Chapter 20, Endocrine and Hematologic Emergencies

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1. Introduction to Endocrine and Hematologic Emergencies

- This report covers **endocrine and hematologic emergencies** from Chapter 20 [1].
- Understanding these conditions is crucial for emergency care and transportation of the sick and injured [1].
- The report aims to explain the **significance and characteristics of diabetes, sickle cell disease, and clotting disorders** [2].
- It will also detail the **assessment and pre-hospital treatment** for these emergencies [4].

- The endocrine system profoundly influences nearly every cell, organ, and function of the body [6].
- **endocrine disorders** often present with a variety of signs and symptoms [6].
- **hematologic emergencies** can be challenging to assess and treat in the pre-hospital setting [7].

2. Anatomy and Physiology of the Endocrine System and Glucose Metabolism

- The **endocrine system** serves as a communication system within the body [8].
- **endocrine glands** secrete messenger hormones that travel through the blood [8].
- These hormones affect specific target organs, tissues, or cells [8].
- **endocrine disorders** arise from internal communication problems [9].
  - A gland may overproduce hormones (**hypersecretion**) or underproduce them (**hyposecretion**) [10].
  - Sometimes the gland functions correctly, but the receiving organ does not respond [11].
- **Glucose metabolism** is vital, as the brain needs glucose and oxygen to survive [11].
- **insulin** is necessary for glucose to enter cells [12].
  - insulin acts like a key unlocking the door for glucose [13].
  - Without sufficient insulin, cells do not receive energy [14].
- The **pancreas** produces and stores two key hormones: **glucagon and insulin** [15].
- The **islets of Langerhans** in the pancreas contain alpha and beta cells [16].
  - **Alpha cells** produce glucagon [18].
  - **Beta cells** produce insulin [18].
- The pancreas secretes insulin and glucagon based on blood glucose levels [19].

Endocrine Gland/Component	Key Hormones Produced	Primary Function Related to Glucose	Source

Pancreas	Glucagon, Insulin	Regulates blood glucose levels	[15]
Islets of Langerhans	Glucagon (Alpha cells), Insulin (Beta cells)	Production site for glucagon and insulin	[16]

3. Diabetes Mellitus: Pathophysiology, Types, and Complications

- **Diabetes mellitus** is a disorder of glucose metabolism [19].
- The body has an impaired ability to get glucose into cells for energy [19].
- Untreated diabetes leads to high blood glucose levels [20].
- Severe cases can cause **life-threatening illness, coma, or death** [21].
- Poorly managed diabetes can lead to severe complications [22].
  - These include **blindness, cardiovascular disease, and kidney failure** [22].
- There are three main types of diabetes [23].
  - **diabetes mellitus type 1** [23].
  - **diabetes mellitus type 2** [23].
  - **gestational diabetes** (pregnancy-induced) [23].
- Diabetes treatments involve medications and injectable hormones [24].
- These treatments lower blood glucose levels [24].
- Incorrect administration can create a medical emergency [24].
- **hypoglycemia** (low blood glucose) is life-threatening if untreated [25].
- **hyperglycemia** (high blood glucose) can result in coma or death [26].
- Excessive treatment (e.g., too much insulin) can cause life-threatening hypoglycemia [26].
- Both hyperglycemia and hypoglycemia can occur in Type 1 and Type 2 diabetes [27].
- Patients often display signs and symptoms of high and low blood glucose [28].
- hyperglycemia and hypoglycemia can have similar presentations [29].
- Patients may have altered mental status and mimic alcohol intoxication [30].

