Chapter 26, Bleeding

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1. Introduction to Bleeding and the Circulatory System

Component	Function
Heart	Pumps blood [7]
Blood Vessels	Serve as the container for blood [7]
Blood and Body Fluids	The fluid circulated [7]

- Bleeding can be **external** and visible or **internal** and hidden [4].
- Both types of bleeding are potentially dangerous and can lead to **weakness, shock, and death** [4].
- **Uncontrolled bleeding** is a common cause of **hypoperfusion** following traumatic injury [5].
- The **circulatory system** circulates blood to all body cells and tissues [5].
- It delivers **oxygen and nutrients** and carries away metabolic waste products [6].
- The system is responsible for supplying and maintaining **adequate blood flow** [6].
- The contents of the circulatory system are the **heart (pump)**, **blood vessels (container)**, and **blood and body fluids (fluid)** [7].
- The heart requires a **rich and well-distributed blood supply** [9].
- It works as two paired pumps: the upper chamber (atrium) and the lower chamber (ventricles) [10].

- Blood leaves each chamber through a **one-way valve** [11].
- Types of blood vessels include **arteries, arterioles, capillaries, venules, and veins** [13].
- Oxygen and nutrients pass from capillaries into cells, while waste and carbon dioxide diffuse from cells back into capillaries [14].
- Blood contains **red blood cells** (oxygen/carbon dioxide transport), **white blood cells** (fighting infection), **platelets** (forming blood clots), and **plasma** (liquid part) [15].
- Blood clot formation depends on blood stasis, changes in blood vessel walls (like a wound), or the blood's ability to clot [18].
- The **autonomic nervous system** monitors the body's needs and adjusts blood flow by constricting or dilating blood vessels [20].
- It automatically redirects blood away from other organs to the **heart, brain, lungs, and kidneys** in an emergency [22].
- This system adapts to changing conditions and maintains **homeostasis and perfusion** [22].

2. Pathophysiology and Perfusion

- **perfusion** is the circulation of blood within an organ or tissue [24].
- It must be in adequate amounts to meet cell needs for oxygen, nutrients, and waste removal [24].
- Blood flow speed must be fast enough to maintain adequate circulation and avoid clotting [24].
- It must also be slow enough to allow cells time to exchange oxygen and nutrients for waste products [24].
- Some tissues need a **constant blood supply** [25].
- Others can survive with **very little blood** [25].
- All tissues, organs, and organ systems rely on **adequate perfusion** to function properly [26].
- Some organs cannot tolerate a blood supply interruption for more than a few minutes without damage [27].
- Death of an organ system can quickly lead to the **death of a patient** [28].
- The heart requires a **constant flow of blood** [29].
- If the circulatory system fails to provide significant circulation, **shock results** [23].

3. External Bleeding: Characteristics and Assessment

Type of Bleeding	Characteristics	Manageability	Appearance	Spurting	Clotting

Arterial	Pressure causes spurting [38]	Difficult to control [38]	Brighter red [39]	Spurts with pulse [39]	Less likely to clot spontaneously [41]
Venous	Does not spurt [40]	Easy to manage [40]	Dark red [39]	Does not spurt [40]	More likely to clot spontaneously [40]
Capillary	Oozes from wound [41]	Steady but slowly [41]	Dark red [41]	Oozes [41]	More likely to clot spontaneously than arterial [41]

- **hemorrhage** means bleeding, and external bleeding is a **visible hemorrhage** [29].
- With serious external bleeding, estimating the amount of blood loss can be difficult [30] .
- Blood looks different on different surfaces, making estimation important [31].
- The body cannot tolerate an acute blood loss greater than **20 percent of blood volume** (about two pints) [32].
- Adverse changes in vital signs occur with significant blood loss [33].
- These include an **increase in heart rate**, an **increase in respiratory rate**, and a **decrease in blood pressure** [33].
- How well people compensate for blood loss depends on how rapidly they bleed [34].
- Rapid blood loss, even if less than 20%, can cause signs of **hypovolemic shock** [35].
- The patient's **age and pre-existing health** should also be considered [36].
- Bleeding is considered serious if certain conditions are present [37].
- These conditions include **poor general appearance**, no response to external stimuli, signs of shock, significant blood loss, rapid blood loss, uncontrolled bleeding, or a significant mechanism of injury [37].
- Types of external bleeding are arterial, venous, and capillary [38].
- Arterial bleeding spurts with the pulse and is typically brighter red [39].
- Venous bleeding is dark red and does not spurt [40].
- Capillary bleeding is dark red and oozes slowly [41].
- Venous and capillary bleeding are more likely to clot spontaneously than arterial bleeding [40].

4. The Clotting Process and Hemophilia

- Bleeding tends to stop within about **10 minutes** in response to internal mechanisms and exposure to air [42].

