

## Acute Blood Loss — Causes, Symptoms and Treatments

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**Acute blood loss is the leading cause of acute anemia. Damage to blood vessels due to several causes results in a disruption in blood vessels' integrity. Blood loss occurs both internally and externally. Internal bleeding may not easily be diagnosed in many cases because the bleeding occurs inside organs, which may result in hematoma formation. External bleeding occurs through the skin from injuries and wounds. Acute blood loss usually requires emergency surgical intervention to avoid further complications.**



### Etiology of Acute Blood Loss

#### Causes of Acute Blood Loss

**Blood** is constantly circulating throughout our bodies, supplying vital organs with oxygen and nutrients. Damage to blood **vessels** disrupts the integrity of the vessel walls. Usually, the body's clotting mechanism helps repair and counteract the damaged vessel walls. However, when the damaged amount exceeds the clotting time, severe bleeding results.

Acute blood loss occurs both internally and externally. Internal bleeding occurs due to damage within [tissues](#), organs, or cavities. It is not easily identifiable and is therefore often undiagnosed. If the bleeding is significant, blood may escape the compact heme system and collect in cavities of the body, forming hematomas.

**Internal bleeding usually** arises from upper GI bleeds, including bleeding ulcers, varices, and diverticuli; [bone](#) damage; subarachnoid hemorrhage arising from a ruptured spleen; a ruptured pregnancy; or malignancy. Other causes include physical damage to the body that does not always result in external wounds or lacerations. These are harder to identify and bleeding may occur internally without any visual defects.

**External bleeding**, which is easier to identify, is the second major cause of acute blood loss. It results from any damage or trauma to the body that creates identifiable blood loss from an open wound. These include lacerations, accidents, severed tissue and organs, lower gastrointestinal bleeds, hematochezia, and hemorrhoids.

## Pathogenesis of Acute Blood Loss

### Anemia Evoked by Acute Blood Loss

Acute blood loss creates anemia due to the loss of red blood cells and depletion of iron.

This type of anemia is sometimes referred to as **posthemorrhagic anemia**.

Hypovolemia is the largest threat, particularly to organs that have a large vascular supply. Hemoglobin is not usually affected, however, so lab tests will not indicate anemia.

The body's baroreceptors will initiate the **release of vasopressin**, shifting extravascular fluid to intravascular compartments. This results in hemodilution, **which changes hypovolemia to anemia**. The plasma that was lost will be replaced by retaining volume in the [kidneys](#). The anemia may be revealed by diluting the red blood cell count. Bone marrow response usually takes 5 to 7 days to respond with reticulocytosis.

In the worst cases, the **loss of >20 % of blood** leads to **hypovolemic shock**. Cardiac output is soon decreased, as the volume of circulated blood is significantly reduced. In response, catecholamines, antidiuretic hormone, and angiotensin II are released and lead to increased peripheral vascular resistance. Although the blood supply to the [brain](#) and [heart](#) stays stable, the perfusion of the extremities (later on even inner organs) is reduced and results in impaired oxygenation.

The affected extremities and organs use **anaerobic metabolism** to produce lactate. Precapillary dilatation and postcapillary constriction direct the blood toward the capillary bed, contributing to increased hypovolaemia.

## Symptoms of Acute Blood Loss

### Signs of Acute Blood Loss

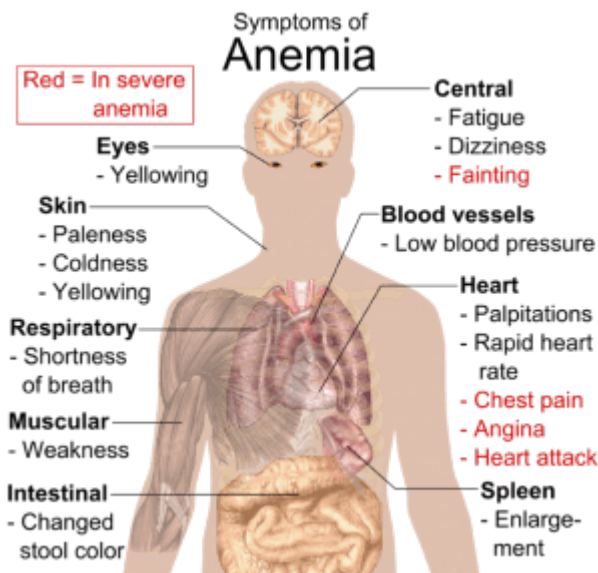


Image: "Main symptoms that may appear in anemia." by Mikael Häggström. License: [Public Domain](#)

Acute blood loss presents with a number of signs and symptoms. Initially, anemia is not present, as blood plasma is lost with red blood cells. However, **as plasma and blood volume fall, anemia results**. Primary symptoms include dyspnea at rest or exertion, fatigue, bounding pulses, palpitations, lethargy, and confusion. Volume depletion due to bleeding can result in cramping, vertigo, syncope, and hypotension. The most serious complication of acute blood loss is volume depletion due to bleeding, which can result in cramping, vertigo, syncope, and hypotension. This leads to hypovolemic shock. Inadequate blood and volume load result in unperfused organs and decreased cardiac output, causing hypotension and end-organ failure. Angina and even cardiac arrest may occur.

