Chapter 17
Endocrine and Hematologic Emergencies

Unit Summary

After students complete this chapter and the related course work, they will understand the significance and characteristics of diabetes, sickle cell disease, clotting disorders, and the complications associated with each. Students should be able to demonstrate knowledge of the characteristics of type 1 and type 2 diabetes. They should be able to list the appropriate steps for assessment and prehospital treatment of diabetic emergencies. Students should also be able to discuss hematologic emergencies, and describe the four main types of sickle cell crises (vaso-occlusive, aplastic, hemolytic, and splenic sequestration) and the two primary types of clotting disorders (thrombophilia and hemophilia).

National EMS Education Standard Competencies

Medicine

Applies fundamental knowledge to provide basic emergency care and transportation based on assessment findings for an acutely ill patient.

Endocrine Disorders

Awareness that:

- ÅDiabetic emergencies cause altered mental status (p 632)

Anatomy, physiology, pathophysiology, assessment, and management of:

- ÅAcute diabetic emergencies (pp 622ï 632)

Hematology

Anatomy, physiology, pathophysiology, assessment, and management of:

- ÅSickle cell crisis (pp 633ï 634)
- ÅClotting disorders (pp 634ï 635)

Knowledge Objectives

1. Describe the anatomy and physiology of the endocrine system and its main function in the body. (p 621)
2. Define and explain the terms diabetes, low blood glucose, and high blood glucose, and distinguish between the two types of diabetes and how their onset patterns differ. (pp 621ï 622)
3. Discuss the role of glucose as a major source of energy for the body and its relationship to insulin. (pp 622ï 623)
4. Describe the differences and similarities between hyperglycemic and hypoglycemic diabetic emergencies, including their onset, signs and symptoms, and management considerations. (pp 624ï 626)
5. Explain some age-related considerations when managing a pediatric patient who is experiencing a hypoglycemic crisis. (p 626)

6. Discuss the steps the EMT should follow when conducting a primary and secondary assessment of a patient with an altered mental status who is a suspected diabetic patient. (pp 626ï 629)
7. Explain the process for assessing and managing the airway of a patient with an altered mental status, including ways to differentiate a hyperglycemic patient from a hypoglycemic patient. (pp 627, 629, 632ï 633)
8. Describe the interventions for providing emergency medical care to both a conscious and unconscious patient with an altered mental status and a history of diabetes who is having a hypoglycemic crisis. (p 629)
9. Describe the interventions for providing emergency medical care to both a conscious and unconscious patient with an altered mental status and a history of diabetes who is having a hyperglycemic crisis. (p 629)
10. Explain when it is appropriate to obtain medical direction when providing emergency medical care to a diabetic patient. (p 629)
11. Provide the generic and trade names, form, dose, administration, indications, and contraindications for giving oral glucose to a patient with a decreased level of consciousness who has a history of diabetes. (pp 630ï 631)
12. Explain some age-related considerations when managing a geriatric patient who has undiagnosed diabetes. (p 630)
13. Discuss the composition and functions of blood. (p 633)
14. Describe the pathophysiology of sickle cell disease and the four main types of sickle cell crises. (pp 633ï 634)
15. Describe the assessment and management of a patient with suspected sickle cell disease. (pp 635ï 636)
16. Describe two types of blood clotting disorders, and the risk factors, characteristics, and management of each. (pp 634ï 636)

Skills Objectives

1. Demonstrate the assessment and care of a patient with hypoglycemia and a decreased level of consciousness. (pp 624ï 626, 630ï 632)
2. Demonstrate how to administer glucose to a patient with an altered mental status. (pp 631ï 632, Skill Drill 17ï 1)

Lecture

I. Introduction

A. The human endocrine system affects nearly every:

1. Cell
2. Organ
3. Bodily function

B. Endocrine disorders can have many signs and symptoms.

C. Hematologic emergencies have the following characteristics:

1. Rare in most EMS systems
2. Difficult to assess and treat
3. EMT can offer support and may save a patientôs life

II. Anatomy and Physiology

A. The endocrine system is a complex message and control system.

B. Endocrine glands secrete hormones.

1. ñEndoò means *inside*.

