

Anticoagulation

National Patient Safety Goal

2008 NPSG

- Goal 3

- “Improve the safety of using medications”

- Goal 3E

- “Reduce the likelihood of patient harm associated with the use of anticoagulation therapy”

Error Potential

- An increasing number of complex agents may lead to increased potential for error
 - Dosing/prescribing
 - Duplication
 - Dispensing
 - Delivery to the patient

Increasing Complexity

■ Antiplatelets

- Aspirin
- Thienopyridines
 - Ticlopidine
 - Clopidogrel
 - *Prasugrel (Effient® *)*
- *Cangrelor**
- 2b3a1s
 - Eptifibatide (Integrilin®)
 - Abciximab (Reopro®)
 - Tirofiban (Aggrastat®)
- Dipyridamole
- Cilostazol

■ Anti-thrombins

- UFH
- Enoxaparin (Lovenox®)
- DTIs (direct thrombin inhibitors)
 - Bivalirudin (Angiomax®)
 - Lepirudin (Refludan®)
 - Argatroban
- Factor Xa inhibitors
 - Fondaparinux (Arixtra®)
 - *Rivaroxaban (Xarelto® *)*

* Medication NOT yet FDA approved

Objectives

- Review some pearls and policies regarding UFH, LMWH, warfarin
- Review potential pitfalls that can occur with anticoagulation
- Describe agents which are in the anticoagulation “pipeline”

Unfractionated Heparin (UFH)

- Transition to anti-Xa levels for monitoring is coming soon
 - Aptt varies
 - Institution and reagent specific
 - Ultimately correlated to Xa level
 - Anti-Xa offers less interference = greater accuracy
 - Disease state (lupus anticoagulant, liver disease, pregnancy, etc.)
 - Warfarin
 - Anti-Xa therapeutic goal - 0.3-0.7 IU/ml on infusion

“Therapeutic Range”

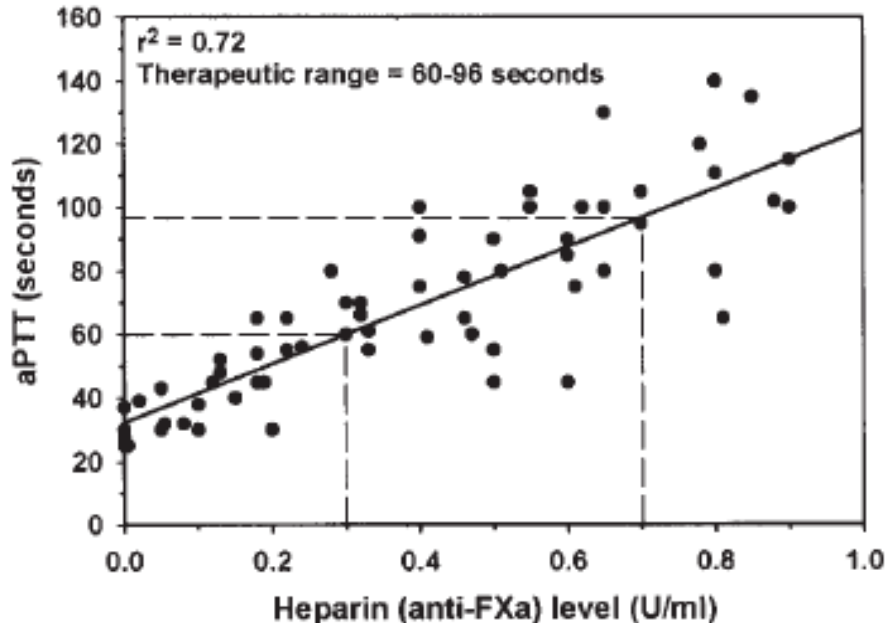


Figure 4. Plot of activated partial thromboplastin time (aPTT) versus heparin antifactor Xa levels in 65 patients receiving heparin for treatment of thrombosis. Regression analysis yielded a coefficient of determination of 0.72. Extrapolation of the line of best fit at points corresponding to 0.3 and 0.7 U/ml of heparin (by antifactor Xa assay) yielded an aPTT therapeutic range of 60–96 seconds.

