Content Description

This session will provide a review of hematologic disorders to prepare the participant for the CCRN and PCCN examinations. The disorders for review are disseminated intravascular coagulation (DIC), heparin-induced thrombocytopenia (HIT), idiopathic thrombocytopenia purpura (ITP) and thrombotic thrombocytopenia purpura (TTP). Anemia will also be reviewed. This section of the CCRN and PCCN examinations accounts for 2% of all questions.

Learning Objectives
At the completion of this session the participant will be able to:

1. Describe the collaborative management of the patient with HIT
2. Discuss the pathophysiology of DIC
3. Describe the clinical manifestations of ITP, TTP and anemia (anemia content in PCCN exam only)

I. Coagulopathies
   A. Acutely ill hospitalized adults develop coagulopathies due to abnormalities in
      1. Platelets
      2. Hemostasis
      3. Fibrinolysis
      4. Combination of all factors
   B. Heparin-Induced Thrombocytopenia
      1. Rare but serious complication associated with heparin administration
      2. Decrease in platelet count
      3. Appearance of thromboembolic events
      4. Type I (mild) and II (more serious)
      5. Immune- mediated process that causes the development of anti-platelet antibodies
      6. Not all patients with antibodies have clinical manifestations
      7. No definitive diagnostic test
   C. Management of HIT
      1. Discontinue all forms of heparin
      2. Use other anticoagulants
      3. Prevention
         a. Use of LMWH less likely to produce HIT
D. Other Platelet Disorders
   1. Idiopathic thrombocytopenia purpura
      a. Autoimmune destruction of platelets
      b. Primary disorder or due to AIDS, SLE, drugs
      c. Results in petechiae, purpura, epistaxis
      d. Management
         1) Steroids
         2) IVIG
         3) Splenectomy
   2. Thrombotic thrombocytopenia purpura
      a. Viral or associated with toxin in E. coli
      b. Hemolytic anemia, fever, renal failure, widespread vascular occlusion, bleeding
      c. Management with plasmapheresis

II. Bleeding and Clotting Disorders
   A. Disseminated intravascular coagulation (DIC)
      1. Secondary to other disease processes
         a. May occur acutely due to sepsis
         b. Chronic form occurs with cancer
         c. Complex, diffuse response to systemic activation of the coagulation system
         d. Circulating thrombin converts fibrinogen to fibrin with fibrin deposition within microcirculation and results in:
            1) Systemic activation of fibrinolytic system and circulation of plasmin
            2) Plasmin- systemic lysis of fibrin to FDP and hemorrhage
   B. Bleeding in DIC
      1. Due to overactivation and eventual consumption of available clotting factors and platelets
      2. Systemic fibrinolysis
      3. Thrombocytopenia
      4. Platelets aggregate due to thrombin
      5. Clotting factor deficiency
      6. Platelet dysfunction
      7. Due to effect of FDP
      8. Normal mechanisms cannot compensate for this consumption
   C. Diagnosis of DIC
      1. PT and PTT increased
      2. Thrombin time increased
      3. Platelet count decreased
      4. Fibrinogen reduced
         a. Plasmin-mediated fibrinolysis
      5. Fibrin degradation products (FDP) elevated
      6. Thrombocytopenia
      7. D-dimer test
a Accurate enzyme-linked immunosorbent assay (ELISA)
b More specific indicator of fibrinolysis than other tests
c Fibrin monomers (unstable form of fibrin)
d Indicator of abnormal clotting

D. Clinical Manifestations of DIC
1. Hemorrhage- predominant clinical finding
   a Sites of injury
      1) Surgical incisions
      2) Venipuncture sites
      3) Gastric ulcers
2. Spontaneous bleeding from intact sites
   a Ecchymosis
   b Petechia
   c Epistaxis
   d Hemoptysis
3. Hematuria
4. GI bleeding
5. Cranial, peritoneal or pericardial

E. Thrombotic Manifestations of DIC
1. Result in obstruction of blood flow to multiple organ systems and multiple system failure
2. Ischemia to end organs
3. Major cause of morbidity, mortality in DIC

F. Pathophysiology of Disseminated Intravascular Coagulation
1. Triggered by disease states/conditions systemically activating coagulation system
2. Systemic endothelial damage as in presence of bacterial endotoxin (sepsis)
3. Release of procoagulants into systemic circulation as in presence of malignancy
4. Contact activation of clotting cascade (bypass)

G. Diseases and Conditions Causing DIC
1. Tissue injury (burns, crush injury, trauma)
2. Infectious diseases (bacterial, viral, fungal)
3. Intravascular hemolysis
4. Obstetric states

