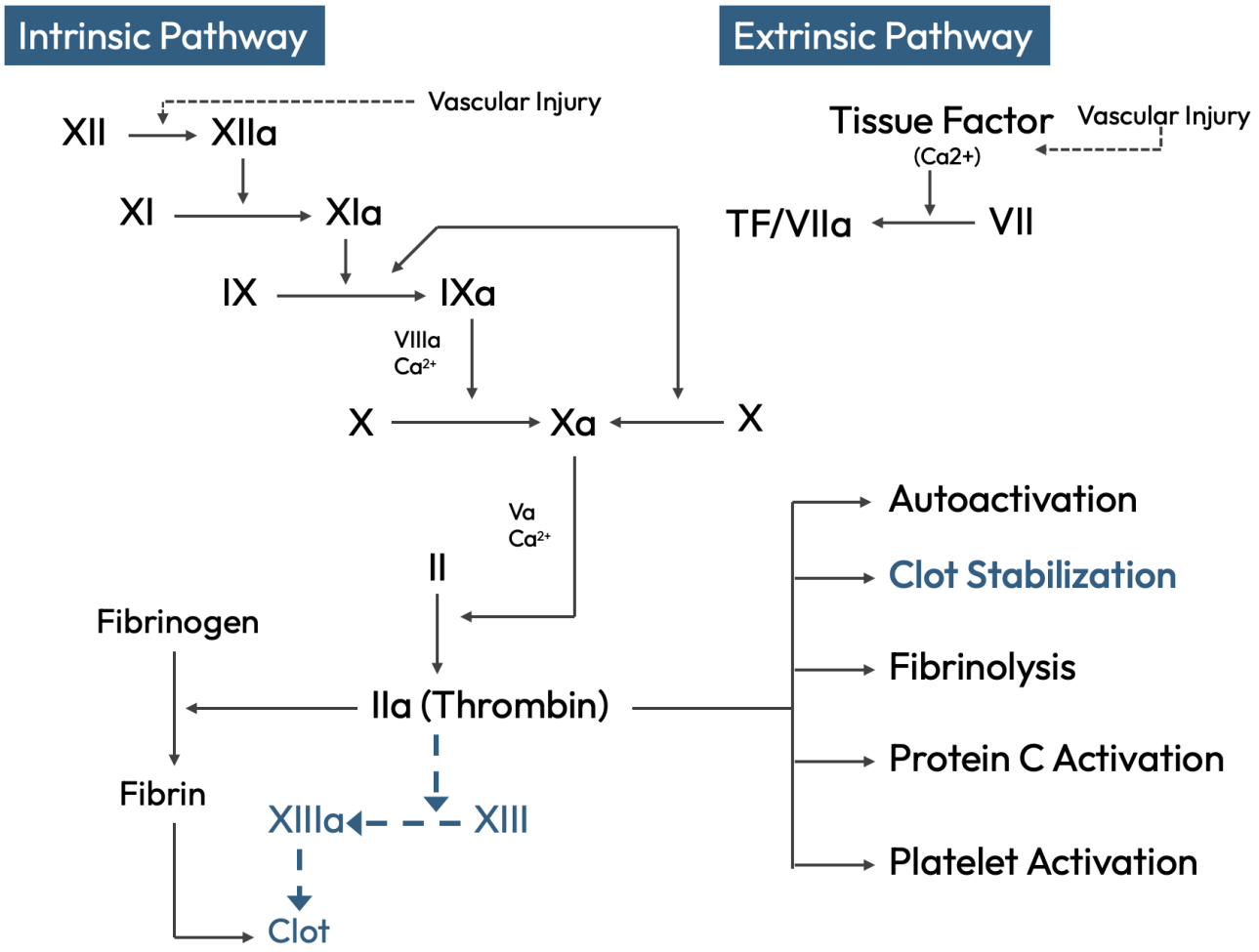



Intrinsic Pathway
Extrinsic Pathway
Vascular Injury
XII
XIIa
XI
XIa
IX
IXa
VIIIa
Ca2+
X
Xa
X
Va
Ca2+
II
Fibrinogen
IIa (Thrombin)
Fibrin
Clot
Tissue Factor
(Ca2+)
Vascular Injury
TF/VIIa
VII
Autoactivation
Clot Stabilization
Fibrinolysis
Protein C Activation
Platelet Activation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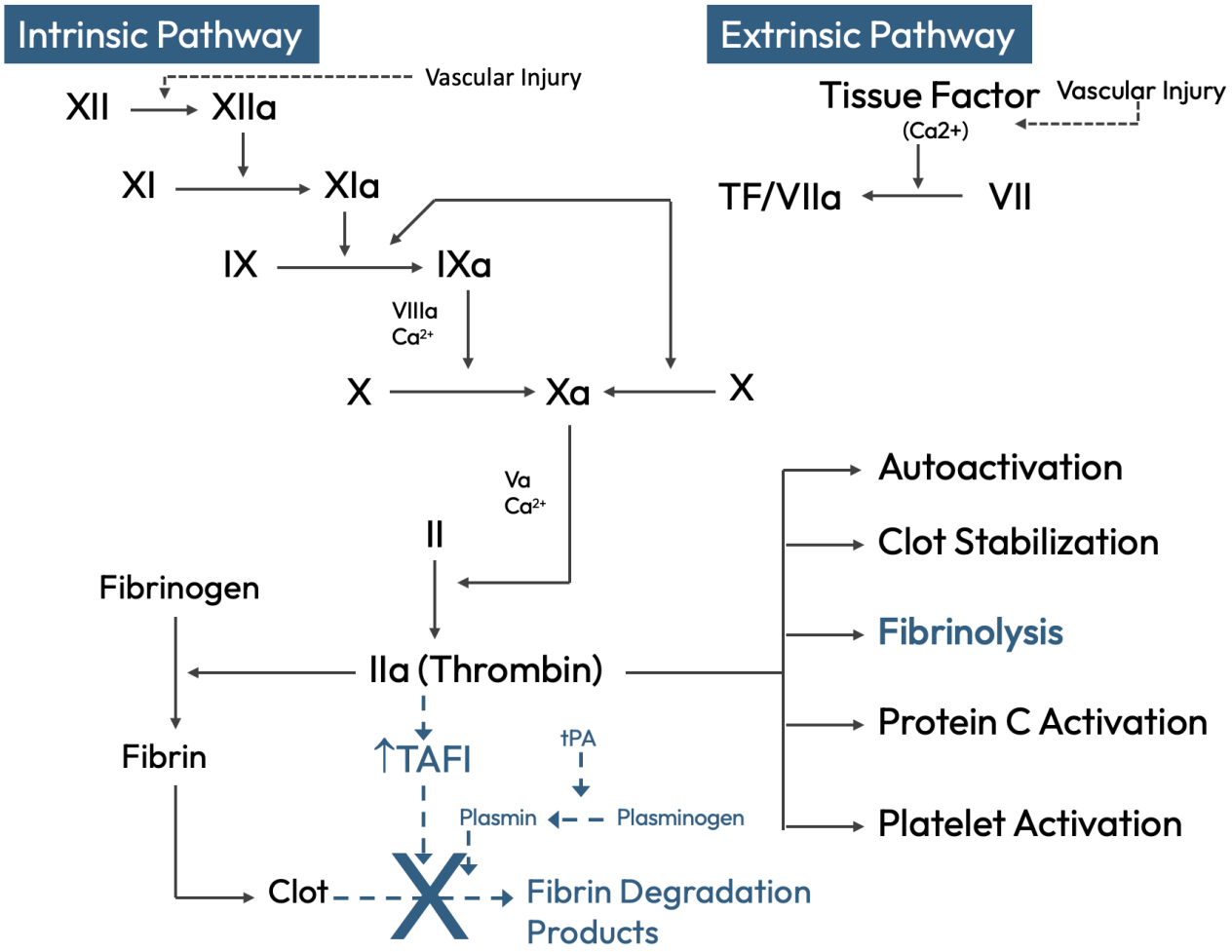
