# Interpreting abnormal PT, aPTT times

From: Kamal et al. How to Interpret and Pursue an Abnormal Prothrombin Time, Activated Partial Thromboplastin Time, and Bleeding Time in Adults. Mayo Clinic Proc July 2007: 864-873

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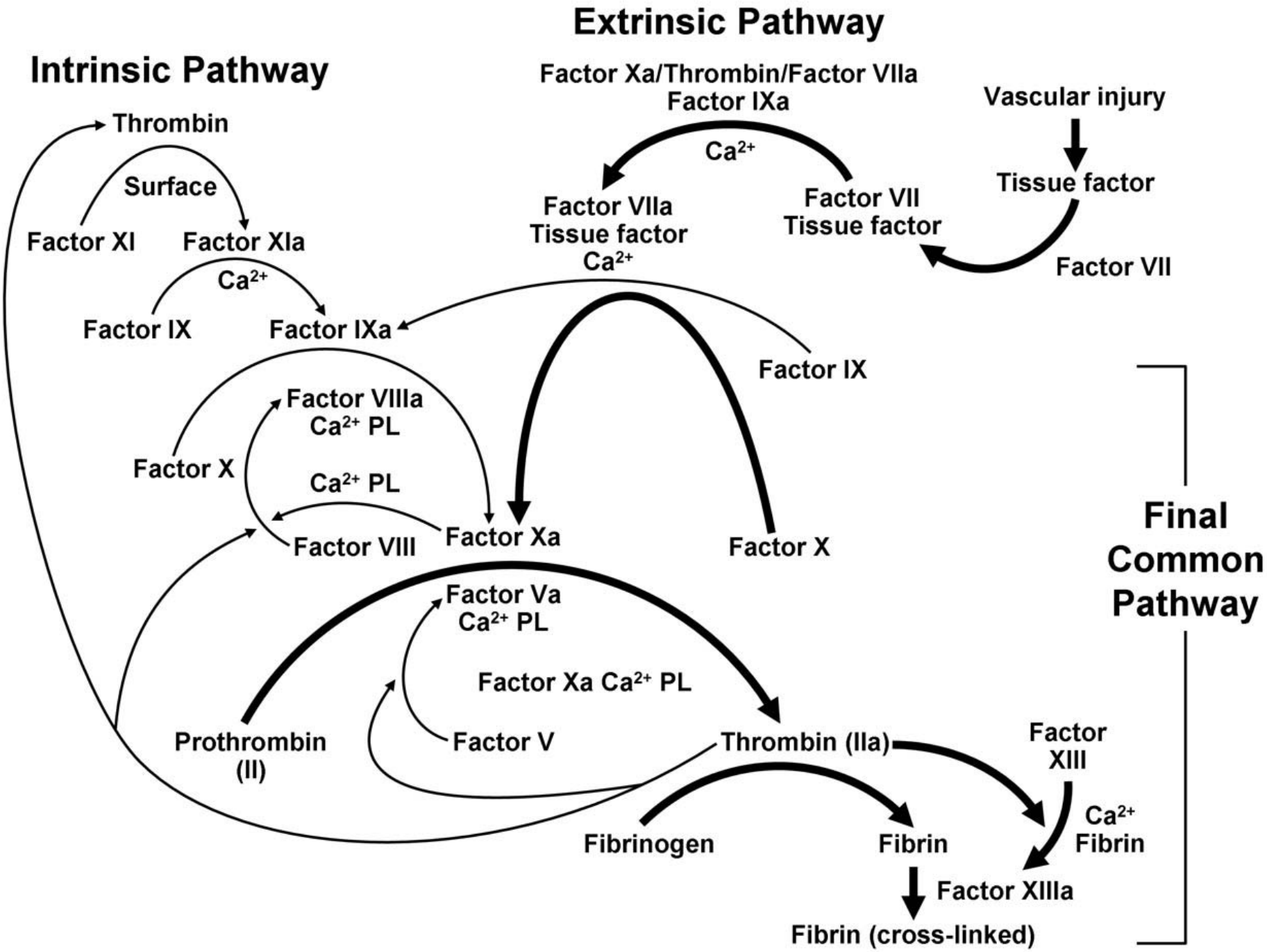