- When skin is broken, blood flows rapidly from the open vessel [42].
- The cut ends of the vessel begin to narrow, a process called **vasoconstriction** [43].
- vasoconstriction reduces the amount of bleeding [44].
- Then a **clot forms** [44].
- Bleeding will not stop if a clot does not form, unless the injured vessel is cut off by direct pressure or a tourniquet [45].
- With **hemophilia**, the patient lacks one or more blood clotting factors [46].
- Bleeding may occur spontaneously in hemophiliacs [46].
- All injuries, even trivial ones, are potentially serious for patients with hemophilia [46].
- hemophiliac patients should be **transported immediately** [46].

5. Internal Bleeding: Recognition and Assessment

Possible Causes	**Signs and Symptoms**
Stomach ulcer [51]	Pain (most common) [57]
Lacerated liver [51]	Swelling in the area [57]
Ruptured spleen [51]	Distension (chest cavity, lung) [57]
Broken bones [51]	Hematoma or bruising [57]
Contusions or ecchymosis [52]	Bleeding from any body opening (mouth, rectum, hematuria, vaginal, hematemesis, melena) [57]
Ulcers [55]	Pain, tenderness, bruising, guarding, or swelling (possible fractures) [58]
Bleeding in the colon [55]	Rigid, distended abdomen [58]
Ruptured ectopic pregnancy [55]	Change in mental status (anxiety, restlessness, combativeness) [59]
Aneurysms [55]	Weakness, faintness, or dizziness on standing [59]
Closed unstable pelvic fracture [111]	Change in skin [60]
	Tachycardia [60]

	Thirst [60]
	Nausea and vomiting [60]
	Cool, moist, clammy skin [60]
	Shallow, rapid breathing [60]
	Dull eyes, slightly dilated pupils slow to respond to light [60]
	Cap refill over two seconds (infants, children) [61]
	Weak rapid pulse [61]
	Decreasing blood pressure [61]
	Altered mental status [61]

- Internal bleeding can be very serious because it is **not easy to detect immediately** [48] .
- Injury or damage to internal organs commonly causes extensive internal bleeding [49].
- Internal bleeding can lead to **hypovolemic shock** [50].
- Possible causes include stomach ulcers, lacerated liver, ruptured spleen, and broken bones [51].
- Signs of internal bleeding may include **contusions or ecchymosis** [52].
- A **high-speed mechanism of injury** increases suspicion for serious unseen injury [52].
- Blunt trauma and penetrating trauma are mechanisms for internal bleeding [53].
- The mnemonic **DCAP-BTLS** is used to assess for signs of injuries [53].
- This stands for deformities, contusions, abrasions, punctures, penetrations, burns, lateral tenderness, laceration, swelling, and other signs of injury [53].
- Internal bleeding is not always caused by trauma [54].
- Non-traumatic causes can be ulcers, bleeding in the colon, ruptured ectopic pregnancy, or aneurysms [55].
- Recognizing a patient in shock and responding appropriately is important [56].
- Signs and symptoms of internal bleeding include pain, swelling, distension, and bruising (hematoma) [57].
- Bleeding from any body opening can indicate internal bleeding [57].
- This includes bright red bleeding from the mouth or rectum, hematuria, non-menstrual vaginal bleeding, hematemesis (vomiting blood), and melena (black, tarry stool) [57].

- Pain, tenderness, bruising, guarding, or swelling can indicate possible closed fractures or broken ribs [58].
- A rigid, distended abdomen might be seen [58].
- hypoperfusion (hypovolemic shock) can cause changes in mental status like anxiety, restlessness, or combativeness [59].
- Weakness, faintness, or dizziness on standing are signs [59].
- Changes in skin can also occur [60].
- Later signs of hypoperfusion include tachycardia, weakness, fainting, thirst, nausea, vomiting, and cool, clammy skin [60].
- Shallow, rapid breathing, dull eyes, slightly dilated pupils, and a weak rapid pulse may be present [60].
- Capillary refill over two seconds in infants and children is a sign [61].
- Decreasing blood pressure and altered mental status are also indicators [61].
- Patients with these signs and symptoms require **prompt transport** [61].

6. Patient Assessment in Bleeding Emergencies

- The **scene size-up** involves being alert for potential hazards, especially in violent incidents [62].
- Ensure police are on scene if necessary and follow **standard precautions** [62].
- Consider the mechanism of injury and the need for **spinal immobilization** and additional resources [62].
- The **primary assessment** focuses on identifying life threats without distraction [63].
- Form a **general impression** to identify serious conditions [64].
- Perform a **rapid exam** [65].
- Address obvious life-threatening external bleeding first [65].
- Assess skin color [65].
- Determine the level of consciousness using the **AVPU scale** [66].
- Assess the **ABCs (Airway, Breathing, Circulation)** and the **D (Transport Decision)** [67].
- Ensure a **patent airway** and provide high-flow oxygen [67].
- Assist ventilations if needed using a bag-valve mask or non-rebreather mask [68].
- Insert an oral pharyngeal airway if the patient is unconscious [68].
- Assess pulse rate and quality, skin condition, color, temperature, and cap refill time for circulation [69].
- Control external bleeding and **treat for shock** [69].
- Make the **transport decision** based on ABCs and life threats [70].
- Patients with significant bleeding can become unstable quickly [72].
- Signs needing rapid transport include tachycardia, tachypnea, low blood pressure, weak pulse, or clammy skin [73].

