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**Pre-Lecture**

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## I. You are the Provider

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Time: 10 minutes

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Small Group Activity/Discussion

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### **Purpose**

This activity is designed to help introduce your students to the content of this chapter.

### **Instructor Directions**

1. Direct students to read the “You are the Provider” scenario found throughout Chapter 34.
2. You may wish to assign students to a partner or a group. Direct them to review the discussion questions at the end of the scenario and prepare a response to each question. Facilitate a class dialogue centered on the discussion questions.
3. You may also assign this as an activity and ask students to hand in their comments on a separate piece of paper.

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**Lecture**

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## I. Introduction

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Time: 5 minutes

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Slides: 2–3

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Lecture

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### **A. Hematologic Emergencies**

1. EMS systems rarely respond to hematologic emergencies.
2. Hematologic disorders can be complex, difficult to assess, and challenging to treat in the out-of-hospital setting.
3. Limited interventions
4. Hematopoietic system
  - a. Blood components and organs involved in their development and production

### **B. You are the Provider**

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Slide: 3

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Discussion

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1. Present the case study provided on the slide:
  - a. You are dispatched to the private home of a 32-year-old woman complaining of shortness of breath.

- b. When you arrive on scene, you notice the patient is showing signs of shock.
- c. As you assess and care for critically injured or ill patients, keep in mind the issue that may lead to DIC. You need to identify the signs and symptoms commonly associated with DIC or the progression towards it.

## II. Anatomy and Physiology

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Time: 10 minutes

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Slides: 4–11

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Lecture

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### A. Blood and Plasma

#### 1. Functions

- a. Respiratory function: transports oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs.
- b. Nutritional function: carries nutrients (glucose, proteins, and fat) from the digestive tract to cells throughout the body.
- c. Excretory function: ferries the waste products of metabolism from the cells where they are produced to the excretory organs.
- d. Regulatory function: transports hormones to their target organs and transmits excess internal heat to the surface of the body to be dissipated.
- e. Defensive function: carries defensive cells and antibodies, which protect the body against foreign organisms.

#### 2. Components

- a. Plasma is essentially 92% water, 6%–7% proteins, and 1%–2% other elements, and accounts for 55% of the total blood volume.
- b. Formed elements account for 45% of the total blood volume and include red blood cells (RBCs or erythrocytes), white blood cells (WBCs or leukocytes), and platelets (thrombocytes).

#### 3. Production

- a. RBCs are produced within stem cells.
- b. Take as long as 5 days to mature and have a life span of 4 months
- c. Iron-rich hemoglobin carries oxygen (gives it its red color).

#### 4. Laboratory tests

- a. RBC count, measuring the number of RBCs in a sample of blood
- b. Hemoglobin level, identifying the percentage of hemoglobin in RBCs
- c. Hematocrit, giving the overall percentage of RBCs in the blood

### B. Blood-Forming Organs and RBC Production

#### 1. Bone marrow

- a. Primary site for cell production within the human body
- b. Found in most of the long bones as well as the pelvis, skull, and vertebrae

#### 2. Liver

- a. Produces clotting factors found in the blood

- b. Filters the blood, removing toxins, and is essential to metabolism and homeostasis
- 3. Spleen
  - a. Filters and breaks down erythrocytes
  - b. Assists in the production of lymphocytes

### C. Inflammatory Response

- 1. At birth all cells and blood contain antigens.
  - a. Activate the immune system

### D. The Immune System

- 1. Primary component is the WBCs.
- 2. Several subcomponents:
  - a. Neutrophils
  - b. Lymphocytes
  - c. Basophils
  - d. Eosinophils

### E. Blood Classifications

- 1. ABO system
  - a. Ensures compatibility of blood types
  - b. RBC classification types are "O," "A," "B," and "AB" indicating antigens in the plasma membrane.
  - c. Rh is a secondary antigen.
  - d. Transfusion reaction similar to anaphylactic reaction is due to incompatible blood types.

### F. Homeostasis and the Homeostatic Mechanism

- 1. Homeostasis is the close balance the body must work to maintain.
- 2. What goes in must come out, what comes out must go in.