C. Hormones are chemical messengers.

1. They have special regulatory effects on organs and tissues.

D. The main function of the endocrine system is to maintain homeostasis, which is stability in the body's internal environment.

1. This involves responding to any change in the body, such as low glucose or calcium levels in the blood.
2. Homeostasis can be disturbed by hypersecretion (overproduction) or hyposecretion (underproduction) of a gland.

III. Pathophysiology of Diabetes

A. Diabetes is a metabolic disorder involving abnormalities in the body's ability to use glucose (sugar) for fuel.

1. It affects about 7% of the population.
2. It can have severe complications such as:
   a. Blindness
   b. Cardiovascular disease
   c. Kidney failure

B. As an EMT, you need to know the signs of symptoms of a blood glucose level that is:

1. High (hyperglycemia)
   a. Can result in coma or death
   b. If treatment exceeds a patientôs need, it can cause a life-threatening state of hypoglycemia.
2. Low (hypoglycemia)

C. The central problem in diabetes is lack of insulin, or ineffective action of insulin.

1. Glucose, or dextrose, is the primary fuel for cellular metabolism.
2. Insulin is a hormone that is normally produced by the endocrine glands on the pancreas that enables glucose to enter the cells.

D. *Diabetes mellitus* (diabetes' full name) means "sweet diabetes," which refers to the presence of wasted glucose in the urine.

E. *Diabetes insipidus* is a rare condition involving excessive urination.

1. The hormone that regulates urinary fluid reabsorption is missing.

F. There are two types of diabetes, which are both equally serious conditions.

1. Both can affect many tissues and functions other than the bodyôs glucose-regulating mechanism, and both require life-long medical management.
2. Type 1 diabetes patients do not produce insulin.
   a. Patients need daily injections of supplemental, synthetic insulin.
      i. In the past, referred to as insulin-dependent diabetes mellitus (IDDM)
   b. Typically develops during childhood (ñjuvenile-onset diabetesò), though it can also develop later in life
   c. Patients more likely to have metabolic problems and organ damage (eg, blindness, heart disease, kidney failure, and nerve disorders)
   d. Considered an autoimmune problem
      i. The body is allergic to and destroys insulin-producing cells of pancreasô endocrine glands
3. Type 2 diabetes patients produce inadequate amounts of insulin, or a normal amount that does not function effectively.
   a. Usually appears later in life
   b. Treatment may be diet, exercise, oral medications (hypoglycemic agents), or supplemental insulin.
      i. Nonï insulin-type oral medications stimulate pancreas to produce more insulin.
         (a) Chlorpropamide (Diabinese)
         (b) Tolbutamide (Orinase)
         (c) Glyburide (Micronase)
         (d) Glipizide (Glucotrol)
         (e) Metformin (Glucophage)
         (f) Rosiglitazone (Avandia)
      ii. Hypoglycemic agent administration may cause hypoglycemia in some patients (eg, those who are very active or who exercise a lot).
   c. In the past, referred to as nonï insulin-dependent diabetes mellitus (NIDDM) or adult (maturity)-onset diabetes
      i. Some patients, however, may require insulin.
   d. Easier to regulate and much more common
4. The severity of diabetic complications depends on how high a patientôs average blood glucose level is and how early in life the diabetes began.
5. Obesity increases the risk of diabetes.

G. Glucose and insulin supply the body with the energy necessary for its cells to function.

1. Glucose is a major source of energy for the body.
   a. Without a constant, sufficient supply of glucose, brain cells will rapidly suffer permanent damage.
2. Insulin is needed to allow glucose to enter cells (with the exception of brain cells).
   a. Said to be a ñcellular keyò
   b. Without insulin, glucose from food remains in the blood and glucose levels become too high.
      i. This is called hyperglycemia.
      ii. Once glucose levels reach twice the normal amount (normal is 80 to 120 mg/dL), excess is excreted by the kidney.

H. The classic symptoms of uncontrolled diabetes are as follows (the “3 Ps”):

1. Polyuria is frequent, plentiful urination.
2. Polydipsia is frequent drinking to satisfy continuous thirst.
3. Polyphagia is excessive eating as the result of cellular hunger (a rare symptom).

