Hemostasis

- Hemo = Blood
- Stasis = Stop or Still

Hemostasis is a complex process involving a number of clotting factors that are activated in a series of sequential steps, or cascade, to prevent or stop bleeding. Drugs are used to modify, interrupt, or enhance this process.

Coagulation Cascade

- **Intrinsic Pathway**: activated in response to injury
- **Extrinsic Pathway**: activated when blood leaks from the blood vessel into tissue space
- Near end of Common Pathway: Prothrombin Activator converts Prothrombin to Thrombin which converts Fibrinogen to long insoluble strands of Fibrin - this creates the fibrin clot or plug in @ 6 minutes.
Clotting Disorders

In the presence of Vit. K., the Liver can manufacture 4 clotting factors, including fibrinogen, which circulates in the blood in an inactive form. Liver disease (Hepatitis B & C, Cirrhosis, etc.) is a common cause of bleeding disorders, for the damaged or scarred organ has decreased function, thus fewer clotting factors are produced.

Hereditary Diseases

- Von Willebrand’s Disease (vWD): most common hereditary bleeding disorder due to low vW Factor, a protein which helps platelet aggregation and carries factor VIII.
- Hemophilia A: No factor VIII
- Hemophilia B (Christmas Disease):
  - No factor IX
- 15,000 people in the U.S. with Hemophilia A or B

Morbidity & Mortality in U.S.

- Deep Vein Thrombosis (DVT): 2 million cases/yr
- 60,000+ patients die each year from Pulmonary Emboli (PE).
- Cirrhosis is the 8th leading cause of death
- 1.25 Million people surviving with Chronic Hepatitis B.
- In 2007: 19,000 new cases of Hepatocellular Carcinoma with almost 17,000 deaths.
Coagulation Modifiers: 4 Mechanisms of Pharmacological Activity

1) Anticoagulants: Prevent venous and arterial clot formation: inhibition of specific clotting factors in both the intrinsic and extrinsic pathways.

2) Antiplatelet Agents: Prevent arterial clot formation: inhibition of Platelet actions.

Coagulation Modifiers Continued

3) Thrombolytics: Removal of Existing Clot: Dissolution of fibrin clot by drug action.


Four Groups of Coagulation Modifying Drugs

#1 Anticoagulants
• Prevents the formation of a clot (consequently this increases the clotting time and/or bleeding time).

#2 Antiplatelet Agents
• Interferes with platelet aggregation and clot formation in arteries.
Nursing Considerations and Anticoagulation Therapies

- Reduce Risk for CVA, MI, PE & DVT due to surgery, illness, restricted mobility, Atrial Fibrillation (Afib), etc.
- Assess for bleeding (dose dependent—higher the dose=greater the risk)
- Hypotension along with dropping H&H, RBC’s and Platelets may indicate internal bleeding

Assessment & Evaluation

- What signs and/or symptoms of internal bleeding or hemorrhage would you be looking for or expect to see if your patient is receiving Anticoagulation Therapy? What would you look for when evaluating for DVT?

Signs and Symptoms

**Hemorrhage:** Bruising nosebleeds heavy menstrual flow coffee-ground emesis tarry stool bloody or tea colored urine rectal bleeding dizziness fatigue paleness pasty skin lumbar pain unilateral abdominal bulge or swelling.

**DVT:** Swelling, pain, tenderness, warmth in effected extremity.
More Considerations

- Contraindicated during Breast Feeding (Warfarin)
- Contraindicated during Pregnancy (Warfarin)
- Heparin Therapy: aPTT (normal: 25-35 sec) therapeutic anticoagulation 1.5-2.0 X above baseline
  Warfarin Therapy: INR 2.0-3.0 for DVT, 2.5-3.5 to prevent arterial thrombosis.