### G. You are the Provider (continued)

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Slide: 11

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Discussion

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- 1. Continue reading the case study provided on the slide:
  - a. The patient advises you that she was discharged from the hospital four days ago, post a motor vehicle collision.
  - b. *What should you suspect is wrong with this patient?*

## III. Epidemiology

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Time: 15 minutes

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Slides: 12–27

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Lecture

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### A. Anemia

1. A hemoglobin or erythrocyte level that is lower than normal
2. May result from acute or chronic blood loss or a decrease in production or an increase in destruction of erythrocytes
3. Hemolytic disorder
  - a. Related to the breakdown of RBCs
4. Iron deficiency anemia
  - a. Most common type
  - b. Causes include gastrointestinal blood loss, menstrual bleeding, and blood loss due to frequent donations or diagnostic tests
  - c. In children it is most often related to premature birth or low birth weight.
5. Hematologic disorders
  - a. Can be hereditary
  - b. Include disease caused by genetic problems (sickle cell disease and thalassemia)
  - c. During formation these cells may become rigid and deformed and then may become lodged in small blood vessels, leading to a thrombosis (blood clot).
  - d. The most common type of acquired anemia develops when the flow of RBCs is disrupted; RBCs are destroyed by the body's own antibodies.
  - e. Areas of high altitude can cause hypoxia, difficulty breathing, and chest pain.

## **B. Leukemia**

1. Develops in the lymphoid system
2. Cancer
3. WBCs develop abnormally and/or excessively.
4. Classified as acute or chronic
  - a. Chronic develops more frequently in older populations. Abnormal lymphoid cells accumulate in the bone marrow, lymph nodes, spleen, and peripheral blood.
  - b. In acute leukemia bone marrow is replaced with abnormal lymphoblasts.
5. Approximately 80% of children will be cured when their leukemia is diagnosed and treated early.
6. The adult cure rate is at best 30% to 40%.

## **C. Lymphomas**

1. Malignant diseases that arise within the lymphoid system
2. Two categories (non-Hodgkin lymphoma and Hodgkin lymphoma)
3. Non-Hodgkin lymphoma
  - a. Can occur at any age in any person and can be hereditary
  - b. Characterized by the progression of the disease (indolent, aggressive, or highly aggressive)
4. Hodgkin lymphoma
  - a. Painless progressive enlargement of the lymphoid glands (spleen and lymph nodes)
  - b. Rare, suspected to have some hereditary components
  - c. Two peaks in incident range (15–35 years old, and 55–60 years old)

- d. Twice as common in men as in women

#### **D. Polycythemia**

1. Overabundance or overproduction of RBCs
2. Hyperviscosity of the circulatory system
3. May cause strokes, transient ischemic attacks, headaches, and abdominal pain
4. Clinical treatment usually includes phlebotomy.

#### **E. You are the Provider (continued)**

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Slide: 19

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Discussion

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1. Continue reading the case study provided on the slide:
  - a. The patient appears to be clammy, pale in color, and is very diaphoretic.
  - b. Capillary refill is greater than 3 seconds and you palpate a blood pressure of 80 systolic/palp.
  - c. *What is your treatment for this patient?*
    - You need to treat this patient for shock. Place the patient supine, provide 100% high-flow oxygen, initiate a large-bore IV, and infuse a fluid bolus. Begin immediate transportation to the hospital.

#### **F. Disseminated Intravascular Coagulopathy**

1. May result from any number of life-threatening conditions such as massive injury and hypotension due to trauma (sepsis and obstetric complications may also cause it).
2. Two stages
  - a. First, free thrombin and fibrin deposits in the blood increase and platelets aggregate.
  - b. The coagulation system and fibrinolytic system become overwhelmed.
  - c. The fibrinolytic system is activated, causing a breakdown of the fibrin clots.
  - d. In the second stage, uncontrolled hemorrhage results from severe reduction in clotting factors.

#### **G. Hemophilia**

1. Bleeding disorder in which clotting does not occur or occurs insufficiently (von Willebrand disease)
2. Usually associate with an X-linked recessive inheritance pattern
3. Two types (type A, type B)
  - a. Type A is due to low levels of factor VIII (antihemophilic globulin and antihemophilic factor).
  - b. Type B is associated with a deficiency of factor IX (plasma thromboplastin component, also known as the Christmas factor).
4. Primarily found in males
5. Acute chronic bleeding that may or may not be fatal

#### **H. Sickle Cell Disease**

1. Leading inherited blood disorder
2. Primarily affects African American, Puerto Rican, and European populations but it can occur in anyone.
3. Starts with a gene defect of the adult hemoglobin (HbA)
  - a. Inherited from one or both parents
  - b. Defective RBCs are misshapen (oblong instead of smooth, round shape).
  - c. Poor oxygen carrier
  - d. Odd shape may cause RBCs to lodge in small blood vessels (thrombotic crisis) or in the spleen (swells and ruptures).