Characteristic	**Diabetes Mellitus Type 1**	**Diabetes Mellitus Type 2**	**Source**

Cause	Autoimmune destruction of pancreatic beta cells	Resistance to insulin effects at cellular level	[34]
Insulin Production	Pancreas produces little to no insulin	Pancreas produces insulin, but cells don't respond effectively	[34]
Onset	Usually early childhood through fourth decade	Often diagnosed at yearly medical exam or from complaints	[35]
Treatment	Requires external insulin source (injections, pump)	Dietary modification, exercise, oral medications, injectable medications, insulin	[35]
Common Complication	Diabetic Ketoacidosis (DKA)	Hyperosmolar Hyperglycemic Nonketotic Syndrome (HHNS)	[48]

4. Hypoglycemia: Causes, Signs, Symptoms, and Management

- **hypoglycemia** is low blood sugar [31].
- It can develop if a person takes medication but doesn't eat enough food [32].
- Taking too much medication can also result in low blood glucose levels [32].
- Common reasons for low blood sugar include:
  - Correct insulin dose with a change in routine or more insulin than normal [75].
  - Correct insulin dose without the patient eating [75].
  - Correct insulin dose and the patient developing an acute illness [75].
- All **hypoglycemic patients require prompt transport** [32].
- Signs and symptoms of hypoglycemia include:
  - Normal to shallow or rapid respirations [75].
  - Pale, moist skin; diaphoresis [75].

    - Dizziness, headache [75].
    - Rapid pulse or normal to low blood pressure [75].
    - Altered mental status [75].
    - Anxious or combative behavior [75].
    - Seizures, fainting, or coma [75].
    - Weakness on one side of the body (may mimic a stroke) [75].
    - Rapid changes in mental status [75].
- hypoglycemia is quickly reversed by giving the patient **glucose** [76].
- Without glucose, the patient can sustain permanent brain damage [77].

5. Diabetes Mellitus Type 1: Characteristics and Diabetic Ketoacidosis (DKA)

- **diabetes mellitus type 1** is an autoimmune disorder [34].
- The immune system attacks pancreatic beta cells that produce insulin [34].
- Missing insulin means glucose cannot enter cells [34].
- The pancreas does not produce its own insulin in Type 1 diabetes [34].
- Onset usually occurs from early childhood through the fourth decade [35].
- Patients with Type 1 diabetes cannot survive without external insulin [35].
- Many patients use an **implanted insulin pump** [36].
    - These pumps continuously measure glucose and provide insulin [37].
    - They can malfunction, leading to diabetic emergencies [39].
    - Always ask about the presence of an insulin pump [39].
- Type 1 diabetes is the most common metabolic disease of childhood [40].
- New onset Type 1 diabetes symptoms relate to eating and drinking [41].
    - **polyuria** (increased urination) [41].
    - **polydipsia** (increased thirst) [41].
    - **polyphagia** (increased hunger) [41].
    - Weight loss and fatigue [41].
- **Normal blood glucose** is between 80 and 120 mg/dL [42].
- When blood glucose is high, the kidneys' filtration system is overwhelmed [43].
- Glucose then spills into the urine [43].
- If glucose is unavailable, the body burns fat for energy [44].

- Burning fat produces acid waste called **ketones** [44].
- Ketone levels rise in the blood and spill into the urine [45].
- Kidneys cannot maintain acid-base balance with high glucose and ketones [46].
- Patients breathe faster and deeper to release carbon dioxide and reduce acid [47].
- This breathing pattern is known as **kussmaul respirations** [47].
- Continued fat metabolism and ketone production can cause **diabetic ketoacidosis (dka)** [48].
- DKA is a life-threatening illness [48].
- DKA may present as generalized illness [49].
- Symptoms include abdominal pain, body aches, nausea, and vomiting [50].
- Altered mental status or unconsciousness can occur in severe DKA [50].
- DKA can result in death if not rapidly recognized and treated [51].
- Blood glucose in DKA is generally higher than 400 mg/dL [52].

Signs and Symptoms	**Diabetic Ketoacidosis (DKA)**	**Source**
Respirations	Rapid and deep (Kussmaul respirations)	[47]
Breath Odor	Sweet, fruity (acetone-like)	[89]
General Presentation	Generalized illness, abdominal pain, body aches	[49]
Gastrointestinal	Nausea, vomiting	[50]
Mental Status	Altered mental status, unconsciousness (severe)	[50]
Blood Glucose	Generally higher than 400 mg/dL	[52]
Urination/Thirst	Polyuria, Polydipsia (especially new onset)	[41]