Heparin

**Indications:** DVT, Pulmonary Emboli (PE), Unstable Angina (USA), evolving Myocardial Infarction (MI).

**Dosage:**
- **Heparin IV infusion:** 5,000 – 40,000 units/daily
- **Heparin SubQ Injection Intra-abdominal:** 5,000-20,000 units X daily
- ½ life 90 minutes.

**Action:** Heparin prevents enlargement of existing fibrin clots and their new formation by binding to antithrombin III.

**Distribution:** Does not cross Placenta or enter Breast Milk

Heparin

**Adverse Effects:**
- **Common:** N/V, transient thrombocytopenia
- **Serious:** Hemorrhage, anaphylaxis

**Contraindicated for clients who have:**
- bleeding disorders, severe hypertension (HTN), recent trauma, Intra-Cranial Hemorrhage (ICH), Bacterial Endocarditis (BE).

**Reversal Agent:** Protamine Sulfate IV, 1 mg/100 units of Heparin

Wilson, B., Shannon, M., Shields, K., 2009
Heparin-Induced Thrombocytopenia (HIT)

- In 5% of patients receiving Heparin, an immune response occurs which activates Platelets (Thrombocytes), causing a clotting response. A decreased Platelet count of 30% or more is considered HIT and more over, places the patient at greater risk of forming HIT (venous or arterial thrombosis in the extremities). These adverse effects can occur several weeks after Heparin therapy is ended.
  - EDNurses 2011
  - Davis’s Drug Guide for Nurses 2011

Anticoagulants cont’d

- **Enoxaparin (Lovenox)** a Low Molecular Weight Heparin, (LMWH) SubQ. 30 mg 2 X daily for 7-10 days (dose is weight-based). Inhibits Factor X, duration 2-4 times longer than Heparin, more stable response.

  **Adverse Effects:**
  - Common: N/V, allergic reaction (rash, urticaria), pain at injection site
  - Serious: Hemorrhage, anaphylaxis, (fewer cases of thrombocytopenia than Heparin).
  - Caution: Lactation, Pregnancy Category B

Nurse’s Drug Guide, 2009

Anticoagulants cont’d

- **Warfarin (Coumadin):** 2-15 mg PO daily
  - ½ life 1-3 days

  **Action:** Inhibits factors II, VII, IX, X

  **Indications:** prevent CVA (Cerebrovascular Accident), MI, DVT, & PE, and thromboembolic episodes s/p MI & Atrial Fibrillation (Afib).

  **DVT Therapeutic Range:** International Normalization Ratio (INR) of 2.0-3.0. (2.5-3.5 for arterial thrombi)

  **Drug to Drug Interactions:** many other drugs increase or decrease the activity of Warfarin (Anti-Seizure Meds., ETOH, NSAIDS, Antifungals and Antibiotics, etc.)
**Warfarin (Coumadin)**

**Adverse Effects:** Common: N/V, transient thrombocytopenia; Serious: Hemorrhage

**Contraindicated:** bleeding disorders, severe HTN, recent trauma, Intracranial Hemorrhage (ICH), Bacterial Endocarditis (BE), severe Hepatic or Renal impairment

**Reversal Agent:** IV/PO Vitamin K

Close monitoring of INR is required while on Warfarin Therapy

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**Therapeutic Intervention**

- Thromboembolic Disorders are the most common indicator for the institution of Coagulation Modifiers.
- Thromboembolic disease can be life threatening, so initial therapy is IV or SubQ to achieve a rapid onset. Switch to PO anticoagulant when patient is stable.

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**Neuman Systems Model**

- *With pharmacological intervention:*
  - Are Flexible and Normal Lines of Defense penetrated?
  - Are Lines of Resistance involved?
  - Is the Basic Structure threatened and/or protected?
Case Study

- Mrs. A. is a 72 y.o. female who was admitted to the hospital from the Emergency Dept. (ED) with a diagnosis of Unstable Angina. She has a history of moderate HTN, Total Abdominal Hysterectomy (TAH), Coronary Artery Disease (CAD), MI and is a past smoker.