### I. Multiple Myeloma

1. Abnormal plasma cells infiltrate the bone marrow.
  - a. Neoplastic (tumor) cells allow tumors to form inside the bones.
  - b. May also accelerate protein development within the bloodstream leading to organ failure (kidneys) and eventually death

### J. You are the Provider (continued)

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Slide: 27

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Discussion

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1. Continue reading the case study provided on the slide:
  - a. You notice there are some skin changes.
  - b. There are small black and blue marks on her chest and abdomen.
  - c. She becomes unresponsive; a repeat of her blood pressure reveals the same result.
  - d. *What is your next step?*
    - You need to maintain and control the patient's airway; intubate the patient if necessary. You should immediately be suspecting DIC.

## IV. General Assessment and Management

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Time: 15 minutes

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Slides: 28–46

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Lecture

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### A. Hematologic Disorders

1. Exam of patient with suspected hematologic disorder should be no different than any other assessment.
2. A few additional items to consider:
  - a. Fully understand the chief complaint.
  - b. Note any signs and symptoms that may be immediately life threatening.
  - c. Be inquisitive about the patient's history and SAMPLE history.
  - d. Be very supportive because the patient may be reluctant to disclose the condition fearing they may be treated differently because of it.
3. General management should include the following elements
  - a. Oxygen

- b. Fluids
- c. Electrocardiogram (ECG)
- d. Transport
- e. Pharmacology
- f. Psychological support

## **B. Assessment and Management of Anemia**

1. Common complaints
  - a. I feel worn down.
  - b. I can't catch my breath.
  - c. My chest hurts.
2. General management
  - a. Recheck vitals frequently.
  - b. Use IV fluids cautiously.
  - c. Use a 12-lead ECG to rule out MI.

## **C. Assessment and Management of Leukemia**

1. Complaints relate to severity of the disease and current treatment.
  - a. Fatigue or neurological problems are common.
  - b. Pain, unexplained bleeding, and dyspnea
  - c. Signs of shock are common.
2. General management
  - a. Analgesics for pain management
  - b. IV fluid bolus for signs of shock
  - c. Be ready; patient condition may deteriorate quickly.

## **D. Assessment and Management of Lymphomas**

1. Ask specific questions.
  - a. What type do you have?
  - b. What kind of treatment are you getting?
  - c. Where are you at in the treatment plan?
2. General management
  - a. Aggressive pain management
  - b. IV fluid bolus for shock
  - c. ECG to watch for and treat dysrhythmias
  - d. Transport to appropriate facility if possible.

## **E. Assessment and Management of Polycythemia**

1. Assessment findings vary widely.
  - a. Altered LOC due to stroke or TIA
  - b. Hypoxia due to poor circulation
  - c. Tachycardia
  - d. Purplish skin with red hands and feet

2. General management

- a. Pain control
- b. Heart rate control

**F. Assessment and Management of DIC**

1. Identify the cause underlying the patient's presenting condition and establish treatment early.
2. Patient will be most likely be severely injured.
  - a. Watch for sudden respiratory changes.
  - b. Signs of shock arise quickly.
  - c. Skin may show black and blue marks on chest and abdomen.
3. Treatment must be started early.
  - a. Maintain the airway and give high levels of O<sub>2</sub>.
  - b. Treat early shock aggressively; keep patient warm.
  - c. Provide medications for pain and heart rhythm control.

**G. Assessment and Management of Hemophilia**

1. Common complaints
  - a. Pallor, weak pulse, and hypotension
  - b. Frequent bleeding of unknown origin
  - c. Bloody noses, blood in sputum or stool
  - d. Hypoxia
2. General management to include:
  - a. Treatment of heart dysrhythmias
  - b. IV is temporary measure; patient will need plasma.
  - c. Analgesics for pain

**H. Assessment and Management of Sickle Cell Disease**

1. Don't take a call for this lightly; patients are often in life-threatening situations.
  - a. Significant shortness of breath
  - b. Hypotension
  - c. Jaundice or yellowing of the eyes
  - d. Multiple system involvement with high levels of pain
2. General management
  - a. Aggressive airway and circulation support
  - b. IV fluid boluses for hypotension
  - c. Rapid transport
  - d. Analgesics for pain control
  - e. High levels of oxygen to prevent further destruction of RBCs due to hypoxia