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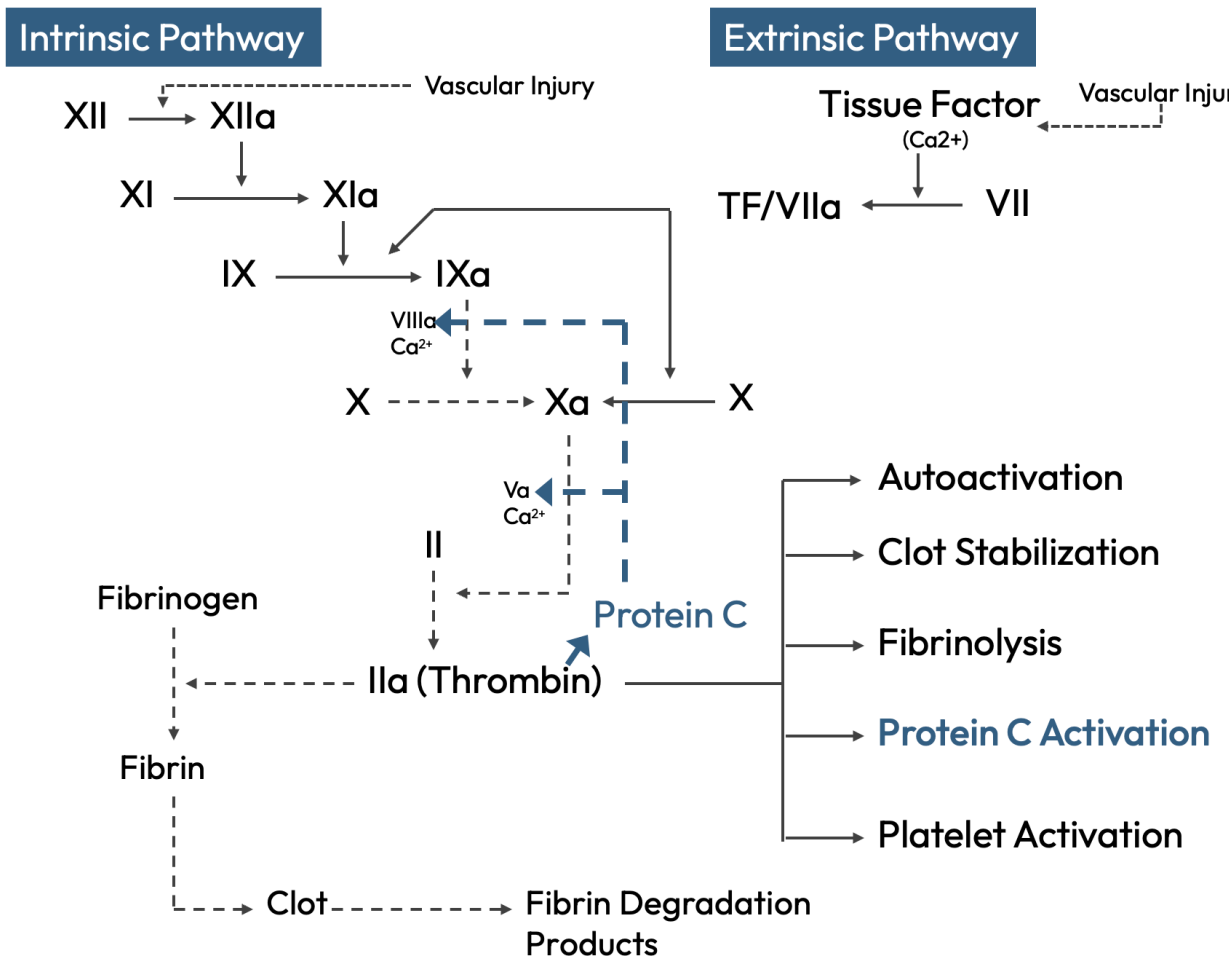
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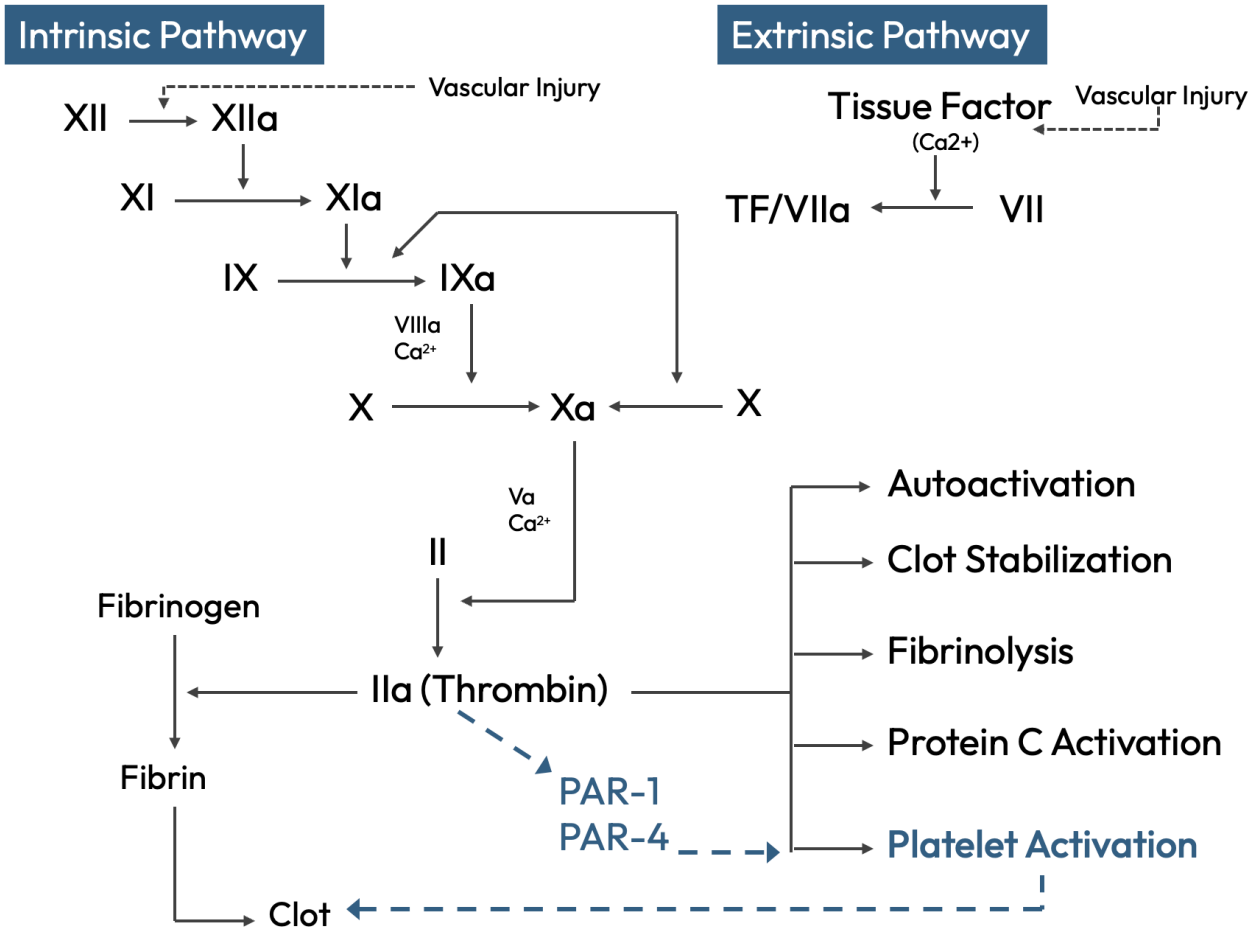
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PAR-1
PAR-4
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Protein C Activation
Platelet Activation

THIS IS WHY with Dr. Busti

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THIS IS WHY with Dr. Busti

COAGULATION DEFECTS CAUSING BLEEDING

Name of Defect	Defect/Deficiency	Treatment
East Texas Bleeding Disorder (ETBD)	Factor 5 & TAFI-alpha	▪ Tranexamic acid (works to prevent the breakdown of fibrin)
Hemophilia A	Factor VIII	▪ Cryoprecipitate (concentrated volume with Factor VIII, but also has fibrinogen (Factor I), Factor XIII, vWF, and Fibronectin) ▪ Uncomplicated bleed: 1 unit to ↑ levels by 15-20%. ▪ Extensive bleed: infusion to ↑ levels by 25-50%. ▪ Life-threatening bleed: 2 weeks of infusions to maintain levels at least 50% ▪ Mild hemophilia: desmopressin (DDAVP; Stimate Nasal Spray) which is known to increase vWF that increases Factor VIII and its duration.
