Anticoagulation considerations in the acute care setting

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I have no relationships, financial or otherwise, or any other form of conflicting interest to disclose relating to the content of this presentation.
Challenges Faced in the Acute Care Setting

- Has the risk for thrombosis or bleeding changed.
  - Environment/Practitioner changes: ICU ↔ Ward
- Starting AC therapy – developing a long term plan from the start
- VTE Prophylaxis
- Temporary Anticoagulation – mechanical devices (ECLS, Impella) or during procedures;
- To measure, or not to measure – Changing Management Targets
- Acute events that suddenly change your path (HIT, Acute Hypercoag/Hypocoag states --- Unique Dosing/Management
- Peri- and Intraoperative management
- Emergent reversal of major/life threatening bleeds
- Educating the patient
- Meeting Mandates
Implementing and Assessing Anticoagulation Therapy

Patient/Condition

Prophylaxis
UFH
LMWH
DTI
ASA
ANTI-PLATELET
Warfarin
DOAC’s

Treatment

Devices

Thrombosis
Bleeding
ADE
Costs

Outcomes

aPTT
Hgb
INR
Plt
Timing

Ordering

Dosing
Interactions
Dual-Triple therapy
Epidural/Spinal
Baseline Labs

Preparation

Administration

Discharge

Administration Schedule
(q___ “hr”)

Order Sets
Best Practice
Alerts

Admit

Pump Settings
Compatibility

IV Admixture
Process
Release to
Pyxis

Monitoring

aPTT = activated partial thromboplastin time; Hgb = hemoglobin;
INR = International Normalized Ratio; Plt = platelets.
## Utilizing Informatics

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### Temp

![Temperature Graph](image)

### Drains - Color

Drainage Characteristics/Odor (V/Vo...
**VTE: Treatment Approach**

- **Acute treatment:** *Adequate AC while waiting for Dx assessment*

- **Lytic Therapy:** *Massive PE, Thrombectomy, Catheter Directed…*

- **Special Populations:** *Organ Failure, Recent ICH/Bleed, No IV access…*

- **No need to be in Hospital:** *Develop Long Term Plan, Coverage, Patient Acceptance*

- **Agent Selection:** *Can be revised as necessary, potential for complications*

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**AC** = anticoagulation  
**IVC** = inferior vena cava
Initiating Anticoagulation

- Efficacy and Safety – Multiple Choices & ↑ Potential Confusion
- Goals/Length of therapy
  - Prophylaxis vs Treatment
- Acute vs Chronic
- Total Plan: Finish what you start…
- Complex Patients
  - May not typically included in trials (ICU, High Risk Bleeding…)
  - Need to modify typical target?
  - Presence or planned invasive procedures
  - High bleeding Risk: IVC?
Special Populations: “On The Fence” Dosing Decisions

- Obesity
- Renal Insufficiency
- Hepatic Failure
- Pregnancy
- Pediatrics/Neonates
- Cancer
- Mechanical Valves
- Advanced Age
- Hypercoagulable State
- Concurrent Coagulopathy
- ICU setting (Pressors, Heart Failure, Open Wounds, ECMO…)

Anticoagulation Indication
- Treatment
- Prophylaxis
- Acute Care plans

Many excluded from clinical trials
Practice Pearl: Dosing/Lab Draw Times

When setting times for Dosing and drawing labs – consider:

- **Shift Change** – Avoid ordering much between 6:00 and 8:00
- Let the patient get rest at night
- Batch labs when possible
- One time orders placed on previous days may get missed

Also: Just because the dose was removed (PYXIS) doesn’t mean it was swallowed
- If suspected – add to order “Nurse to watch patient swallow”
When bleeding concerns in the ICU are present
Unfractionated Heparin: Monitoring

Monitoring (aPTT/anti-Xa)
- Time post bolus: 6-8 hr
- No bolus: 4-6 hr
- Kearon et al Arch Intern Med 1998
  - Warfarin: INR ↑ 1.0 = ~16 sec aPTT ↑

Heparin Resistance: (No Change with ↑Result)
- aPTT/Anti-Xa; Antithrombin, FVIII, Fibrinogen

Pearl: Get good information and know the limitations of it
- Set it up to be useful
Know your lab methods: aPTT Reagent and Instrument Variation

Sigma CS-190
MLA-1600
STA
CA-6000
MDA-180
BCT

aPTT seconds

25 50 75 100 125 150 175
ACT: Two different tests – Is the right Card in?

![Graph showing ACT vs Heparin concentration]

- LR-ACT: $y = 365.93x + 164.29$, $LR-\text{ACT } R^2 = 0.9832$
- HR-ACT: $y = 117.73x + 110.58$, $HR-\text{ACT } R^2 = 0.9945$
LMWH: Just Monitor anti-Xa?