(Unstable Angina = increasing recurrent cardiac symptoms and ischemic episodes

Case Study cont’ed

- She has just been transferred to your care in the Telemetry Care Unit. She is receiving IV Heparin at 1000 units/hour and Plavix 75 mg PO daily. Her last aPTT was 55 sec. at noon today (her baseline is 27). She is tolerating a soft diet.

Initial Assessment

- Report & Chart Check: Labs/VSS/pain/EKG/neuro status
- Visit Patient: check VS/pain/Neuro/skin/visible evidence of bleeding/nausea
- IV Heparin: calculate rate to determine units/hr setting is correct; check IV site for oozing of blood, pain, swelling & coolness etc.
- Level of patient’s knowledge regarding disease process and anticoagulation therapy
Potential/Actual Nursing Diagnosis

- Injury, Risk for Bleeding, related to adverse effects of anticoagulation therapy
- Tissue Perfusion, Ineffective, related to hemorrhage
- Knowledge, Deficient, related to drug therapy
- Anxiety, in response to uncertainty of illness

Planning: Client Goals & Expected Outcomes

- The client will:
  - Experience an increase in bleeding/clotting times as evidenced by laboratory values, prevention of new thrombus formation or the enlarging of existing clots and no embolic events
  - Demonstrate an understanding of the drug’s action by describing the side effects and precautions

Planning: Client Goals & Expected Outcomes Cont’d

- Not signs or symptoms of hemorrhage
- Demonstrate proper self-administration of medication (dose, timing, injection technique, when to notify MD).
- Maintain calm and receptive demeanor
Implementation

- Your assessment of Mrs. A. is within normal limits (WNL).
- You instruct Mrs. A. to report any sudden dyspnea, chest pain, temp. or color change in hands, arms, feet or legs, and any signs of bleeding, bruising, faintness or dizziness; you instruct pt. to avoid injury and falling, use a soft toothbrush and electric razor.

Implementation cont’ed

- The nurse understands that Unstable Angina is often caused by platelet-rich non-occlusive thrombus formations. Plavix is an appropriate therapy for this client. The nurse reinforces in her teaching the risk for bleeding, activity intolerance, and impaired tissue integrity.

Antiplatelet Agent

- **Clopidogrel (Plavix):** 75 mg PO daily
  
  **Indications:** reduce atherosclerotic & thromboembolic events in pts. with recent Hx of MI, CVA, peripheral artery disease.

  **Action:** an ADP Receptor Blocker (prevents platelet aggregation)

  **Adverse Effects:**
  
  - **Common:** Dyspnea, abd. pain, rash, diarrhea
  - **Serious:** Increased clotting time, GI Bleeding, blood dyscrasias

Another Antiplatelet Agent

- **Aspirin (ASA):** 81 to 650 mg PO BID
  - **Action:** inhibits thromboxane A2, thus prevents platelet aggregation
  - **Adverse Effects:**
    - **Common:** N/V/D, abd. pain
    - **Serious:** Increased clotting time, GI Bleeding, anaphylaxis
    - **Salicilates** can have adverse effects upon both mother and fetus-avoid during pregnancy, esp. 3rd trimester.
      Safety in Lactation not established.

#3 Thrombolytics

- The nurse is aware Mrs. A. could develop a Coronary Artery occlusion due to thrombus formation. Thus, the patient might require Thrombolytic therapy in order to prevent a Myocardial Infarction (MI). Thrombolytic therapy converts plasminogen to plasmin which dissolves fibrin clots, allowing free flow of blood through the once occluded artery.