The therapeutic aPTT is ultimately derived from the Xa level using the institution's specific reagent. If the reagent changes, the aPTT range may change, but the Xa range will not.

Unfractionated Heparin (UFH)

- Concentration change coming soon
 - From 50 units/ml to 100 units/ml
 - To standardize across the System
- Weight based adjustments coming soon
 - Current practice is weight based initiation but not adjustment
 - High & low dose protocols available
 - RN driven

Low Molecular Weight Heparins (LMWH)

- Enoxaparin
- Xa monitoring option
 - Who should be monitored?
 - Obesity
 - Renal issues
 - Pregnancy
 - Timing and target for anti Xa level
 - 4 hour peak level
 - Goal 0.6-1 IU/ml on q12h treatment regimen

LMWH & Epidural = ↑ Risk

- Avoid with epidural in place
- If epidural/LP planned...
 - Wait 12 hours after prophylactic dose
 - Wait 24 hours after treatment dose
- If epidural pulled/LP preformed...
 - Wait minimum of 2 hours to initiate
 - Wait up to 24 hours if traumatic

LMWH/UFH Pitfalls

■ Transition

- ED to ED/floor/cath lab
- Outside facility

■ Duplication

- UFH/LMWH/Fonda
- Therapeutic INR

■ Weight errors

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- Evaluate baseline coags
 - Attempt to document and communicate:
 - Outside labs
 - Weight
 - Prior dosing

Ways to Help Reduce the Risk of Duplication or Double Dosing?

- Please document on orders
 - Any prior dosing in ED
 - Dosing at outside facility
- Obtain and evaluate baseline coag studies
- Vigilant review of medication list

Warfarin

- Avoid loading
 - Induces hypercoaguable state
- Avoid initiation in documented HIT
 - Until platelet recovery ($>150K$) due to increased risk of microvascular thrombosis
- Vitamin K
 - Use oral when possible – same efficacy, lower risks
 - SQ erratic absorption, injections have anaphylaxis risk
 - Full effect in 24-48 hours
 - Avoid large doses
 - Induce warfarin “resistance”
 - Reversal with 1-2.5mg oral vitamin K often sufficient

Warfarin

- Interactions numerous

- Big 5

- Fluconazole

- Amiodarone

- Metronidazole

- Bactrim

- Rifampin- reduces INRs & efficacy

- All increase INR substantially, usually within 48 hrs

- Dose reductions recommended

Warfarin

■ Warfarin policy

- INR change of 0.8 or more = pharmacist may call prescriber
- No INR in 3 days = RN will obtain baseline prior to dose being given
- INR > 3 = RN will call MD prior to administration unless higher target INR specified

Warfarin Discharge Safety

- Nursing will educate your patients on important safety information regarding warfarin therapy.
- It is important for follow up appointments to be made to ensure proper monitoring on discharge

Pipeline (agents not currently FDA approved)

■ Antiplatelets

- New thienopyridine
 - Prasugrel
- Direct ADP receptor blockers
 - Cangrelor, ticagrelor
- Thrombin receptor antagonists

■ Direct factor Xa inhibitor

- Rivaroxaban

Summary

- Transitioning to Xa level monitoring
 - Routine for heparin drip
 - Available for LMWH outliers
- New heparin drip concentration (100 units/ml) is coming soon
- Heparin drip weight based adjustments
- Attempt to document dosing prior to admission
- Avoid warfarin loading
- Avoid warfarin initiation in HIT until platelets $>150K$

Question 1

- What changes will be occurring with UFH?
 - A. Concentration change
 - B. Monitoring via Xa levels
 - C. Weight based protocol adjustments
 - D. Elimination of RN-driven protocol
 - E. A,B,C

Question 2

- Which statements are true regarding warfarin?
 - A. Avoid loading doses
 - B. Avoid initiation in documented HIT until platelet count has recovered
 - C. IV vitamin K is the preferred reversal strategy
 - D. You may be contacted about an INR increase of 0.8 or higher
 - E. A,B,D

Question 3

- What may help decrease errors involving anticoagulants?
 - A. Order documentation of prior dosing
 - B. Evaluation of baseline coag studies
 - C. Vigilant medication profile review
 - D. A,B,C