Extrinsic Pathway
Intrinsic Pathway
Factor Xa/Thrombin/Factor VIIa
Factor IXa
Vascular injury
Thrombin
Ca2+
Surface
Tissue factor
Factor VIIa
Tissue factor
Ca2+
Factor VII
Tissue factor
Factor XI
Factor XIa
Factor VII
Ca2+
Factor IX
Factor IXa
Factor IX
Factor VIIIa
Ca2+ PL
Factor X
Ca2+ PL
Factor VIII
Factor Xa
Factor X
Final
Common
Pathway
Factor Va
Ca2+ PL
Factor Xa Ca2+ PL
Prothrombin
(II)
Factor V
Thrombin (IIa)
Factor
XIII
Ca2+
Fibrin
Fibrinogen
Fibrin
Factor XIIIa
Fibrin (cross-linked)

# Screening tests for Hemostasis

- **PT (prothrombin time)**

-the measure of the integrity of the extrinsic and final common pathway

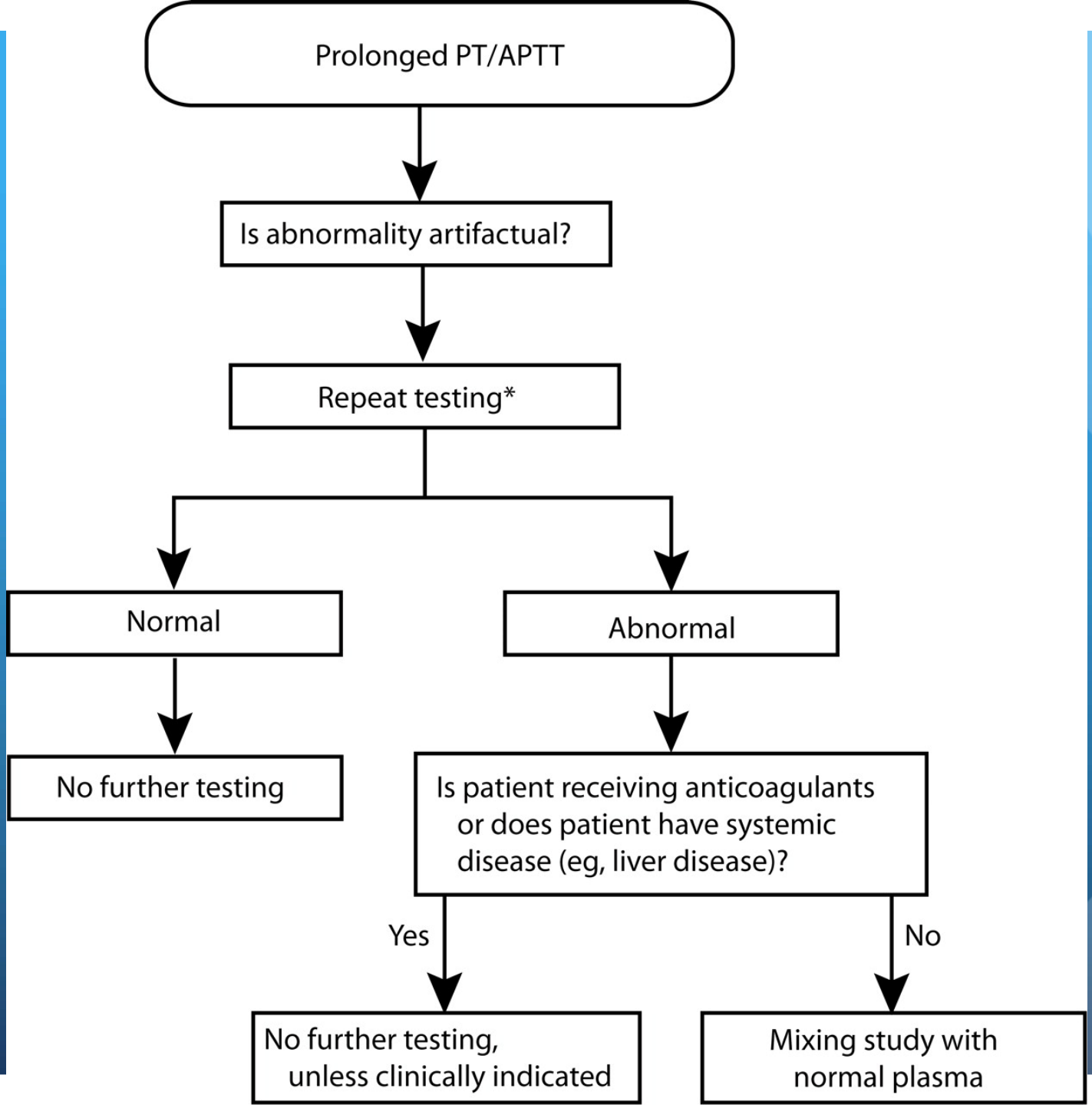
-INR (international normalized ratio) = patient's PT/ MNPT