Thrombolytics Continued

- **Alteplase (Actvase, TPA)**
  - **Indications:** Given within 12 hours of onset of symptoms of MI and 3 hours for embolic CVA for maximum effectiveness.
  - **Dosing:** initially 60 mg IV, then 20 mg/hour X 2 hours
  - **Action:** promotes fibrinolysis (clot-busting) by converting plasminogen to the enzyme plasmin which digests fibrin & breaks down clotting factors and plasma proteins.
Thrombolytics Continued

Alteplase (Activase, TPA)

Adverse Effects:
Common: superficial bleeding at injection site, allergic reactions
Serious: internal bleeding, Intracranial Hemorrhage.

Nurse Follow Up
• The nurse reviews Mrs. A’s electronic medical record to establish/confirm that she has had no CVA in the last 2 months, no recent trauma, biopsies or surgery, arterial emboli, hemorrhage, severe uncontrolled HTN, intracranial neoplasm, or Arterio-Venous Malformation (AVM). She also does a thorough review of all recent and current laboratory results of clotting and bleeding times.

QSEN Competency
• Informatics
  • "Use Information and technology to communicate, manage knowledge, mitigate error and support decision-making."
  • Knowledge: essential information in a common data base promotes safe and effective patient care.
  • Skills: Navigate the electronic health record, monitor outcomes of the care process.
  • Attitudes: Value technologies that support clinical decision-making and care co-ordination.

• Cronenwett, L., Sherwood, G., Barnstein, J., et al. 2007
**#4 Hemostatics (antifibrinolytics)**

- Opposite action of anticoagulants in that they shorten or inhibit bleeding by preventing dissolution of fibrin, thus enhancing clot stability.
- Use: prevent/treat excessive bleeding from surgical sites
- Patient evaluated for clotting: changes in pulses, paresthesias, +Homans Sign, prominence of superficial veins/arteries, chest pain (C.P.), shortness of breath (SOB).

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**Hemostatic Drugs**

- **Aminocaproic Acid (Amicar), IV 4-5 gm for one hour, then 1-1.25 gm/hr till bleeding is controlled.**

- **Adverse Effects:**
  - *Common:* Allergic skin reactions, H/A
  - *Serious:* Anaphylaxis, thrombosis, bronchospasm, nephrotoxicity

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Mrs. A. was taken to the Cardiac Catheterization Lab. After angiography, TPA was given for a 100% occluded Left Anterior Descending (LAD) Coronary Artery. Then a stent was placed. She tolerated the procedure well and is now to be discharged home 3 days later after having been started on Warfarin.
Evaluation of Outcome Criteria

- The clients laboratory values exhibit an increased bleeding time.
  - Lab values: PT 35 (normal PT 12-15 sec)
  - INR 1.7 (therapeutic range 2-3)

- The nurse understands that while the patient is receiving both heparin and warfarin there is even greater risk for bleeding.

Evaluation of Outcome Criteria

- The client demonstrates understanding of the drug’s action, describes side effects and precautions.
  - Mrs. A. states she will take her Coumadin at 5 pm every day and keep all doctor and lab appointments. She is observed walking carefully, wearing her shoes and socks, using a soft toothbrush and electric razor.

Dietary Consultation

- The Nurse, after obtaining the MD’s order, contacts the dietician and schedules a consult. The nurse understands that while on Coumadin Therapy, the patient must monitor her intake of Vitamin K-rich foods. The dietician meets with Mrs. A. and her daughter, explaining the role of foods and diet in relation to her anticoagulation therapy. The dietician provides them with a list of foods high in Vitamin K, what foods/beverages to avoid in excessive amounts, etc.
Mrs. A. describes to the nurse and doctor that she is watching for excessive dark red or blue skin patches (bruising), or bleeding from a wound that won't stop after 10 minutes of direct pressure, and will notify her doctor immediately. She states she will maintain her normal diet and keep her appointments at the Coumadin Clinic.

She understands that she will immediately report any flu-like symptoms, any dyspnea, C.P., temp/color change in hands, arms, feet or legs. Her daughter has brought in a Medical ID bracelet indicating Warfarin therapy that Mrs. A. will wear home.

References