



TRANSITION SERIES  
**TOPICS** FOR THE **EMT**

TOPIC **31**  
**Hematology:**  
**Blood Disorders**

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## Objectives

- Review frequency of hematological disorders.
- Review the basic blood components.
- Discuss pathophysiology of blood-related disorders.
- Review basic assessment and management strategies.

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Discuss objectives.



# Introduction

- Hematology is the study of the blood and blood products.
- Medical conditions can arise from changes to these components.

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Hematology is the study of the blood and blood products.

Blood consists of:

- Plasma
- Red blood cells
- White blood cells
- Platelets

Various medical conditions result from changes associated with these components.

Lab tests, combined with history and physical exams by physicians, are needed to accurately diagnose hematologic conditions.

## Epidemiology

- Not a common reason for a chief complaint in EMS
- Incidence does increase in certain ethnicities
  - Sickle cell occurs in about 1 out of every 400 African Americans.

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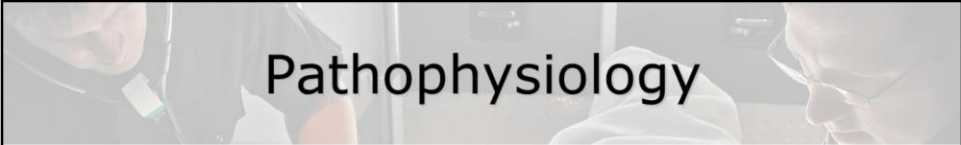
Hematologic conditions are common but do not often present as the primary complaint of patients in the prehospital environment.

Some conditions are not very common in the overall population but are more prevalent in a specific population.

For example, one of the more common hematologic conditions encountered by the EMT in the prehospital environment is sickle cell disease, also known as sickle cell anemia.

Sickle cell anemia occurs in about one in every 400 African Americans in the United States.

The sickle cell trait is found in 8 percent to 10 percent of African Americans in the United States.



# Pathophysiology

- Components of the blood
  - Plasma
  - Red blood cells
  - White blood cells
  - Platelets

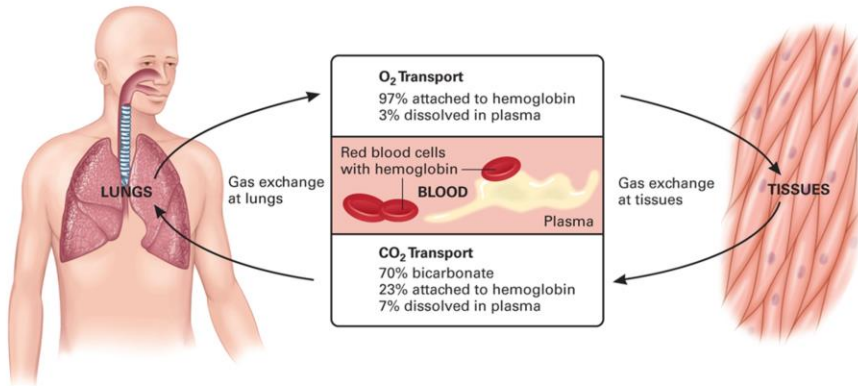
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Discuss/overview the components of blood and their basic function.

**Figure 31-1** Oxygen is transported in the blood in two ways: attached to hemoglobin and dissolved in plasma. Carbon dioxide is transported in the blood in three ways: as bicarbonate, attached to hemoglobin, and dissolved in plasma.



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# Pathophysiology

- Red blood cell diseases
  - Anemia – reduction in red blood cells
    - Aplastic
    - Iron deficiency
    - Pernicious
    - Sickle cell
    - Hemolytic
    - Chronic disease

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A reduction in red blood cells (anemia) will reduce the body's ability to carry oxygen.

The main causes are:

- Blood loss
- Lack of red blood cell production
- Excessive red blood cell destruction

Feedback mechanisms will include:

- Peripheral vasodilation
- Increased cardiac output
- Preferential distribution of blood to critical organs

Eventually though, damage to the heart, brain, and other organs can occur leading to emergencies precipitated by that.