I. When glucose is unavailable to cells, the body turns to other fuel sources.

1. Fat is the most abundant source of energy.
    a. Ketones and fatty acids accumulate in blood and tissue (acidosis) when fat is used for energy.
2. Diabetic ketoacidosis (DKA) is a form of acidosis seen in uncontrolled diabetes.
    a. Without insulin, certain acids accumulate.
    b. More common in type 1 diabetes
    c. Signs and symptoms include:
        i. Weakness
        ii. Nausea
        iii. Weak, rapid pulse
        iv. Kussmaul respirations, which ñblow offò excess acids
        v. Sweet-smelling breath, caused by ketones
        vi. Altered mental status
    d. Without proper fluid and insulin to reverse fat metabolism and restore glucose use for energy, DKA can progress to coma and death.
3. Type 2 diabetes more often results in hyperosmolar hyperglycemic nonketotic coma (HHNC).
    a. Slower, more gradual onset than DKA
    b. Sweet smell is not present on the breath because the body does not burn fat for energy.
    c. The body tries to get rid of excess sugar through urine, causing dehydration.

J. In some systems, EMTs are allowed to use glucometers to monitor patients' blood glucose levels.

1. Treatment must be tailored to each patientôs need for glucose.
2. Most type 1 patients use glucometers several times a day to monitor their blood glucose levels.
    a. Device analyzes a drop of blood, usually from the fingertip, on a disposable sensor.
    b. Newer devices, in development, can be worn like a wristwatch or pulse oximeter.
3. Glucose test strips are also used in some EMS systems.
    a. A drop of blood is placed on a paper strip.
    b. Less accurate than glucometers

K. Both hyperglycemia and hypoglycemia can lead to a diabetic emergency.

1. Hyperglycemia is a state in which the blood glucose is above normal.
    a. The result of a lack of insulin, which causes excessive amounts of glucose to remain in the blood
    b. Untreated, it results in DKA.
    c. Signs and symptoms include:
        i. History: Excessive food intake, insufficient insulin dosage, gradual onset (hours to days), warm and dry skin, infection is common
        ii. Gastrointestinal tract: Dehydration; lack of appetite; weakness, nausea, and vomiting
        iii. Respiratory system: Rapid, deep (Kussmaul) respirations; sweet, fruity breath odor
        iv. Cardiovascular system: Normal to low blood pressure; rapid, weak, and thready pulse
        v. Nervous system: Restless; possible progression to coma; abnormal or slurred speech; unsteady gait
        vi. Response to treatment: Gradual, 6ï 12 hours following medical treatment
2. Hypoglycemia is a state in which the blood glucose is below normal.
    a. Untreated, it results in unresponsiveness and eventually hypoglycemic crisis.
    b. Signs and symptoms include:
        i. History: Insufficient food intake; excessive insulin dosage; rapid onset (minutes); pale, cool, moist skin
        ii. Gastrointestinal tract: Absence of thirst and intense hunger

iii. Respiratory system: Normal to shallow or rapid respirations
iv. Cardiovascular system: Normal to low blood pressure; rapid, weak pulse
v. Nervous system: Altered mental status (aggressive, confused, lethargic, or unusual behavior); seizure, fainting, or coma; unsteady gait (weakness on one side of the body, may mimic stroke)
vi. Response to treatment: Immediate

3. The signs and symptoms of hyperglycemia and hypoglycemia can be quite similar (see Table 17-1).
   a. Staggering, intoxicated appearance or complete unresponsiveness

L. Hyperglycemic crisis (diabetic coma) is a state of unconsciousness resulting from DKA, hyperglycemia, and/or dehydration due to excessive urination.

1. On some occasions, excess blood glucose by itself can lead to hyperglycemic crisis.
2. It can occur in diabetic patients who:
   a. May not be under medical treatment
   b. Have taken insufficient insulin
   c. Have markedly overeaten
   d. are under stress related to infection, illness, overexertion, fatigue, or alcohol consumption
3. If untreated, it can result in death.
4. Treatment may take hours in a well-controlled hospital setting.

M. Hypoglycemic crisis (insulin shock) is the result of insufficient levels of glucose in the blood (hypoglycemia).

1. It can occur when insulin-dependent patients:
   a. Take too much insulin
   b. Take a regular dose of insulin but have not eaten enough food
   c. Engage in vigorous activity and use up all available glucose
   d. Vomit a meal after taking a regular dose of insulin
2. There may not be enough glucose to supply the brain.
   a. Treat quickly to avoid brain damage.
3. If untreated, it can produce unconsciousness and death.
4. The condition is quickly reversed by giving the patient glucose.

