

IMPACTS OF COMMON ANTICOAGULANTS ON COAGULATION TESTING

	UFH	LMWH	WARFARIN	DIRECT THROMBIN INHIBITORS ^a	DIRECT FACTOR XA INHIBITORS ^b
Common Coagulation Assays					
PT/INR	No effect ^c	No effect ^c	Prolonged	No effect/prolonged ^d	No effect/prolonged ^d
aPTT	Prolonged	No effect/prolonged	No effect/prolonged	No effect/prolonged ^d	No effect/prolonged ^d
D-dimer	No effect	No effect	No effect	No effect	No effect
Fibrinogen	No effect ^c	No effect ^c	No effect	No effect/underestimate ^d	No effect
Fibrinogen antigen	No effect	No effect	No effect	No effect	No effect
Reptilase time	No effect	No effect	No effect	No effect	No effect
Thrombin time	Prolonged	No effect/prolonged	No effect	Prolonged	No effect
Anti-Xa assays ^e (for UFH, LMWH, or anti-Xa DOACs)	Possible effect/overestimate ^e	Possible effect/overestimate ^e	No effect	No effect	Possible effect/overestimate ^e
Thrombotic Risk Assays					
APC resistance	No effect ^c	No effect ^c	No effect ^f	Possible false negative	Possible false negative
Antithrombin activity, IIa method	No effect ^g	No effect ^g	No effect ^g	Overestimate ^d	No effect
Antithrombin antigen	No effect ^g	No effect ^g	No effect ^g	No effect	No effect
Protein C activity, clot based	No effect ^c /overestimate	No effect ^c /overestimate	Decreased	Overestimate ^d	Overestimate ^d
Protein C antigen	No effect	No effect	Decreased	No effect	No effect
Protein S activity	No effect ^c /overestimate	No effect ^c /overestimate	Decreased	Overestimate ^d	Overestimate ^d
Protein S free antigen	No effect	No effect	Decreased	No effect	No effect
Protein S total antigen	No effect	No effect	Decreased	No effect	No effect
Lupus Anticoagulant Assays					
dRVVT	No effect ^c /prolonged	No effect ^c /prolonged	No effect/prolonged	No effect/prolonged ^d	No effect/prolonged
dRVVT confirmatory ratio	No effect ^c /false positive	No effect ^c /false positive	No effect/possible false positive ^f	Possible false positive	Possible false positive or false negative
Hexagonal phospholipid neutralization	No effect ^c /false positive	No effect ^c /false positive	No effect/possible false positive ^f	Possible false positive	Possible false positive
Platelet neutralization procedure	No effect ^c /false positive	No effect ^c /false positive	No effect/possible false positive ^d	Possible false positive	Possible false positive
Fibrinolytic Assays					
Alpha-2-antiplasmin	No effect	No effect	No effect	No effect	No effect
Fibrin/fibrinogen degradation products	No effect	No effect	No effect	No effect	No effect
Plasminogen activator inhibitor-1	No effect	No effect	No effect	No effect	No effect
Plasminogen activity	No effect	No effect	No effect	No effect	No effect
tPA antigen	No effect	No effect	No effect	No effect	No effect
Soluble fibrin monomer	No effect	No effect	No effect	No effect	No effect
Other Assays					
ADAMTS13	No effect	No effect	No effect	No effect	No effect
Factor assays, clot based ^h	No effect/underestimate ⁱ	No effect/underestimate ⁱ	No effect/decreased vitamin K-dependent factors	Underestimate ^d	Underestimate ^d
von Willebrand factor antigen and activity	No effect	No effect	No effect	No effect	No effect



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^aArgatroban, bivalirudin (Angiomax), dabigatran (Pradaxa).

^bRivaroxaban (Xarelto), apixaban (Eliquis), edoxaban (Savaysa).

^cReagent contains heparin neutralizer; effect may be seen with supratherapeutic drug levels.

^dDrug, concentration, and reagent dependent.

^eFor accurate drug quantitation, the selected assay must correspond with the specific drug (ie, UFH, LMWH, rivaroxaban, apixaban, edoxaban) that the patient is receiving. Additionally, reported concentrations will be inaccurate (ie, overestimated) when >1 drug with anti-Xa activity is present (eg, when a patient is being bridged between medications).

^fDrug does not interfere with assay, but presence may affect analyte.

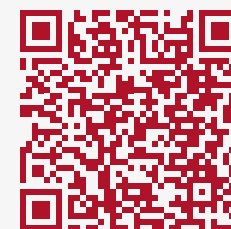
^gInterference in high concentrations of anticoagulant medication.

^hPresence of UFH, LMWH, direct thrombin inhibitors, and direct Xa inhibitors may produce inhibitory patterns and may prevent accurate quantitation (underestimation) of factor activity. May also interfere with and cause false-positive Bethesda assays (false-positive coagulation factor inhibitor). Chromogenic factor XIII activity may also be falsely decreased in the presence of direct thrombin inhibitors.

ⁱaPTT-based factor assays (for factors VIII, IX, XI, XII) are more likely to demonstrate assay interference and underestimation than PT-based factor assays (for factors II, V, VII, X). The effect is more pronounced with UFH than with LMWH.

APC, activated protein C; aPTT, activated partial thromboplastin time; DOAC, direct oral anticoagulant; dRVVT, dilute Russell viper venom time; INR, international normalized ratio; LMWH, low-molecular-weight heparin; PT, prothrombin time; tPA, tissue plasminogen activator; UFH, unfractionated heparin

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