Hemophilia B	Factor IX	▪ Fresh frozen plasma (contains: Fibrinogen, Factors II, V, VII, IX, X, protein C/S, and antithrombin).
Vitamin K Deficiency	Factors II, VII, IX & X	▪ Phytonadione (Vitamin K) 10 mg SC, IM, or IV. Given to newborns.
von Willebrand's disease	vWF	▪ More acute or severe situations: Factor VIII concentrate complexed to vWF (Humate-P); Desmopressin (DDAVP; Stimate Nasal Spray)

THIS IS WHY with Dr. Benoit

COMPARISON OF ANTICOAGULANTS BY DRUG CLASS

Variable	Warfarin	Unfractionated Heparin	Low Molecular Weight Heparin	Direct Xa Inhibitor	Direct Thrombin Inhibitor
Medications	**Coumadin, Jantoven**	**Heparin sodium**	**Dalteparin Enoxaparin**	**Fondaparinux Apixaban Edoxaban Rivaroxaban**	**Argatroban Bivalirudin Desirudin Dabigatran**
MW	308	3,000-30,000	2,000-10,000	1,728 / 435	500-7,000
Route Given	PO; IV (rare)	SC, IV	SC, IV	F: SUBQ; A/E/R: PO	SC, IV; D: PO
Mechanism of Action	Inhibits activation of II, VII, IX, & X	Binds to AT and inhibits factors Xa:IIa at 1:1 ratio	Binds to AT and inhibits factors Xa:IIa at >1:1 ratio	F: Binds to AT to inhibit factor Xa only; others bind directly to Xa	Directly inhibits factor II only
Needs Titration	Yes ++	Yes ++	No	+/-	No
Onset of Action	Delayed, 5-7 days	Acute; immediate	Acute; 1-2 hours	Acute; 1-2 hours	Acute; Immediate
Duration of Action	Days	IV: 2-3 hours	SC: 12 hours	24 hours	N/A; D: >12 hours
Affected by Food	Yes (Vit K containing)	No	No	No	N/A; D: Negligible
Monitoring	PT/INR	aPTT, anti-Xa, ACT	Anti-Xa levels	none	aPTT/ACT; D: None
Renal Adjustments	No	No	Yes	Yes	Yes
CYP450 Enzymes	2C9 >> 3A4	None	None	F: No, A/E/R: 3A4	None
Transporters	None	None	None	P-gp, +/- BCRP	P-gp
Precipitates Emboli	Yes (early on)	+/- (during HIT)	+/- (during HIT)	No	No
Cause HIT	No	Yes; 0.5-5%	Yes; 0.1-1.3%	F: -/+, A/E/R: No	No
Cross Placenta	Yes	No	No	Maybe	No
Antidote	Vitamin K, aPCC	Protamine, FFP	Protamine, FFP	aPCC	Idarucizumab, FFP