IV. Patient Assessment of Diabetes

A. Scene size-up

1. Ensure scene safety.
   a. Be careful of the presence of syringes, used by diabetic patients for insulin.
   b. Be alert for clues (eg, syringes, insulin bottles, plate of food, glass of orange juice) that this is a diabetic emergency.
   c. Use gloves and eye protection at a minimum.
   d. Determine the number of patients involved in the emergency.
   e. Consider the need for additional resources.
2. Determine the mechanism of injury (MOI)/nature of illness (NOI)
   a. Remember, trauma may also have occurred.

B. Primary assessment

1. Form a general impression.

a. Perform a rapid scan.
    i. Appearance
        (a) Anxious, restless, or listless?
        (b) Apathetic or irritable?
        (c) Interacting appropriately with environment?
b. Identify life threats and provide lifesaving interventions, particularly airway management.
c. Determine level of consciousness using the AVPU (*Alert* to person, place, and day; responsive to *Verbal* stimuli; responsive to *Pain* or *Unresponsive*) scale.
    i. If unresponsive:
        (a) Call for ALS.
        (b) Patient may have undiagnosed diabetes.
    ii. If patient has altered mental status:
        (a) Assess blood glucose level if you have proper equipment and training.
d. Perform cervical spine (c-spine) stabilization, if necessary, and provide rapid transport.
e. Remember: Always carry out a thorough, careful primary assessment, paying attention to the ABCs.
    i. Other medical or trauma emergencies may be responsible for diabetic patientsô signs and symptoms.

2. Assess the patientôs airway and breathing.
    a. Patients showing signs of inadequate breathing or altered mental status should receive high-flow oxygen (12 to 15 L/min via nonrebreathing [NRB] mask).
    b. Hyperglycemic patients will have rapid, deep (Kussmaul) respirations and sweet, fruity breath.
    c. Hypoglycemic patients will have normal or shallow to rapid respirations.
    d. Respiratory distress or arrest:
        i. Open the airway; insert airway adjunct.
        ii. Administer oxygen.
        iii. Assist ventilations.
        iv. Continue to monitor ventilations throughout patient care.
3. Assess the patientôs circulation.
    a. Dry, warm skin: hyperglycemia
    b. Moist, pale skin: hypoglycemia
4. Make a transport decision.
    a. Unconscious patients or patients with altered mental status and impaired ability to swallow should be transported promptly.
    b. Patients capable of swallowing and conscious enough to maintain their own airway may be further evaluated on scene and interventions performed.

C. History taking

1. Investigate the chief complaint.
    a. Obtain a history of the present illness from responsive patients, family, or bystanders.
        i. Responsive, diabetic patients will often know what is wrong.
    b. If patient has eaten but not taken insulin, hyperglycemia is more likely.
    c. If patient has taken insulin but not eaten, hypoglycemia is more likely.
    d. Observe physical signs and symptoms to determine whether the patient is hyperglycemic or hypoglycemic.
2. Obtain the SAMPLE history from a responsive patient or a family member.
    a. For a known diabetic patient, ask:
        i. Do you take insulin or pills to lower blood sugar?
        ii. Have you taken your usual insulin dose today?
        iii. Have you eaten normally today?

iv. Have you had any illness, unusual amount of activity, or stress?

b. Look for an emergency medical identification device (eg, wallet card, necklace, or bracelet).

