



NMNEC Concept: **Clotting**

Mega Concept: Health and Illness

Category: Oxygenation and Homeostasis

Concept Name: Clotting

Concept Definition:

Mechanisms that facilitate and impair homeostasis of blood clotting mechanisms.

Scope and Categories:

- **Scope:** Clotting issues fall on a spectrum, ranging from abnormal clotting resulting in thrombus formation, to abnormal clotting resulting in bleeding problems.
- **Categories:** Clotting problems can be categorized as either disorders that lead to abnormal bleeding and disorders that lead to abnormal clotting
 - **Bleeding disorders:** a lack of or dysfunction of clotting factors can lead to increased bleeding
 - **Clotting disorders:** excessive or inappropriate clotting can effect both local and widespread tissues.

Risk Factors:

Impaired clotting can affect all individuals regardless of age, gender, race, or socioeconomic status.

Populations at Risk:

- Older adults are at higher risk of increased clotting because of increased platelet adhesiveness, which promotes blood stasis.
- Individuals with certain genetic disorders (i.e., hemophilia) are at higher risk of bleeding disorders caused by lack of specific clotting factors.

Individual risk factors:

- Virchow's triad includes the three risk factors that contribute to excessive clotting. The result is platelet aggregation; fibrin is produced which then traps red blood cells, white blood cells and platelets which adhere to the vein wall forming a thrombus.
 1. Hypercoagulability
 - a. Estrogen (increased clotting factors)
 - b. Tobacco use (increased fibrinogen)
 2. Venous Stasis



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- a. Immobility
 - b. Orthopedic surgery
 - c. Pregnancy
3. Endothelial damage
- a. Intravenous (IV) catheters
 - b. Trauma
- Some medical conditions increase the risk of excessive bleeding (thrombocytopenia, hemophilia)
 - Some medical conditions increase the risk of excessive clotting (polycythemia, atrial fibrillation)

Physiological Processes and Consequences:

- Knowledge of the Coagulation Cascade is essential to understand the causes and effects of clotting problems across the spectrum from bleeding to thrombus. Abnormal bleeding can result from diminished clot generation or enhanced clot lysis, while excessive clot formation or reduced clot lysis can lead to excessive thrombosis. Clotting factors, including platelets, respond to triggers in the clotting cascade to form clots. A decrease or absence of clotting triggers or factors may result in bleeding and hemorrhage. Hypercoagulable states and accumulation of clotting factors may result in venous and arterial thrombosis. Fibrinolysis and other processes control clotting and prevents extension of the clot. Failure of this process supports the extension and embolism of clots. The combination of all these processes will result in Disseminated Intravascular Clotting (DIC)
- **Consequences**
 - Bleeding into tissues
 - Hemorrhage
 - Deep Vein Thrombosis (DVT)
 - Embolism and tissue infarction
 - DIC

Assessment:

Subjective:

- Thorough past medical history to include acute and chronic conditions known to be associated with bleeding or thrombus disorders (i.e., polycythemia, Hemophilia A and B, leukemia, Von Willebrand disease (VWD), childbirth, liver failure, trauma, long trips resulting in immobility, etc.)
- Medications that may affect clotting (aspirin, warfarin, clopidogrel)



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- Herbal and dietary supplements that may affect clotting (chamomile, chondroitin, garlic, ginger, etc.)
- Lifestyle habits: exercise, tobacco use
- Unusual bleeding (bruising easily, nosebleeds, black tarry stools, etc.)
- Thrombus symptoms (pain, edema, paresthesia in lower extremities, etc.)

Objective:

- Examination findings will vary based on the clotting condition.
 - **Bleeding:**
 - Skin: Petechiae, ecchymosis, purpura
 - Musculoskeletal: Pain, redness, edema and decreased range of motion (ROM)
 - Brain: Signs and symptoms of hemorrhagic stroke
 - Vital signs: Blood pressure and heart rate
 - **Thrombus:**
 - Arterial:
 - '5 Ps': pain, paresthesia, paralysis, pulselessness, pallor, poikilothermia
 - Ischemic stroke, myocardial infarction (MI)
 - Venous: lower extremities are usually involved
 - Pain, redness, edema
 - Pulmonary Emboli
 - Dyspnea, chest pain and hemoptysis

Diagnostic Tests:

- Laboratory
 - Red blood cell (RBC) count
 - Hemoglobin and hematocrit (Hgb and Hct)
 - Partial thromboplastin time (PTT)
 - Prothrombin time (PT)
 - International normalized ration (INR)
 - Fibrinogen
 - D-dimer
 - Platelet count
 - Bone marrow
 - Activated clotting time (ACT)
 - Fibrinogen degradation products (FDP)
 - Rotational thromboelastometry (ROTEM)
- Radiology



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- Ultrasound
- Arteriogram
- Venogram
- Probability scoring
 - Well's Criteria for deep vein thrombosis (DVT) (Well's Criteria for DVT)
 - DIC score (International Society of Thrombosis & Hemostasis DIC Scoring System)

Clinical Management:

Primary Prevention: Health Promotion

- Excessive bleeding: Genetic counseling
- Excessive clotting: Minimize risks related to Virchow's Triad. Some examples include:
 - Tobacco use cessation
 - Regular exercise
- DVT prophylaxis in hospitalized/immobilized patients
 - Early mobilization
 - Anticoagulants
 - Sequential compression device

Secondary Prevention: Screening

- No routine tests for the general public are available related to this concept.