## Diagnosis of Acute Blood Loss

Lab work and diagnosis suggest a **hemoglobin level <7 g/dl** as symptomatic and suggestive of acute anemia. Mean corpuscular volume is usually in the normal range, from 80 to 100 fL. **Ultrasound** and **magnetic resonance imaging/computed tomography** imaging can be performed to rule out bleeding locations if not visibly identifiable or if the damage is hidden. Tagged red blood cell studies may also be performed to identify sources of gastrointestinal bleeding.

## Treatment and Management of Acute Blood Loss

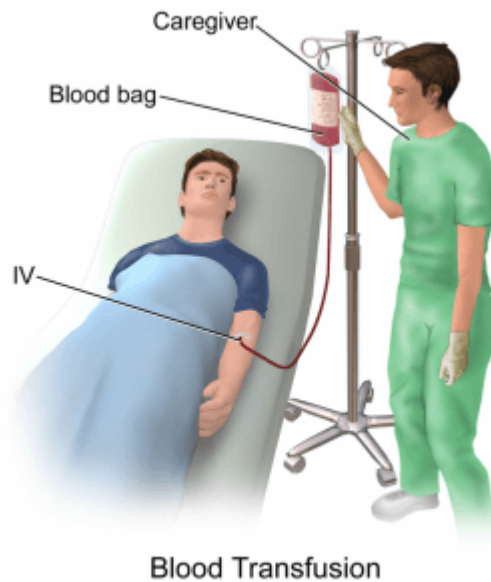


Image: "Blood Transfusion" by BruceBlaus. License: [CC BY 3.0](https://creativecommons.org/licenses/by/3.0/)

Identifying the source of the bleed and **eliminating hemorrhaging** is the first priority. Stabilization is achieved by providing oxygen and cauterizing any bleeds. Blood may also need to be replaced via a transfusion if hematocrit levels are  $<20\%$ . Red blood cell transfusion is the most efficient way to regulate heme concentration; however, increases in mortality have been reported in patients receiving transfusions.

A hemoglobin level  $<6.8$  g/dl is usually the threshold for transfusions. Packed red blood cells may also be used to raise hematocrit levels.

Patients with acute blood loss should be monitored until stable; this includes **monitoring** their oxygen saturation levels, placing them on telemonitors, and inserting intravenous lines. Vasopressors are contraindicated. Pregnant patients who are RH-negative and have acute blood loss must be given RhoGAM due to the risk of the fetus's interaction with the mother's blood.

## Review Questions

The answers are below the references.

**1. A 43-year-old male was playing soccer when he suddenly fractured his knee. He received knee arthroplasty. Lab values before and after surgery are as follows: hemoglobin 17.2 and 14.0; hematocrit 90 and 75. Which of the following describes his condition?**

- A. Acute blood loss anemia according to the above-mentioned H/H levels
- B. No acute blood loss anemia according to H/H values
- C. Chronic anemia with concurrent acute blood loss anemia
- D. Iron deficiency anemia

**2. A 24-year-old 28-week pregnant female was presented to the ER due to a slip and fall. She has a history of chronic anemia and vitamin K deficiency. The patient was complaining of tender flank pain and bruising in the lower abdomen and pelvic area. Which is the best immediate next step?**

- A. Blood transfusion
- B. Treatment of RhoGAM

- C. Open laparotomy
- D. Physical examination and ultrasound

**3. An 18-year-old male was brought to the ER after a motor vehicle accident. He was unable to ambulate and found to have a pelvic fracture on CT. While undergoing orthopedic surgery, the patient's blood pressure dropped significantly; he had a normal central venous pressure and non-palpable veins. The patient was most likely suffering from which of the following?**

- A. Hypovolemic shock
- B. Cardiogenic shock
- C. Transfusion reaction
- D. Septic shock

## References

Hillman, R. S., Ault, K. A., Lepporier, M., & Rinder, H. M. (2011). Hematology in clinical practice. In *Hematology in clinical practice* (5th ed., pp. 10–26). essay, New York: McGraw-Hill Medical.

Tefferi, A. (2003). *Anemia in Adults: A Contemporary Approach to Diagnosis*. Mayo Clinic Proceedings, 78(10), 1274–1280. <http://doi.org/10.4065/78.10.1274>

**Correct answers:** 1B, 2D, 3A

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