6. Diabetes Mellitus Type 2: Characteristics and Hyperosmolar Hyperglycemic Nonketotic Syndrome (HHNS)

- **diabetes mellitus type 2** is caused by cellular resistance to insulin [53].
- **Obesity** predisposes patients to Type 2 diabetes [54].
- The pancreas produces insulin, but cells and receptors are dysfunctional [55].
- insulin resistance can improve with exercise and dietary modification [56].
- Treatment includes oral medications [57].
  - Some increase insulin secretion, posing a hypoglycemia risk [57].
  - Others stimulate insulin receptors or decrease glucagon effects [57].
- Injectable medications and insulin are also used for Type 2 diabetes [58].
- Type 2 diabetes is often diagnosed at a yearly medical exam [58].
- Complaints relate to high blood glucose levels [58].
  - These include recurrent infections, vision changes, or foot numbness [59].
- **Symptomatic hyperglycemia** occurs with very high blood glucose [60].
- Patients have altered mental status due to combined problems [60].
- Contrast with Type 1 diabetes:
  - Type 1 leads to ketoacidosis and dehydration from urination [62].
  - Type 2 leads to a non-ketotic state of dehydration [63].
  - Fluid is discharged from body systems and kidneys, causing imbalance [63].
- Long-term hyperglycemia can cause complications [64].
  - Wounds that don't heal, numbness in hands/feet, blindness, renal failure [64].
  - Gastric motility problems [64].
- Uncontrolled Type 2 diabetes can lead to **hyperosmolar hyperglycemic nonketotic syndrome (hhns)** [65].
- HHNS key signs and symptoms include:
  - hyperglycemia [65].
  - Altered mental status, drowsiness, lethargy [65].
  - Severe dehydration, thirst, dark urine [65].
  - Visual and sensory defects, partial paralysis, muscle weakness [66].
  - Seizures [66].
- High blood glucose causes glucose excretion into urine [66].

- Patients increase fluid intake, causing polyuria [66].
- In HHNS, patients cannot drink enough to keep up with high glucose levels [67].
- Urine becomes dark and concentrated [68].
- Severe dehydration can lead to unconsciousness or seizure activity [69].

7. Patient Assessment for Diabetic Emergencies

- Begin with **scene size-up** [78].
- Be cautious of syringes used for insulin [78].
- Look for clues like syringes, insulin bottles, food, or orange juice [79].
- Use **standard precautions** [80].
- Question bystanders about events leading to your arrival [80].
- Consider that trauma may also have occurred [80].
- Determine the mechanism of injury (MOI) or nature of illness (NOI) [81].
- Perform a **primary assessment** [82].
- Get a general impression of the patient [82].
- Identify threats and provide life-saving interventions, especially airway management [83].
- Determine the level of consciousness using the AVPU scale (Alert, Verbal, Painful, Unresponsive) [84].
- If unresponsive and you suspect diabetes, call for Advanced Life Support (ALS) [85].
- Patients may have undiagnosed diabetes [85].
- Assess blood glucose levels in patients with altered mental status [85].
- Perform cervical spine immobilization if necessary [86].
- Provide **rapid transport** [86].
- Assess the patient's **breathing** [87].
- Patients with inadequate breathing, a pulse ox less than 94, or altered mental status need high flow oxygen (12-15 L/min via non-rebreather) [88].
- Hyperglycemic patients may have rapid, deep (Kussmaul) respirations and sweet, fruity breath [89].
- Hypoglycemic patients may have normal, shallow, or rapid respirations [90].
- If the patient isn't breathing well, open the airway, insert an adjunct, administer oxygen, and assist ventilations [91].