D. Secondary assessment

1. Physical examination
   a. Full-body scan
      i. Look for clues about the patientôs condition.
      ii. Be alert for secondary injury/illness (eg, trauma due to altered level of consciousness).
   b. For known diabetic patients, focus on mental status, ability to swallow, and ability to protect the airway.
      i. Obtain a Glasgow Coma Scale (GCS) score.
2. Vital signs, including blood glucose level.
   a. Use a glucometer, if available and protocols allow.
      i. Study the operatorôs manual for proper use in the field.
      ii. Know the upper and lower ranges at which your glucometer functions.
   b. Normal adult blood glucose level range: 80 to 120 mg/dL
   c. Use a pulse oximeter to assess perfusion.
      i. Can assist in identifying degree of respiratory distress

E. Reassessment

1. Reassess the diabetic patient frequently to assess changes.
   a. Improved mental status?
   b. Are ABCs intact?
   c. How is patient reacting to interventions performed?
2. Provide the indicated interventions.
   a. For hypoglycemic, conscious patients who can swallow without the risk of aspiration (inhalation of a substance):
      i. Encourage patient to drink juice containing sugar.
      ii. Administer highly concentrated sugar gel, if local protocol permits (eg, oral glucose or intramuscular [IM] glucagon).
      iii. Provide rapid transport to hospital.
   b. For unconscious, hypoglycemic patient, or patient with risk of aspiration:
      i. Intravenous (IV) glucose or IM glucagon is needed, which EMTs are not permitted to give.
         (a) AEMTs and paramedics can start an IV line and administer IV glucose.
      ii. Provide rapid transport to hospital.
   c. For unconscious, known diabetic patient:
      i. Determine whether hyperglycemic or hypoglycemic.
         (a) Primary difference is breathing (Kussmaul respirations = hyperglycemia).
         (b) Seizures are more likely a sign of hypoglycemic crisis.
      ii. If hypoglycemic crisis:
         (a) Patient needs sugar immediately (give, if protocols allow).
      iii. If hyperglycemic crisis:
         (a) Patient needs insulin and IV fluid therapy (EMTs do not perform these interventions).
      iv. When in doubt, err on the side of giving glucose (if protocols allow).
      v. Provide prompt treatment and transport.
3. Reassess your interventions.
   a. Patient response to current interventions
   b. Adjustments to interventions

4. Coordinate communication and documentation.
    a. Inform receiving hospital about prehospital patient assessment and care.
    b. Follow local communication and documentation protocols.

V. Emergency Medical Care for Diabetic Emergencies

A. Oral glucose is a commercially available gel that is given to increase a patient's blood glucose level.

1. One tube contains one 30-g dose.
    a. Trade names: Glutose, Insta-Glucose
2. Follow local protocols for glucose administration (***Skill Drill 17-1***).
3. The only contraindications are the inability to swallow and unconsciousness.
    a. Aspiration can occur.
4. Wear gloves before putting anything in the patientôs mouth.

VI. Problems Associated With Diabetes

A. Seizures

1. Should be considered very serious, even in patients with a history of chronic seizures
2. Though brief seizures are not harmful, they may indicate a potentially life-threatening underlying condition.
3. Possible causes
    a. Infection
    b. Poisoning
    c. Hypoglycemia
    d. Trauma
    e. Decreased levels of oxygen
    f. Idiopathic (unknown cause)
    g. Fever (children)
    h. Undiagnosed epilepsy (children)
4. Management
    a. Ensure that the airway is clear.
    b. Place the patient on his or her side, if there is no possibility of c-spine trauma.
    c. Do not place anything in the patientôs mouth (eg, bite stick or oral airway).
    d. Have suctioning equipment ready in case the patient vomits.
    e. If the patient is cyanotic or appears to be breathing inadequately, provide oxygen or artificial ventilations.
    f. Transport promptly.

B. Altered mental status

1. May be caused by complications of diabetes
    a. Hypoglycemia
    b. Ketoacidosis
2. May also be from other conditions
    a. Poisoning
    b. Head injury

c. Postictal state
d. Decreased perfusion to the brain

3. Management
   a. Ensure that the airway is clear.
   b. Be prepared to provide artificial ventilations.
   c. Be prepared to suction if the patient vomits.
   d. Provide prompt transport.

C. Alcoholism

1. Occasionally patients with diabetic emergencies are thought to be under the influence.
2. A diabetic patient confined by police in a ñdrunk tankò is at risk for a severe emergency.
3. An emergency medical identification bracelet, necklace, or card may help to save the patientôs life in such situations.
4. A blood glucose test performed at the scene (if protocols allow) or in the emergency department identifies the real problem.
5. Be alert to the potential for diabetes and alcoholism to coexist in a patient.