**Table 31-1** Types of Anemia *Source: Bledsoe, Porter, and Cherry, Paramedic Care Vol. 3, p. 533.*

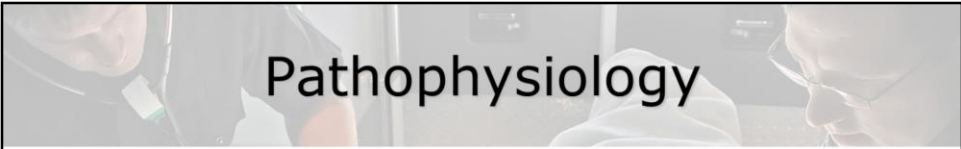
Cause	Type	Pathophysiology
Inadequate production of red blood cells	Aplastic	Failure to produce red blood cells.
	Iron deficiency	Iron is the primary component of hemoglobin.
	Pernicious	Vitamin B <sub>12</sub> is necessary for correct blood cell division during its development.
	Sickle cell	A genetic alteration, in low oxygen states, causes production of a hemoglobin that changes the shape of red blood cells to a C, or sickle.
Increased red blood cell destruction	Hemolytic	Body destroys red blood cells at a rate greater than production; red blood cell parts interfere with blood flow.
Blood cell loss or dilution	Chronic disease	Hemorrhage leads to cell loss; excessive fluid leads to a dilution of red blood cell concentration.

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# Pathophysiology

- Red blood cell diseases
  - Sickle cell disease
    - Abnormal production of hemoglobin
    - RBCs take on a “sickle” shape
    - Aggregation occurs and vessel occlusion results
    - Vaso-occlusive crisis

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Discuss pathophysiology behind sickle cell and the effects on the body.

# Pathophysiology

- Red blood cell diseases
  - Polycythemia
    - Excessive creation of RBCs
    - Blood becomes more viscous

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Polycythemia , or erythrocytosis , is a condition resulting from an abnormally high level of red blood cells in the blood.

The increase is usually due to an excess production of red blood cells.

Pseudoerythrocytosis may appear secondary to dehydration.

The higher the red blood cell levels, the greater is the risk of thrombosis in the individual.

# Pathophysiology

- Red blood cell diseases
  - Thalassemia
    - Inherited blood disorder
    - Decreased production of hemoglobin and red blood cells

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Thalassemia is an inherited blood disorder that results in the decreased production of:

- Hemoglobin
- Red blood cells

It usually affects people of:

- Mediterranean ancestry
- Asian ancestry

Severe thalassemia is normally identified by the age of two years.

Signs and symptoms include:

- Pallor
- Anorexia
- Listlessness
- Jaundice

# Pathophysiology

- White blood cell disease
  - Leukopenia/neutropenia
    - Too few white blood cells
  - Leukemia
    - Cancer of the bone marrow
    - Diminishes ability to fight off infection
  - Lymphoma
    - Cancer of lymphatic system
    - Impairs the immune system

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Discuss pathophysiology behind the listed white blood cell diseases.

Leukocytes respond to infection by increasing in number.

Disseminated intravascular coagulation results when excessive clotting is followed by excessive hemorrhage.

thrombocytes are the primarily function of blood component?

# Pathophysiology

- Platelet disease/Clotting disorders
  - Thrombocytopenia
  - Thrombocytosis
  - Hemophilia
  - Von Willebrand disease
  - Disseminated intravascular coagulation
  - Multiple myeloma


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Discuss pathophysiology behind the listed platelet and clotting disorders.

Generally speaking, due to the overproduction, underproduction, or disturbed production of platelets and clotting elements—there is ongoing disturbances to the clotting mechanisms which can result in either excessive bleeding or the clumping of cells together in the formation of vascular emboli.