- Monitor ventilations throughout care [91].
- Assess **circulation** (the "C") [92].
- Hyperglycemic patients often have dry, warm skin [92].
- Hypoglycemic patients often have moist, pale skin [92].
- A rapid, weak pulse can indicate symptomatic hypoglycemia [93].
- Make a **transport decision** (the "D") [94].
- Transport patients with altered mental status and impaired swallowing [95].
- Conscious patients who can swallow may be evaluated on scene [96].
- Perform **history taking** [97].
- Investigate the chief complaint and obtain the history of the present illness using OPQRST [97].
- Obtain the patient's history [97].
- If the patient ate but didn't take insulin, hyperglycemia is more likely [97].
- Obtain a SAMPLE history [98].
- For known diabetics, ask about insulin/pills, insulin pump use, insulin/pill dose taken, food intake, illness, unusual activity, or stress [99].
- Look for emergency medical identification tags (wallet card, necklace, bracelet) [99].
- Conduct a **secondary assessment** [100].
- For nature of illness, focus on a neurological assessment [100].
- Assess non-responsive patients head-to-toe for clues and secondary injuries like trauma [100].
- When diabetes is suspected, focus on mental status, ability to swallow, and airway protection [100].
- Obtain a Glasgow Coma Scale (GCS) score [100].
- Obtain **vital signs**, including blood glucose level if possible [100].
- hypoglycemia vital signs: normal to rapid respirations, weak and rapid pulse, pale and clammy skin, low blood sugar [101].
- hyperglycemia vital signs: rapid (maybe deep and rapid) respirations, rapid, weak, thready pulse, warm and dry skin, normal blood pressure [102].
- Use a **portable glucometer** if available and protocol allows [103].
- Know the glucometer's operating ranges [104].
- Normal non-fasting adult/child blood glucose: 80-120 mg/dL [104].
- Neonate glucose should be above 70 mg/dL [104].

Assessment Step	Key Actions and Findings	Source
Scene Size-Up	Be aware of syringes; Look for clues (insulin, food); Use standard precautions; Question bystanders; Consider trauma; Determine MOI/NOI	[78]
Primary Assessment	General impression; Identify threats; Airway management; Determine LOC (AVPU); Call ALS for unresponsive suspected diabetics; Assess blood glucose (if training allows); C-spine immobilization (if needed); Rapid transport for altered mental status/impaired swallowing	[82]
Breathing Assessment	Assess respirations; High flow oxygen for inadequate breathing, SpO2<94%, altered mental status; Kussmaul respirations/fruity breath (hyperglycemia); Normal/shallow/rapid respirations (hypoglycemia); Open airway, adjuncts, assist ventilations if needed	[87]
Circulation Assessment	Assess skin (warm/dry for hyperglycemia, pale/moist for hypoglycemia); Assess pulse (rapid/weak for symptomatic hypoglycemia)	[92]
History Taking	Investigate chief complaint (OPQRST); Patient history (eating/insulin status); SAMPLE history; Ask specific diabetes questions; Look for medical ID tag	[97]
Secondary Assessment	Physical exam (focus on neuro); Head-to-toe for unresponsive; Focus on mental status, swallowing, airway protection for suspected diabetes; GCS score	[100]
Vital Signs	Blood glucose level (glucometer); Hypoglycemia (rapid/weak pulse, pale/clammy skin); Hyperglycemia (rapid/weak/thready pulse, warm/dry skin)	[100]

8. Emergency Medical Care for Diabetic Emergencies

- **Reassess** diabetic patients frequently [105].
- Assess changes in mental status and ABCs [106].
- Evaluate response to interventions [106].
- Adjust interventions based on glucose administration, readings, or deteriorating consciousness [106].
- For **conscious hypoglycemic patients** who can swallow [107]:
  - Encourage glucose tablets or juice containing sugar [107].
  - Use glucose gel or sugar drink if local protocol allows [108].
- Provide **rapid transport** for **unconscious hypoglycemic patients** [109].
- Also transport patients with risk of aspiration (cannot maintain airway) [109].
- These patients may need IV glucose, IM shot, or intranasal glucagon [110].
- Most EMTs cannot give glucagon [111].
- If unsure if the patient is hyperglycemic or hypoglycemic, **err on the side of giving sugar** [112].
- Determining blood glucose can be hard if signs are confusing and you can't test [113].
- Perform a thorough assessment in these cases [114].
- Contact the hospital to help sort out signs and symptoms [114].
- Coordinate communication and documentation [114].
- Patients refusing transport after symptoms improve with oral glucose need thorough documentation [114].
- **Oral glucose preparations** are available [115].
  - Rapidly dissolving gel [115].
  - Large chewable tablets [115].
  - Liquid formulation [115].
- Contraindications for oral glucose: inability to swallow and patient being unconscious [116].
- Wear gloves before putting anything in a patient's mouth [117].
- Follow local protocols for glucose administration [118].
- Reassess frequently and transport [118].
- hypoglycemia is a possible cause of **seizures** [119].
- Seizures may indicate a life-threatening underlying condition [120].