D. Patients with altered mental status can lose their gag reflex, which affects airway management.

1. Vomit or tongue may obstruct the airway.
2. Carefully monitor the airway.
3. Place the patient in a lateral recumbent position.
4. Make sure that suction is readily available.

VII. Hematologic Emergencies

A. Hematology is the study and prevention of blood-related diseases.

1. Blood-related diseases
   a. Sickle cell disease
   b. Hemophilia

B. Blood is “the fluid of life.”

1. Understanding its composition helps to understand various disorders.

VIII. Anatomy and Physiology

A. Blood is made up of cells and plasma.

1. Red blood cells (erythrocytes) contain hemoglobin, which carries oxygen to the tissues.
   a. Red blood cells make up 47% of male and 42% of female blood volume
2. White blood cells (leukocytes) are the ñcleanersò of body.
   a. Respond to infection and dead cells
3. Platelets are small cells in the blood.
   a. Essential for clot formation
   b. Respond to blood vessel damage
   c. Stop bleeding

4. Plasma is the straw-colored fluid that transports red blood cells, white blood cells, and platelets throughout the body.

IX. Pathophysiology of Hematologic Disorders

A. Sickle cell disease

1. An inherited blood disorder that affects the red blood cells.
2. It is predominantly found in African Americans and persons of Mediterranean descent.
3. People with sickle cell disease have red blood cells that are oblong or sickle shaped, contain hemoglobin S, are poor oxygen carriers, and live for only 16 days.
   a. May result in lack of oxygen in bodyôs cells and tissues (hypoxia)
   b. Sickle cells may lodge in small blood vessels or spleen, causing swelling, rupture, and ultimately death.
4. Normal red blood cells are round, contain hemoglobin A, and live 120 days.
5. There are four main types of sickle cell crises:
   a. Vaso-occlusive crisis
      i. Blood flow to organs becomes restricted causing pain, ischemia, and organ damage (lasts 5ï 7 days).
      ii. Circulation to spleen is usually obstructed due to narrow vessels and function of removing damaged red blood cells.
   b. Aplastic crisis
      i. Aplastic crisis is a worsening of a patientôs baseline anemia.
         (a) Lack of circulating red blood cells in the body
         (b) Causes tachycardia, pallor, and fatigue
         (c) May be caused by the parvovirus B19, which affects the production of new red blood cells, nearly stopping it for 2ï 3 days.
   c. Hemolytic crisis
      i. Hemolytic crisis is an acute, accelerated drop in hemoglobin level.
      ii. Caused by red blood cells breaking down at a faster rate than normal
      iii. Common in patients with an enzyme deficiency
   d. Splenic sequestration crisis
      i. Splenic sequestration crisis is painful, acute enlargement of the spleen.
      ii. Abdomen becomes very hard and bloated
6. Complications of sickle cell disease
   a. Although some take days and weeks to develop, some complications of sickle cell disease are acute and life-threatening.
      i. Cerebral vascular attack
      ii. Gallstones
      iii. Jaundice
      iv. Avascular necrosis
      v. Splenic infections
      vi. Osteomyelitis
      vii. Opiate tolerance
      viii. Leg ulcers
      ix. Retinopathy
      x. Chronic pain
      xi. Pulmonary hypertension