CAP Survey: LMWH – Lots of Variability between labs

Decrease in clotting factors
Treat with FFP or cryoprecipitate. Hold anticoagulation

- $r = 11-14$ min: FFP 8 ml/kg
- $r > 14$ min, FFP 16 ml/kg

Primary fibrinolysis
(e.g. $\epsilon$-aminocaproic acid)

Treat with anti-fibrinolytics

Primary fibrinolysis
High LY30

Coagulopathy/anticoagulants
Long R time

Reduced platelet function
Low MA

Hypercoagulable
Short R time, High MA

DIC
Stage 1 - hypercoagulable state with secondary fibrinolysis

DIC
Stage 2 - hypocoagulable state

Thromboelastography

MacLaren R. Pharmacotherapy 2007;27:93S-102S
Factors Correlating with Warfarin Dose/Complications

- Age
- Diet/Vitamin K stores
- Interacting Drugs/Herbs
- INR target
- CYP2C9 polymorphism
- Heart Failure
- Liver Impairment
- Infection/ Acute Illness
- Confusion of taking medications / Incorrect dose
- Quality of management
- Frequent INR values >3.0
Pearl – Difficult Warfarin Patient – New Start

- Elevated baseline INR, Organ Failure, Multiple Interactions etc
  - Give first dose of Warfarin as soon as possible –
  - Draw INR a far post dose as possible to unmask ↑ sensitivity

Also:
If a single result is unexpected – and not explained by the clinical situation
  - REPEAT IT
Thinking Ahead

It is Thursday and the patient wants to be treated for the DVT at home. Monday is a holiday

- How to start the warfarin
- Ability to receive the bridge therapy
- When will the first INR be drawn
It is Thursday and the patient wants to be treated for the DVT at home. Monday is a holiday

- How to start the warfarin
- Ability to receive the bridge therapy
- When will the first INR be drawn
Practice Pearl: Transitioning between agents

- What is the eminent thrombosis risk?
  - Device/Can’t be without (e.g. UFH to DTI)
    - Stop UFH and Start DTI at same time
    - Watch trend in (aPTT) movement to new target frequently
  - No immediate risk (UFH to LMWH/DOAC)
    - Why place pause? Do it in one step
    - Stop UFH when giving LMWH
    - Small change in level of anticoagulation should not cause thrombosis or bleed
Devices

- ECLS (VV/VA)
- Impella
- EKOS
- RVAD/LVAD
- Balloon Pump
- Dialysis
What do you “Monitor”

- Monitoring Pt
  - Bleeding/Thrombosis/Goals
- Laboratory
- Medication Administration
- Co-morbid condition changes

Pearl: If changes rapid and unclear, reassess more frequently. Adjust the orders to fit the patient needs. You can always make changes.
Renal Insufficiency

- Defining “Renal Failure” AKI vs CKD
  - CrCl Calculation approach (C and G equation using TBW)
  - Hemodialysis

- Thrombosis
  - Patient
  - Graft/Dialyzer

- Bleeding
  - Hgb reserve
  - Independent Risk Factor (Hemodialysis >>>>> below 30 ml/min)

Enoxaparin PI: (CrCl < 30 ml/min)
  - Prophylaxis: 30 mg q day
  - Treatment: 1 mg/kg/day
  - Patients < 20 ml/min not included

Dalteparin
  - No change > 20 ml/min

- Patients not included
Renal Insufficiency

- Defining “Renal Failure” AKI vs CKD
  - CrCl Calculation approach (C and G equation using TBW)
  - Hemodialysis
- Thrombosis
  - Patient
  - Graft/Dialyzer
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- Treatment: 1mg/kg/day
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Dalteparin
- No change > 20 ml/min

Not all CKD/AKI Categories fit < 30 ml/min – HD never studied
No change > 20 ml/min

HD never studied
Anticoagulant “Reversal” Strategy

- Hold Anticoagulation
- Bleeding?
  • Site and severity – may influence outcomes
- Mechanical Intervention (Surgery)
- Pharmacological intervention
  • Topical Agents
  • Neutralize the drug
  • Reverse the effects of the drug independently
- Replace losses
- Optimize management of co-morbid situations
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<td>Including trauma patients with ICH on oral anticoagulation</td>
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<td>Hours</td>
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<td>Hours to days</td>
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<td>Reduce therapeutic target</td>
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<td><em>(usually related to changes in risk acceptance)</em></td>
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How long for effects to be gone?

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<td>Moderate Dose</td>
<td>Cp = Rate In/Rate Out</td>
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<td>Low Dose</td>
<td>Time</td>
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AC Effect
Does the setting matter?

- **Emergency Department and ICU**
  - What is available and how long to get once ordered?
  - Can the necessary labs be done
  - PCC dosed on INR/Assessment – lowest effective dose
    - Can start their and always give more once INR reported.
  - Unclear if PCC alone vs surgery impacts ICH outcomes

- **Operating Room**
  - May depend on risk of thrombosis short and long term
  - How much reversal or hemostasis is needed
  - Ability to titrate depending on situation
  - What can be requested and administered rapidly
  - May not be able to wait for pharmacy to process