**I. Assessment and Management of Multiple Myeloma**

1. Early stage symptoms may be as simple as fatigue or mild pain.

2. Later stage disease may be evidenced by unexplained hemorrhage and significant weight loss, frequent bone fracture, and elevated pain in any number of locations.
3. General management
  - a. Analgesics for pain
  - b. Support for the patient because they may think they are going to die
  - c. Transport to a facility capable of treating myeloma

**J. You are the Provider Summary**

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Slide: 45

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Discussion

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1. Continue reading the case study provided on the slide:
  - a. It is important to identify the underlying cause of the patient's presenting condition and establish early treatment.
  - b. Do not delay transportation to the hospital.
  - c. Patients who have DIC due to severe trauma have a poor survival rate; they will need strong support. Be optimistic but honest and do not provide a false impression of survival.

**K. Summary**

1. Encountering hematologic disorders in the field is a rare and challenging situation.
2. Interventions are limited but important.
3. Do not delay transportation to the hospital.

**Post-Lecture**

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**I. Prep Kit Activities**

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Time: 65 minutes

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*Note: This section contains various student-centered end-of-chapter activities designed as enhancement to instructor's preparation. As time permits, these activities may be presented in class. They are also designed to be used as outside homework/activities.*

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**A. Assessment in Action**

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Time: 20 minutes

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Individual/Small Group Activity/Discussion

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**Purpose**

This activity is designed to assist students in gaining a further understanding of the chapter content. This activity allows students an opportunity to analyze an emergency care scenario, develop responses, and integrate what they have learned.

**Instructor Directions**

1. Direct students to read the "Assessment in Action" scenario located in the Prep Kit at the end of Chapter 34.
2. Direct students to read and individually answer the quiz questions at the end of the scenario. Facilitate a class review and dialogue of the answers, allowing students to correct responses as may be needed. Use the quiz question answers noted below to assist in building this review.
3. You may also wish to assign these as individual activities and ask students to turn in their comments on a separate piece of paper.

### Answers to Multiple-Choice Questions

*You are dispatched for a "sick person." When you arrive on scene, you find a 32-year-old woman lying supine on her couch. She called 9-1-1 because she has not been feeling right for about 1 week and just can't move today. During your assessment, you note that she is very pale; her skin is warm and dry. Her vital signs seem to be within normal limits. The patient says that she is tired all the time and has lost approximately 20 pounds during the past 3 to 4 weeks. She denies any chance of pregnancy but reports that her menstrual cycles have been heavier. She denies any medical history of disease and tells you that she takes a daily vitamin and an iron supplement.*

*You apply oxygen via a nasal cannula at 4 L/min, begin an IV line at a keep-vein-open rate, and transport the patient to the hospital. While you are obtaining your patient's disposition, an emergency department staff member tells you that the patient was admitted to a regular floor with anemia.*

1. What is anemia?
  - A. Reduction below the normal levels of RBCs, as shown by a decreased hemoglobin or hematocrit level
  - B. A malignant tumor of blood-forming tissue
  - C. Overproduction of RBCs and platelets
  - D. A malignant tumor of lymphatic tissues

**Answer: A.** Anemia is a reduction below the normal levels of RBCs, as shown by a decreased hemoglobin or hematocrit level. It may be due to a number of causes, mostly precipitated by blood loss, chronic diseases, iron deficiency, or intravascular hemolysis.

2. What is the name of the body system that produces blood cells?
  - A. Circulatory system
  - B. Respiratory system
  - C. Hematopoietic system
  - D. Hepatic system

**Answer: C.** The hematopoietic system produces blood cells. It includes the liver, spleen, bone marrow, and blood components.

3. What are the blood-forming organs in an adult?
  - A. The liver and spleen

- B. Bone marrow
- C. Myocardium
- D. Lungs

**Answer: B.** Bone marrow. The liver and spleen produce RBCs during fetal life. The bone marrow carries out the majority of RBC production after birth.

4. What is the normal life cycle of an RBC?

- A. 1 month
- B. 3 months
- C. 4 months
- D. 1 year

**Answer: C.** Mature RBCs circulate for approximately 4 months. After that, they are absorbed by the spleen and tissue macrophages.

5. Hematocrit (Hct) is:

- A. an iron-rich compound responsible for carrying oxygen to the tissues.
- B. a measure of RBCs per unit of blood volume.
- C. the pulse oximetry reading.
- D. the number of leukocytes per unit of blood volume.