xii. Chronic renal failure

B. Clotting disorders

1. Clotting disorders are abnormalities in clotting of the blood.
2. Thrombosis is the development of a blood clot, occurring in arterial or venous blood vessels.
3. Patient symptoms relate to clot location, size, and whether the clot becomes dislodged and travels to another part of the body.
4. Thrombophilia
   a. Thrombophilia is the tendency to develop blood clots.
   b. Affects 5% to 7% of Caucasians of European descent in the United States
   c. Thrombosis may manifest as a clot in a blood vessel or in one of the chambers of the heart.
   d. Nearly 2 million people per year experience the formation of a clot in a deep vein (deep vein thrombosis) in the United States.
      i. Nearly 50% experience long-term, adverse health effects.
      ii. Leading cause of death in hospitalized patients, due to lack of mobility
   e. Nearly 40% experience pulmonary embolism, a complication involving a clot that travels through and obstructs blood flow to the lung.
   f. Blood-thinning medications decrease frequency of clotting.
      i. Aspirin
      ii. Heparin
      iii. Warfarin (Coumadin)
   g. Not common in pediatric patients
   h. Risk factors include:
      i. Recent surgery
      ii. Impaired mobility
      iii. Congestive heart failure
      iv. Cancer
      v. Respiratory failure
      vi. Infectious diseases
      vii. Age, older than 40 years
      viii. Being overweight/obesity
      ix. Smoking
      x. Oral contraceptive use
5. Hemophilia
   a. Hemophilia is a congenital abnormality in which the body is unable to produce clots.
   b. Results in uncontrollable bleeding
   c. Occurs predominantly in males (1 in every 5,000ï 10,000 births)
   d. Classified into two types
      i. Hemophilia A
         (a) Most common type
         (b) Low levels of factor VIII
      ii. Hemophilia B
         (a) Deficiency of factor IX
   e. Signs and symptoms of hemophilia A and B are the same.
      i. Spontaneous, acute, and chronic bleeding that may or may not be life threatening
      ii. Spontaneous intracranial bleeding common (major cause of death)

f. When assessing hemophilia patients, seriously consider injury or illness that can cause bleeding.

X. Patient Assessment of Hematologic Disorders

A. Scene size-up

1. Ensure scene safety.
   a. Most sickle cell patients will have had a crisis before.
   b. Wear gloves and eye protection at a minimum.
   c. Determine the number of patients involved.
   d. Be alert for possible trauma.
   e. Consider ALS support (eg, analgesic administration for vaso-occlusive crisis pain).
2. Determine the MOI/NOI.
   a. Remember that trauma may also have occurred.

B. Primary assessment

1. Is the patient in pain and of African American or Mediterranean descent?
   a. If yes, may have undiagnosed sickle cell disease
2. Perform c-spine stabilization, if necessary.
3. Form a general impression.
   a. Perform a rapid scan:
      i. Is the patient anxious, restless, or listless?
      ii. Is the patient apathetic or irritable?
   b. Determine level of consciousness using the AVPU scale.
4. Assess the patientôs airway and breathing.
   a. For patients with inadequate breathing or altered mental status:
      i. Provide high-flow oxygen at 12 to 15 L/min via NRB mask.
   b. Patients experiencing a sickle cell crisis may have increased respirations or exhibit signs of pneumonia.
   c. For patients with breathing difficulty:
      i. Open the airway; insert airway adjunct.
      ii. Give oxygen; assist ventilations.
5. Assess the patientôs circulation.
   a. Sickle cell crisis patients will have increased pulse rate to ñforceò sickled cells through smaller vasculature.
   b. For hemophilia patients:
      i. Be alert for signs of acute blood loss:
         (a) Pallor
         (b) Weak pulse
         (c) Hypotension
      ii. Note bleeding of unknown origin:
         (a) Nosebleeds
         (b) Bloody sputum
         (c) Blood in urine or stool
      iii. Be alert for signs of hypoxia, which is due to blood loss.
6. Make a transport decision.

C. History taking

1. Investigate the chief complaint.
   a. Obtain a history of the present illness from responsive patients, family, or bystanders.
   b. Be alert for physical signs indicating sickle cell crisis:
      i. Swelling of the fingers and toes
      ii. Priapism
      iii. Jaundice
2. Include the OPQRST mnemonic for assessing pain.
   a. Is pain isolated to a single location or felt throughout the body?
   b. Is the patient having visual disturbances?
   c. Is the patient experiencing nausea, vomiting, or abdominal cramping?
   d. Is the patient experiencing chest pain or shortness of breath?
3. Obtain the SAMPLE history from a responsive patient or family member.
   a. Have you had a crisis before?
   b. When was the last time you had a crisis?
   c. How did your last crisis resolve?
   d. Have you had any illness, unusual amount of activity, or stress lately?

D. Secondary assessment

1. Perform a physical examination.
   a. Focus on major joints at which cells congregate.
   b. Determine level of consciousness using the AVPU scale.
2. Obtain a complete set of vital signs.
   a. Normal sickle cell crisis vital signs:
      i. Normal to rapid respirations
      ii. Pale, clammy skin
      iii. Low blood pressure
   b. Use pulse oximeter, if available, to monitor oxygen saturation.
      i. Reading may be inaccurate due to patientôs anemic state.