- Management of seizures:
  - Maintain the airway [121].
  - Place the patient on their side if no cervical spine trauma [121].
  - Do not place anything in the mouth [121].
  - Have suction ready if the patient vomits [121].
  - Provide oxygen or artificial ventilations if cyanotic or breathing inadequately [121].
  - Transport promptly [121].
- **Altered mental status** may be caused by complications like hypoglycemia or ketoacidosis [122].
- Use the mnemonic AEIOU TIPS for altered mental status [122].
- Always suspect and check blood glucose in patients with altered mental status [122].
- Management of altered mental status:
  - Ensure the airway is clear [123].
  - Be prepared to provide artificial ventilations [123].
  - Be prepared to suction if they vomit [123].
  - Provide transport promptly [123].
- Diabetic emergencies can be misdiagnosed as neurological dysfunction or intoxication [124].
- An emergency medical identification (bracelet, necklace, card) can be life-saving [125].
- A blood glucose test can identify the real problem [126].
- Be alert for diabetes and alcoholism coexisting [126].
- Regarding **airway management**:
  - Diabetic patients may not have a gag reflex and vomit [127].
  - The tongue may obstruct the airway [127].
  - Carefully monitor the airway [128].
  - Place the patient in the lateral recumbent position [128].
  - Ensure suction is readily available [128].

9. Introduction to Hematologic Emergencies

- Now transitioning from endocrine to **hematologic emergencies** [129].

- Hematology is the study of blood-related diseases [130].
- Three disorders can create pre-hospital emergencies [131].
  - **sickle cell disease** [131].
  - **hemophilia** [131].
  - **thrombophilia** [131].
  - **anemia** is also discussed [131].

10. Anatomy and Physiology of Blood

- Blood consists of four main components [133].
  - **erythrocytes** (red blood cells) [133].
  - **leukocytes** (white blood cells) [133].
  - **platelets** [133].
  - **Plasma** [133].
- Each component contributes to maintaining the body's **hemostatic balance** [134].
- **Red blood cells** contain hemoglobin [134].
- They carry oxygen to the tissues [134].
- **White blood cells** respond to infection [135].
- They collect dead cells and manage their disposal [135].
- **platelets** are essential for clotting [136].
- **Plasma** serves as the transport medium for blood components, proteins, and minerals [137].

Blood Component	Function	Source
Erythrocytes (Red Blood Cells)	Contain hemoglobin, carry oxygen to tissues	[133]
Leukocytes (White Blood Cells)	Respond to infection, collect dead cells	[133]
Platelets	Essential for clotting	[133]

Plasma	Transport medium for blood components, proteins, minerals	[133]

11. Sickle Cell Disease: Pathophysiology, Complications, and Assessment

- **sickle cell disease**, or hemoglobin s disease, is an inherited blood disorder [138].
- It primarily affects red blood cells [138].
- It is predominantly found in people of African, Caribbean, or South American ancestry [138].
- Patients have **misshapen red blood cells** (sickle-shaped) [138].
- Sickled cells lead to dysfunction in oxygen binding [138].
- They also cause unintentional clot formation [138].
- Sickle cells have a short lifespan, resulting in more cellular waste [139].
- This waste contributes to **sludging** or clumping of blood [139].
- Maintaining hydration is important [139].
- Insufficient hydration increases blood clumping [139].
- Complications of sickle cell disease include:
  - anemia, gallstones, jaundice, and spleen dysfunction [140].
  - Vascular occlusion with ischemia [141].
  - Acute chest syndrome, strokes, joint necrosis, pain crisis [141].
  - Acute or chronic organ dysfunction or failure, retinal hemorrhages [141].
  - Increased risk of infections [141].
- Many complications are very painful and potentially life-threatening [142].
- Patients are more susceptible to infections [143].
- Assessment findings in sickle cell crisis:
  - Increased respirations or signs of pneumonia [167].
  - Increased heart rate [170].
  - Swelling of fingers and toes, priapism, or jaundice [173].
  - Pain (isolated or throughout the body) [174].
  - Visual disturbances [174].
  - Nausea, vomiting, abdominal cramping [174].