**Answer: B.** Hematocrit is a measure of RBCs per unit of blood volume. It has also been called the packed cell volume. The normal range for women is 36% to 46% and for men is 41% to 53%.

6. Hemoglobin (Hb) is:

- A. an iron-rich compound responsible for carrying oxygen to the tissues.
- B. a measure of RBCs per unit of blood volume.
- C. the pulse oximetry reading.
- D. the number of leukocytes per unit of blood volume.

**Answer: A.** Hemoglobin is an iron-rich compound responsible for carrying oxygen to the tissues. If the number of RBCs is normal, the Hb is normal. If it is high, there are too many RBCs. If it is low, the patient is anemic. The normal range for women is 12 to 16 g/dL and for men is 13.5 to 17.5 g/dL.

7. Cells that can develop into other types of cells in the body are:

- A. stem cells.
- B. erythrocytes.
- C. fibrin.
- D. plasma.

**Answer: A.** Stem cells are cells that develop into other types of cells in the body. Erythrocytes (RBCs) are normally greatest in number and carry oxygen. WBCs are larger than RBCs and have the primary function of providing immunity within the body; they are derived from stem cells. WBCs are classified as granulocytes or agranulocytes. Fibrin

is a protein involved in the clotting process. Plasma is the waterlike medium that makes up 55% of blood.

8. \_\_\_\_\_ are the smallest of the formed elements and are responsible for the clotting of the blood.
- A. Leukocytes
  - B. Erythrocytes
  - C. Platelets
  - D. Stem cells

**Answer: C.** Platelets, the smallest blood elements, are responsible for the clotting of the blood. They are derived from stem cells and have an average life span of 16 days.

9. Blood transports oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. This is the \_\_\_\_\_ function.
- A. respiratory
  - B. nutritional
  - C. excretory
  - D. regulatory

**Answer: A.** The respiratory function of blood is that it transports oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs.

10. Blood carries glucose, proteins, and fats from the digestive tract to cells through the body. This is the \_\_\_\_\_ function.
- A. respiratory
  - B. nutritional
  - C. excretory
  - D. regulatory

**Answer: B.** The nutritional function is that blood carries nutrients (glucose, proteins, and fats) from the digestive tract to cells throughout the body.

11. Blood ferries the waste products of metabolism from the cells where they are produced to excretory organs. This is the \_\_\_\_\_ function.
- A. respiratory
  - B. nutritional
  - C. excretory
  - D. regulatory

**Answer: C.** The excretory function is that blood ferries the waste products of metabolism from the cells where they are produced to excretory organs.

12. Blood brings hormones to their target organs and transmits excess internal heat to the surface of the body to be dissipated. This is the \_\_\_\_\_ function.
- A. respiratory
  - B. defensive

- C. excretory
- D. regulatory

**Answer: D.** The regulatory function is that blood brings hormones to their target organs and transmits excess internal heat to the surface of the body to be dissipated.

13. Blood carries defensive cells and antibodies that protect the body against foreign organisms. This is the \_\_\_\_\_ function.
- A. respiratory
  - B. defensive
  - C. excretory
  - D. regulatory

**Answer: B.** The defensive function of blood is that it carries defensive cells and antibodies, which protect the body against foreign organisms.

### Challenging Questions

*You are dispatched to the local mall for a fall victim. On arrival, you find a 42-year-old man sitting at the base of the steps. According to witnesses, he tripped up the steps, lost his balance, and then fell down four steps. He is alert to his name but is confused about what happened. The patient complains of pain to his left axillary area and his left knee. During your assessment, you find him to be tachycardic, tachypneic, and grossly diaphoretic. His blood pressure is 70/30 mm Hg, heart rate is 118 beats/min, and respiratory rate is 30 breaths/min. While you and your partner are providing the patient with full cervical-spine precautions, you note a bruise on his left flank area. You provide the patient with 100% oxygen via a nonrebreathing mask and take him to the ambulance for transport to the emergency department.*

*During your focused exam, you note a medical ID tag that reads "Hemophilia A." You initiate IV therapy and provide a fluid bolus. The patient is transported to the hospital without any further incident. You give report to the emergency department nurse and physician. You overhear the physician order "factor VIII" from the pharmacy.*

14. What is your primary care in the field for a patient with hemophilia?

**Rationale:** Hemophilia is a blood disorder in which one of the proteins necessary for blood clotting is missing or defective. Hemophilia A is deficient in factor VIII; hemophilia B is missing factor IX. When a person who has hemophilia is injured, the injury could be life threatening. The bleeding will take longer to control because the individual's body cannot form stable fibrin clots. During prehospital treatment of patients with hemophilia, you need to pay attention to any prolonged bleeding. Administer oxygen therapy via a nonrebreathing oxygen mask, and initiate IV therapy, being careful not to cause other bleeding. Transport the patient safely and expeditiously to the hospital.