Tertiary Prevention: Treatment

Collaborative Care:

- Interventions for patients with bleeding disorders:
 - Monitor lab results
 - If a bleeding episode occurs, control bleeding and volume replacement and/or blood transfusion
 - Clotting factor replacement and/or medications to stimulate production of factors
 - Antifibrinolytic agents (Tranexamic Acid [TXA], Recombinant factor VIIa)
- Interventions and/or prophylaxis for patients with clotting disorders:
 - Pharmacotherapy agents related to clot formation:
 - Anticoagulants
 - Antiplatelets
 - Direct thrombin inhibitors



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- Thrombolytic agents
- Mechanical prophylaxis (sequential compression device)
- Invasive procedures
 - Phlebotomy
 - Thrombectomy
 - Vena cava filters

Nursing Management:

The focus of nursing care r/t clotting disorders is related to education and supportive care interventions.

- Assessment:
 - Determine risk to initiate early intervention (thrombus)
 - Recognize and teach signs and symptoms of bleeding and thrombus
- Education related to minimizing risk of trauma/injury to patients with bleeding disorders
 - Avoid contact sports, soft toothbrush, minimize injections, etc.
- Medication education:
 - Warfarin has dietary implications (NIH Clinical Center Drug-Nutrient Interaction Task Force)
 - Anticoagulant medication education:
 - The use of standardized practices for anticoagulation therapy that include patient involvement can reduce the risk of adverse drug events associated with heparin (unfractionated), low molecular weight heparin, and warfarin (Joint Commission: Hospital National Patient Safety Goals - #3).
- Positioning will vary based on the clotting condition. For example:
 - DVT – elevate affected extremity to increase venous return
 - Arterial thrombus – affected extremity should be in a dependent position to improve perfusion
- Administration of blood products in bleeding disorders

Interrelated Concepts:

- Perfusion: Relates to all clotting conditions as perfusion is disrupted with bleeding and thrombi.
- Gas Exchange: Impairment occurs when a pulmonary emboli reduces the blood supply to the lungs.
- Intracranial Regulation: Can be affected by a hemorrhagic or ischemic stroke.



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Model Case:

Mary Smith is an 80-year-old female who was admitted to the nursing unit with a complaint of left lower extremity (LLE) pain. Her past medical history is extensive and includes tobacco use (one and a half packs of cigarettes a day for sixty years), mobility issues related to multiple back surgeries (she can only walk short distances with a walker), Type 2 Diabetes (insulin dependent) with peripheral neuropathy, and oxygen dependent COPD. Her left calf area is red, edematous and warm to touch. An ultrasound confirmed a LLE DVT. She was placed on a Heparin drip and warfarin was started.

Mary exhibits two of the Virchow's triad risk factors for developing a clot:

- 1) Hypercoagulability (tobacco use) and
- 2) Venous stasis (immobility and increased platelet adhesiveness secondary to her advanced age).

She was treated with anticoagulants and required education (patient and caregiver) since she would be on warfarin for three to six months.

Exemplars:

New Mexico Nursing Education Consortium (NMNEC) Required Exemplars:

- Venous Thromboembolism (VTE)
 - Pulmonary embolism resulting from deep vein thrombosis—collectively referred to as venous thromboembolism—is the most common preventable cause of hospital death (Agency for Healthcare Research and Quality [AHRQ])
- Disseminated Intravascular Coagulation (DIC)
 - DIC is a complication of underlying illness occurring in approximately 1 percent of hospital admissions (Leung, 2012)



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References:

Agency for Healthcare Research and Quality (AHRQ): Preventing Hospital-Acquired Venous Thromboembolism <http://www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/vtguide/index.html>

Joint Commission: Hospital National Patient Safety Goals - #3: Reduce the likelihood of patient harm associated with the use of anticoagulant therapy. http://www.jointcommission.org/assets/1/18/NPSG_Chapter_Jan2013_HAP.pdf

International Society of Thrombosis and Hemostasis: DIC Scoring System. Retrieved from <http://reference.medscape.com/calculator/dic-score>

Leung, L. (2017). Clinical features, diagnosis, and treatment of DIC in adults. UpToDate http://www.uptodate.com/contents/clinical-features-diagnosis-and-treatment-of-disseminated-intravascular-coagulation-in-adults?source=search_result&search=dic&selectedTitle=1%7E150

NIH Clinical Center Drug-Nutrient Interaction Task Force: Important information to know when you are taking Warfarin and Vitamin K. Retrieved from http://www.cc.nih.gov/cc/patient_education/drug_nutrient/coumadin1.pdf

Well's Criteria for DVT. Retrieved from <http://www.mdcalc.com/wells-criteria-for-dvt/>

Resources:

Agency for Healthcare Research and Quality (AHRQ) American Academy of Orthopedic Surgeons: Preventing venous thrombotic disease in patients undergoing elective hip and knee arthroplasty. (2011) <http://www.guideline.gov/content.aspx?id=35173>

Healthy People 2020 Topics & Objectives: Blood disorders and blood safety <http://www.healthypeople.gov/2020/topicsobjectives2020/default.aspx>

Wilson, S. (2017). Clotting. In J.F. Giddens (Ed.), *Concepts for Nursing Practice* (2nd ed.) (pp. 189-195). St. Louis, MO: Mosby Elsevier.