- **aPTT (activated partial thromboplastin time)**

-measure of the integrity of the intrinsic and final common pathways of the coagulation cascade.

# Artificial abnormal results

- Patient's hematocrit
- Concentration of the citrate anticoagulant
- Fasting State of the patient
- Time interval between specimen collection and assay performance


Prolonged PT/APTT
Is abnormality artifactual?
Repeat testing*
Normal
Abnormal
No further testing
Is patient receiving anticoagulants or does patient have systemic disease (eg, liver disease)?
Yes
No
No further testing, unless clinically indicated
Mixing study with normal plasma

# Additional Studies

- Mixing studies
- Clotting factor assays
- Inhibitor assay

# Prolonged aPTT

- **aPTT corrects**

-Coagulation factor deficiency

-Factor VIII, IX, XI, or XII; high-molecular weight kininogen (HMWK); or prekallikrein (PK)

-deficiencies of factor XII, HMWK, and PK do NOT result in bleeding disorders

- **aPTT inhibited**

-Drugs: unfractionated heparin or direct thrombin inhibitors (lepirudin and argatroban)

-Lupus anticoagulant (LAC)

-Specific factor inhibitor

# Prolonged PT

- **PT corrects**

-Factor II, V, VII, X, and fibrinogen deficiency

-Vitamin K deficient patients

-Amyloidosis (facor X deficiency)

-Myeloproliferative disorder (factor V deficiency)

- **PT inhibited**

-Rarely present w/o prolonged aPTT too.

-direct thrombin inhibitor, factor V inhibitor, excess heparin

-rarely LAC

# Both PT and aPTT

- **Deficiencies**

-Warfarin, rodenticide/brodifacoum poisoning

-Consumptive coagulapathies (DIC)

- **Inhibitors**

-direct thrombin inhibitors, excess heparin, LAC

TABLE 1. **Causes of Congenital Coagulation Factor Deficiencies***

| Congenital coagulation factor deficiency | Deficient factor | PT | APTT | Prevalence | Mode of inheritance |
|---|---|---|---|---|---|
| Hemophilia A | Factor VIII | Normal | Prolonged | 1:5000† | X-linked recessive |
| Hemophilia B | Factor IX | Normal | Prolonged | 1:30,000† | X-linked recessive |
| Hemophilia C | Factor XI | Normal | Prolonged | Up to 4%‡ | Autosomal |
| von Willebrand disease | von Willebrand factor | Normal | Normal/prolonged | Up to 1% | Autosomal |
| Factor VII | | Prolonged | Normal | 1:500,000 | Autosomal |
| Rare coagulation factor deficiencies | | | | | |
| Factor V | | Prolonged | Prolonged | 1:1 million | Autosomal |
| Factor II | | Prolonged | Normal/prolonged | Rare§ | Autosomal |
| Factor X | | Prolonged | Normal/prolonged | 1:500,000 | Autosomal |
| Factor XIII | | Normal | Normal | Rare§ | Autosomal |
| Combined factors VIII and V | | Prolonged | Prolonged | Rare§ | Autosomal |

*APTT = activated partial thromboplastin time; PT = prothrombin time.
†Live male births.
‡Among Ashkenazi Jews.
§Case reports.

# Bleeding disorders not detected with PT and aPTT tests

- Von Willebrand dx, factor XIII deficiency, Plasminogen activator inhibitor