15. What would your primary care be for any patient with a hematopoietic problem?

**Rationale:** General management for a patient with hematopoietic problems is usually supportive. Many patients have chronic conditions that may be exacerbated when the patient is exposed to stressors such as infections, trauma, or anxiety. Some may have

significant blood or fluid loss; IV therapy should be initiated in these situations. Pay close attention to the ABCs. Give supportive care, including analgesics if the patient is in a great deal of pain. Provide psychological support to the patient and the patient's family as best as possible. Above all, provide expeditious but safe transport to the hospital.

## **B. Points to Ponder**

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Time: 20 minutes

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Individual/Small Group Activity/Discussion

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This activity addresses the affective objectives of the chapter, allowing you to help students probe the more difficult situations that they face. Use this as an opportunity to allow them to express differences of opinion and approach, while directing them to be thorough and decisive in their answers. Encourage challenges.

### **Purpose**

To allow students an opportunity to apply critical thinking analysis to a given case study.

### **Instructor Directions**

1. Direct students to read the "Points to Ponder" scenario found in the Prep Kit at the end of Chapter 34.
2. You may wish to assign students to a partner or a group and direct them to review the discussion question at the end of the scenario and prepare a response. Facilitate a class dialogue centered on the discussion point.
3. You may also ask students to complete this activity on their own and hand in their comments on a separate piece of paper.
4. Personally review the scenario and discussion question based on your experience and knowledge as an emergency care professional. Develop your own key points for guiding this discussion.

### **Scenario**

*You respond to a private residence, where you find a 28-year-old African American woman lying in bed. She complains of pain in her chest with associated shortness of breath. You note swelling of her hands and feet. The patient says that she has had the flu for the past 2 days and has vomited at least four times. She has also had a low-grade fever and generalized body aches. Your physical exam reveals nothing truly remarkable. The patient has a history of high blood pressure and sickle cell disease.*

What is happening with this patient physiologically?

What, if any, treatment should you administer?

### **Issues**

Understand the Urgency for Assessment and Intervention in Patients With Hematologic Crises

### **Discussion**

Sickle cell disease is a disease that causes the RBCs to be misshapen, resulting in poor oxygen-carrying capability and potentially resulting in the lodging of RBCs in blood vessels or the spleen. This disease produces hemoglobin S. When hemoglobin S is exposed to low-oxygen states, it crystallizes and turns the RBC into the shape of a sickle. These sickle cells cannot pass through the tiny blood vessels, so they block the vessels to vital organs. The resulting vaso-occlusive sickle cell crisis may be life threatening. Fewer and fewer RBCs reach the organs; tissues and joints become hypoxic and can cause severe pain.

This scenario presents an acute sickle cell crisis that was probably exacerbated by the flu. The patient probably became dehydrated from the vomiting. This patient requires oxygen therapy and IV fluid therapy to help manage the dehydration. She will also need pain medication.

## II. Lesson Review

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Time: 10 minutes

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Discussion

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*Note: Facilitate the review of this lesson's major topics using the review questions as direct questions or overhead transparencies. Answers are found throughout this lesson plan. Each question includes a reference to the slide where the information is covered.*

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1. What are the major components of blood and plasma? (Lecture II-A)
2. What is the importance of a functional immune system? (Lecture II-D)
3. Who are universal blood donors, and who are recipients? (Lecture II-E)
4. Why is it important for the body to remain in balance? (Lecture II-F)
5. What are the stage progressions of DIC? (Lecture III-F)
6. Who commonly are carriers of sickle cell disease? (Lecture III-H)
7. What is the importance of an ECG in hematological emergencies? (Lecture IV-A)
8. Why do many hematological patients require aggressive pain management? (Lecture IV-A)
9. Why should you be cautious with IV fluids in anemia? (Lecture IV-B)
10. Why are crises in sickle cell disease patients serious? (Lecture IV-H)

## III. Assignments

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Time: 5 minutes

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Lecture

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1. Review all materials from this lesson and be prepared for a lesson quiz to be administered (date to be determined by instructor).
2. Read Chapter 35: *Environmental Emergencies* for the next class session.