## Assessment Findings

- General assessment findings
  - Vague and nonspecific findings
    - Fatigue, weakness
    - Shortness of breath
    - Bleeding or bruising easily
    - Headache and dizziness
    - Jaundice
    - Obtaining good history is very important

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Unfortunately the symptoms are very vague and nondescript. It is difficult to develop a differential diagnosis in the prehospital environment.



## Emergency Medical Care

- Ensure airway adequacy
- Provide oxygen based on ventilatory need
  - NRB mask at 15 lpm with adequate breathing
  - PPV with 15 lpm oxygen with inadequate breathing
- Control external hemorrhage if present

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Emergency medical care for patients with hematological emergencies is primarily supportive.

Patients may present with a wide variety of signs and symptoms, based on their underlying condition, that require emergency medical care.



## Emergency Medical Care

- Keep patient in position of comfort
- Arrange for ALS backup or intercept
- Provide rapid transport to the ED

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Review treatment strategies.





## Case Study

You are dispatched to a residence for a male patient with “back pain.” Upon your arrival you locate the patient lying on his living room couch. The patient is talking, and appears to be in great pain. He is conscious and oriented.

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Present case study.



## Case Study

- Scene Size-Up
  - Scene is safe, standard precautions taken
  - Patient is 22 years old, African American, about 145 lbs
  - Entry and egress from room is unobstructed
  - MOI/NOI appears to be back pain
  - No additional resources needed

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Present case study.



## Case Study

- Primary Assessment Findings
  - Patient alert and well oriented
  - Airway patent
  - Breathing normally
  - Peripheral perfusion intact
  - Primary complaint is back pain

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Present case study.



## Case Study

- What kind of differentials could you consider at this time?
- What care should you initiate prior to the secondary assessment?
- Is the patient a high or low priority?

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In a young male with back pain, one may initially suspect a traumatic etiology.

Others would include vertebral disk injuries, renal pathologies, or maybe GI that radiates into the back (Kehr sign).

Initial treatment at this time would be oxygen. Finally, the patient would be categorized as a low priority.



## Case Study

- Medical History
  - Patient has history of sickle cell disease
- Medications
  - Self-medicates with 800 mg ibuprofen
- Allergies
  - None

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Discuss case study.



## Case Study

- Pertinent Secondary Assessment Findings
  - Pupils equal and reactive, membranes moist
  - Airway patent and breathing normal
  - Perfusion intact and strong
  - No history of trauma or similar incident
  - Similar episodes of pain due to sickle cell crisis
  - M/S/C present, SpO<sub>2</sub> 98% on room air
  - BGL normal, no other contributory findings

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Discuss case study.



## Case Study

- What may be the cause of the back pain?
- What hematological emergency is this patient likely experiencing?
- What would be three assessment findings that could confirm your suspicion?

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The pain is probably secondary to ischemic or poorly perfused tissues secondary to the sickle cell disease.

Sickle cell crisis is the obvious choice:

- History of sickle cell
- Atraumatic back pain in a young patient
- Similar episodes of sickle cell crisis



## Case Study

- Care provided:
  - Patient placed on low-flow oxygen
  - Placed in a position of comfort on wheeled cot
  - Transport initiated to ED

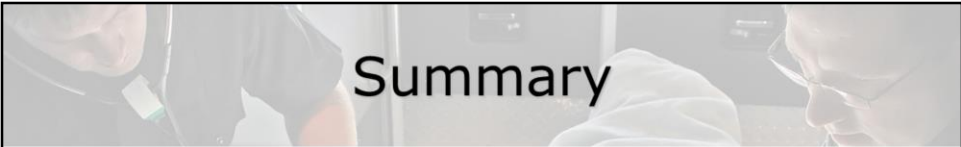
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Review patient management.





## Summary

- Hematological emergencies are rare, and when they do occur, are often difficult to distinguish between.
- If the EMT is ever uncertain of which etiology is occurring, treat the patient symptomatically and provide transport.

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Review as appropriate.