H. Management of DIC
1. No definitive treatment
2. Alleviate underlying cause
3. Supportive therapy
   a Heparin
      1) Risk of bleeding and efficacy not reported
   b Recombinant activated protein C
      1) Inhibits thrombin but not tested in DIC
   c Vitamin K to enhance factor production
   d Recombinant activated factor VIIa
      1) Reported to reduce hemorrhage in trauma patients
2) At high doses attaches to activated platelets, enhancing production of a fibrin clot resistant to fibrinolysis

III. Disorders of Hemostasis
A. Inherited abnormalities of coagulation factors
B. Hemophilia type A and B
   1. Factor VIII and factor IX deficiencies
C. Von Willebrand’s disease
   1. Plasma deficiency
D. Replace deficient factors
E. Monitoring when hospitalized
F. Management of Coagulopathies
   1. Restore normal hemostasis
   2. Treat platelet disorders
   3. Steroids
   4. IVIG
   5. Discontinue offending medication
   6. Acute replacement of coagulation factors
   7. Vitamin K
   8. Control and prevent bleeding
   9. Minimize trauma, prevent disruption in skin and mucous membranes
   10. Apply pressure to puncture sites

IV. Anemia-
A. Blood loss
   1. Abnormal or inadequate production of RBC’s
   2. Destruction of RBC’s
   3. Acute anemia
      a. Abrupt reduction of RBC’s
      b. Reduced production of erythropoietin
B. Clinical Manifestations of Mild to Moderate Anemia
   1. Tachycardia, angina
   2. Hypotension, orthostasis
   3. Dysrhythmias
   4. Exertional dyspnea, tachypnea
   5. Fatigue, weakness
   6. Pallor, dusky nailbeds
C. Clinical Manifestations of Severe Anemia
   1. Decreased oxygen delivery to tissues
   2. Anaerobic metabolism
   3. Lactate production
   4. Myocardial infarction
   5. Ischemic stroke
D. Management of Anemia
1. Restoring hemostasis
2. Maintaining hemostasis
3. Improve oxygen delivery
   a. Supplemental oxygen
   b. RBC transfusion to replete hemoglobin
   c. Other volume replacement
   d. Monitor patient vital signs, response to therapy
   e. Minimize activity
4. Identifying & treating underlying disease states
   a. Diagnostic tests (radiologic, endoscopic)
   b. Erythropoietin to increase marrow production in chronic anemia
   c. Iron preparation
   d. Vitamin B12 & folic acid
5. Minimize blood loss/reduce transfusions
   a. Small volume blood collection tubes
   b. Daily assessment of routine blood draws
   c. Autologous blood donation
   d. Prophylaxis against GI bleeding

E. Who Should Be Transfused?
   1. Controversial & varying practices
   2. Optimal hemoglobin & hematocrit level for acutely ill adults has not been determined
   3. Transfusion triggers:
   4. Avoidance of unnecessary transfusion

F. Transfusion of Blood Components: Adverse Outcomes
   1. TRALI
   2. Immunosuppression
   3. Organ dysfunction
   4. Transmission of infectious diseases
      a. Hepatitis B
      b. West Nile virus
      c. Hemolytic
      d. Nonhemolytic transfusion reactions

Certification Questions
1. A young woman did not seek medical care during her brief, medical care during her brief, unwanted pregnancy owing to her cultural beliefs as well as to economic challenges. One week ago, the patient’s grandmother helped her to end the pregnancy, using traditional methods. Today the woman collapsed at school and was transported to the hospital exhibiting petechiae on her skin and difficulty breathing. Which of the following best explains the pathophysiology underlying this patient’s condition?
   A. Amniotic fluid has entered her bloodstream and caused an embolism
   B. Trauma from delivery of the premature fetus led to hemorrhage
   C. Bacterial endotoxins have altered her coagulation pathways
   D. Her kidneys were damaged by toxins during her pregnancy
2. A patient recently treated for deep vein thrombosis is now admitted to the ICU. The patient is pale and complains of dizziness, chest pain, and shortness of breath. During the review of medications, the nurse learns that the patient has been on heparin therapy. Which of the following laboratory test would be most important for determining whether this patient is experiencing heparin-induced thrombocytopenia (HIT)?
   A. Enzyme-linked immunosorbent assay (ELISA) and platelet count
   B. International normalized ratio (INR) and prothrombin time
   C. Complete blood count with manual differential
   D. Arterial blood gas and mixed venous blood gas

3. Your patient received one unit of packed cells. You would expect which of the following effects of the transfusion?
   A. Increase in hemoglobin by 0.5 gm/dl and increase in hematocrit by 2%
   B. Increase in hemoglobin by 0.5 gm/dl and increase in platelets by 50,000/mm3
   C. Increase in hemoglobin by 1 gm/dl and increase in hematocrit by 3%
   D. Increase in hemoglobin by 1 gm/dl and increase in platelets by 50,000/mm3

4. The most common cause of DIC is:
   • A. Carcinoma
   • B. Surgery
   • C. Sepsis
   • D. Vasculitis

References


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