E. Reassessment

1. Reassess vital signs frequently to determine changes in the patientôs condition.
   a. Are there changes in mental status?
   b. Are the ABCs intact?
2. Provide the indicated interventions.
3. Reassess your interventions.
   a. Patient response to current interventions?
   b. Adjustments to interventions?
4. Hospital care for sickle cell crises may include:
   a. Analgesics for pain
   b. Penicillin for infection
   c. IV fluid for hydration
   d. Blood transfusion, depending on severity of condition
5. Hospital care for hemophilia may include:
   a. IV therapy to treat hypotension
   b. Transfusion of plasma

6. Coordinate communication and documentation.

XI. Emergency Medical Care for Hematologic Disorders

A. Emergency care is mainly supportive and symptomatic.

B. For patients with inadequate breathing or altered mental status:

1. Administer high-flow oxygen 12 to 15 L/min.
2. Place in position of comfort.
3. Transport rapidly to hospital.

XII. Summary

A. The endocrine system is a complex message and control system that maintains stability in the body's internal environment (homeostasis).

B. Type 1 and type 2 diabetes are metabolic disorders involving abnormalities in the body's ability to use glucose (sugar) for fuel.

C. Polyuria (frequent, plentiful urination), polydipsia (frequent drinking to satisfy continuous thirst), and polyphagia (excessive eating due to cellular hunger) are common symptoms, or the "3 Ps," of uncontrolled diabetes.

D. Patients with diabetes have chronic complications that place them at risk for other diseases, such as heart attack, stroke, and infections.

E. Hyperglycemia is the result of a lack of insulin, which causes excessive amounts of glucose to remain in the blood. It must be treated in the hospital.

F. Hypoglycemia is a state in which the blood glucose level is below normal. Without treatment, permanent brain damage and death can occur.

G. Diabetic ketoacidosis is the buildup of ketones and fatty acids in the blood and body tissue that results when the body relies upon fat for energy.

H. Hyperglycemic crisis (diabetic coma) is a state of unconsciousness resulting from DKA, hyperglycemia, and/or dehydration due to excessive urination.

I. Hypoglycemic crisis (insulin shock) is caused by insufficient blood glucose levels. Treat quickly, by giving oral glucose (if protocols allow), to avoid brain damage.

J. When assessing diabetic emergencies, err on the side of giving oral glucose (if protocols allow). Do not give oral glucose to patients who are unconscious or who cannot swallow properly and protect the airway. In all cases, provide rapid transport.

K. Problems associated with diabetes include seizures, altered mental status, "intoxicated" appearance, and loss of a gag reflex, which affects airway management.

L. Hematology is the study and prevention of blood-related disorders.

M. Sickle cell disease is a blood disorder the affects the shape of red blood cells. Symptoms include joint pain, fever, respiratory distress, and abdominal pain.

N. Hemoglobin A is considered normal hemoglobin. Hemoglobin S is considered an abnormal type of hemoglobin and is responsible for sickle cell crisis.

O. Patients with sickle cell disease have chronic complications that place them at risk for other diseases, such as heart attack, stroke, and infection. Most often, however, you will be called on to treat acute complications of severe pain.

P. Patients with hemophilia are not able to control bleeding because clots do not develop as they should.

Q. Emergency care in the prehospital setting is supportive for patients with sickle disease or a clotting disorder such as hemophilia.

Post-Lecture

Unit Assessment

1. What type of diabetes is characterized by an absence of insulin production?

2. What is the role of insulin?

3. What is the normal blood glucose range?

4. If insulin is unavailable for glucose to enter cells, what will the body use for fuel?

5. What are the rapid, deep respirations seen with diabetic ketoacidosis called?

6. True or False: Diabetic coma can be caused by too little glucose in the blood.

7. What physical findings are associated with hyperglycemia?

8. What are the contraindications to administering oral glucose?

9. List three medical emergencies that may be caused by or mistaken for diabetes.

10. What are the two main components of blood?

11. What type of hemoglobin do normal red blood cells contain?

12. List four risk factors for increased clotting of the blood.

13. What is hemophilia?

14. What is the primary intervention for patients suffering from hematologic crises?

Knowledge Objectives

Knowledge Objectives