- Chest pain or shortness of breath [174].
- Vital signs may be normal to rapid respirations, weak rapid pulse, pale clammy skin, or low blood pressure [177].

12. Clotting Disorders: Hemophilia and Thrombophilia

- **Clotting disorders** affect the blood's ability to clot properly [144].
- **hemophilia** is a rare disorder [145].
- Only about 20,000 Americans have this disorder [145].
- **hemophilia A** affects mostly males [146].
- People with hemophilia A have a decreased ability to create a clot after injury [147].
- This decreased ability can be life-threatening [147].
- Patients can be prescribed medications to replace missing clotting factors [148].
- Medications can also prevent the breakdown of blood clots [148].
- Common complications of hemophilia A include:
  - Long-term joint problems (may need joint replacements) [149].
  - Bleeding in the brain [149].
  - Thrombosis due to treatment [149].
- **thrombophilia** is a disorder of the blood's ability to flow smoothly [150].
- It affects the venous and arterial systems [150].
- Concentrations of blood elements create clogging or blockage issues [151].

- thrombophilia is a general term for conditions causing blood to clot more easily [152].
- It can be an inherited or genetic disorder [152].
- Other causes include medications, other factors, or cancer [152].
- Clots can develop spontaneously in the blood [153].

13. Deep Vein Thrombosis (DVT): Causes, Risk Factors, and Treatment

- **deep vein thrombosis (dvt)** is a common medical problem [154].
- It occurs in sedentary patients and those with recent injury or surgery [154].
- Methods to prevent blood clot formation include:
  - Blood thinning medications [154].
  - Compression stockings [154].
  - Mechanical devices [154].
- Risk factors for DVT include:
  - Recent history of some type of replacement [155].
  - Complications of leg swelling [155].
  - Remaining sedentary for long periods [155].
- Treatment for DVTs includes **anticoagulation therapy** [156].
- Oral medications are typically given for at least three months [157].
- A clot from a DVT may travel from the leg to the lung [157].
- This causes a **pulmonary emboli** [158].

14. Anemia: Causes and Impact on Oxygen Delivery

- **anemia** is an abnormally low number of red blood cells [159].
- Causes include chronic or acute bleeding [160].
- Deficiency in certain vitamins or minerals can cause anemia [160].
- An underlying disease process may also be responsible [160].
- anemia impairs the blood's ability to deliver adequate oxygen to tissues [160].
- Pulse oximetry may show inadequate saturation [160].
- This can happen even if underlying tissues are hypoxic [160].

15. Patient Assessment for Hematologic Emergencies

- Begin with **scene size-up** [161].
- Ensure scene safety [161].
- Most sickle cell patients have experienced a crisis before [162].
- Wear gloves and eye protection at a minimum [163].
- Determine the number of patients involved [163].
- Be alert for possible trauma [164].
- Consider advanced life support (ALS) [164].
- Perform a **primary assessment** [165].
- Perform cervical immobilization if needed [165].
- Form the general impression [165].
- Proceed to the ABCs [165].
- For inadequate breathing or altered mental status, give high flow oxygen (12-15 L via non-rebreather) [166].
- Sickle cell crisis patients may have increased respirations or pneumonia signs [167].
- For difficulty breathing, open the airway, insert adjuncts, administer oxygen, and assist ventilations if needed [168].
- Assess the patient's **circulatory status** [169].
- Sickle cell crisis patients will have increased heart rate [170].
- This helps force sickled cells through smaller vessels [170].
- For suspected hemophilia, be alert for signs of blood loss [170].
- Note bleeding of unknown origin [170].
- Be alert for signs of hypoxia due to blood loss [170].
- Make the **transport decision** (the "D") [171].
- Rapid transport to the emergency room is recommended for any patient experiencing a sickle cell crisis or hemophilia [171].
- Perform **history taking** [172].
- Investigate the chief complaint [172].
- Obtain history of the present illness from responsive patients, family, or bystanders [172].
- Be alert for signs of sickle cell crisis [173].
  - Swelling of fingers/toes, priapism, jaundice [173].
- Ask specific questions:

    - Is pain isolated or throughout the body? [174].
    - Any visual disturbances? [174].
    - Experiencing nausea, vomiting, or abdominal cramping? [174].
    - Experiencing chest pain or shortness of breath? [174].
- Obtain a SAMPLE history from responsive patients or family [175].
- Ask if they've had a crisis before, when the last one was, and how it resolved [175].
- Ask about recent illnesses, unusual activity, or stress [175].
- Conduct a **secondary assessment** [175].
- Systematically examine the patient, focusing on the joints [175].
- Evaluate and document the mental status [175].
- Obtain a complete set of **vital signs**, including oxygen saturation [176].
- Normal sickle cell crisis vital signs: normal to rapid respirations, weak rapid pulse, pale clammy skin, or low blood pressure [177].
- Use pulse ox to monitor oxygen saturation [178].
- Readings may be inaccurate in anemic patients [178].

Assessment Step	Key Actions and Findings	Source
Scene Size-Up	Ensure safety; Be aware of prior crises; Wear gloves/eye protection; Determine patient number; Consider trauma; Consider ALS	[161]
Primary Assessment	C-spine immobilization (if needed); General impression; ABCs; High flow oxygen for inadequate breathing/altered mental status; Assess respirations (increased in sickle cell crisis); Open airway, adjuncts, assist ventilations if needed; Assess circulation (increased heart rate in sickle cell crisis); Be alert for blood loss/hypoxia in hemophilia; Rapid transport for sickle cell crisis/hemophilia	[165]
History Taking	Investigate chief complaint; Obtain history of present illness; Be alert for sickle cell crisis signs (swelling, priapism, jaundice); Ask about pain, vision, GI symptoms, chest pain/SOB; Obtain	[172]

	SAMPLE history (crisis history, recent illness/activity/stress)	
Secondary Assessment	Systemic exam (focus on joints); Evaluate/document mental status; Obtain vital signs (including SpO2)	[175]
Vital Signs	Respirations (normal to rapid); Pulse (weak rapid); Skin (pale clammy); Blood Pressure (low); Pulse ox (may be inaccurate in anemia)	[177]

16. Emergency Medical Care for Hematologic Emergencies

- **Reassess vital signs frequently** to track changes in the patient's condition [179].
- Evaluate the effectiveness of interventions performed [180].
- **Communicate with hospital staff** for continuity of care [180].
- **Document clearly** all findings and care provided [180].
- Emergency care for hematologic emergencies is mainly **supportive and symptomatic** [182].
- For patients with inadequate breathing or altered mental status, provide **high flow oxygen** (12-15 L/min) [182].
- Place the patient in a position of comfort [182].
- **Transport rapidly** to the hospital [182].

17. Review Questions and Conclusion

- This concludes Chapter 20 on endocrine and hematologic emergencies [183].
- Review questions help assess understanding of the material [183].
- **Type 1 diabetes** impairs glucose utilization because cells lack insulin [184].
- In a patient with Type 1 diabetes found unresponsive, asking if they took insulin is most important [186].
- Dehydration in a diabetic patient with high blood glucose is due to the kidneys excreting glucose and water [187].
- Skipping a meal but still taking insulin would most likely cause a hypoglycemic crisis [188].

- For an unresponsive diabetic patient, the first action is to open the airway [191] .
- **kussmaul respirations** (rapid and deep) are typical in diabetic ketoacidosis (dka) [193].
- Excessive urination, thirst, hunger, altered mental status, and fast breathing in a child suggest a hyperglycemic crisis (DKA) [195].
- If cells don't receive glucose, they metabolize **fat** [198].
- Fat metabolism results in **keto acids** [199].
- Compared to a hyperglycemic crisis, a hypoglycemic crisis usually responds immediately to treatment with sugar [200].
- Patients with DKA experience polydipsia (thirst) because they are dehydrated from excessive urination [202].