- **History taking** involves investigating the chief complaint [74].
- Look for signs and symptoms of other injuries based on the mechanism of injury or nature of illness [75].
- Gather the **SAMPLE history** (Signs, Allergies, Medications, Past medical history, Last oral intake, Events leading up to injury) [76].
- Ask about **blood-thinning medications** [76].
- For unresponsive patients, get history from medical alert tags or bystanders [77].
- Look for signs of shock and estimate the amount of blood loss [77].
- The **secondary assessment** involves assessing all areas using DCAP-BTLS [78].
- Check the head for uncontrolled bleeding from scalp lacerations [79].
- Feel all four abdominal quadrants for tenderness or rigidity [80].
- Record pulse, motor, and sensory functions in the extremities [81].
- Record vital signs [81].
- With critically injured patients or short transport times, a full secondary assessment may not be possible [82].
- **Reassessment** is done frequently, especially in areas with abnormal findings [83].
- Reassess unstable patients every 5 minutes and stable patients every 15 minutes [83].
- Interventions include high-flow oxygen, controlling external bleeding, treating for shock, and rapid transport [84].
- If internal bleeding is suspected, provide high-flow oxygen and rapid transport [85].
- Do not delay transport to complete assessments [86].

7. Emergency Care for External Bleeding

Method	Application	Notes
Direct Pressure	Apply glove fingertip or hand over sterile dressing [94]	Most common and effective method [92]. Apply pressure for at least 5 minutes [95].
Pressure Dressing	Wrap sterile, self-adhering roller bandage around wound [96]	Stretch tight enough to control bleeding [96]. Should still feel distal pulse [97]. Do not remove until physician evaluates [98]. Add more dressings if bleeds through [99].
Tourniquets	Apply above the level of bleeding [100]	Useful for substantial extremity bleeding not controlled by direct pressure [99]. If not possible, consider additional tourniquet or wound packing [100]. Follow skill drill 26-3 [108].

Hemostatic Dressing/Wound Packing	Pack gauze or dressing into larger wounds [103]	Used when direct pressure is inadequate or tourniquet is not possible [103]. Hemostatic dressing has chemical to promote clot formation [104]. Can be used with wound packing and direct pressure [105]. Follow skill drill 26-2 [106].
Junctional Tourniquets	Apply for proximal compression in areas like groin or axilla [108]	For severe hemorrhage at the junction of torso with arms/legs [109]. Pelvic binder is a type [109].
Air Splints	Apply to entire extremity [109]	Controls internal and external bleeding with severe extremity injuries [109]. Immobilizes fractures [109]. Acts like a pressure dressing [109].
Pelvic Binder	Apply for suspected closed unstable pelvic fracture [110]	Helps control internal bleeding, especially with life-threatening open-book pelvic fracture [111].

- Follow **standard precautions** when providing emergency care for external bleeding [88].
- Wear a **mask, gloves, eye protection, and sometimes a gown** [88].
- Ensure the patient has an **open airway** and is breathing adequately [89].
- Provide **high-flow oxygen** [90].
- If obvious life-threatening bleeding is present, control it quickly [90].
- Several methods exist to control external bleeding [91].
- These include **direct pressure, pressure dressings, tourniquets, hemostatic dressing, and wound packing** [91].
- **Direct pressure** is the most common and effective method [92].
- Pressure stops blood flow and allows normal coagulation [93].
- Apply pressure with a gloved fingertip or hand over a sterile dressing [94].
- For a protruding object, stabilize it with bulky dressing and apply pressure [95].
- Hold uninterrupted pressure for at least five minutes [95].
- A **pressure dressing** involves wrapping a sterile, self-adhering bandage firmly around the wound [96].
- Stretch the bandage tightly enough to control bleeding [96].
- You should still feel a distal pulse after applying the dressing [97].
- Do not remove the dressing until a physician has evaluated the patient [98].
- Add more dressings if the first one bleeds through [99].

- A **tourniquet** is useful for substantial extremity bleeding not controlled by direct pressure [99].
- Apply the tourniquet **above the level of bleeding** [100].
- If a single tourniquet is not possible, consider an additional one or wound packing [100].
- Follow the skill drill for applying a commercial tourniquet [108].
- **Wound packing** uses gauze packed into larger wounds [103].
- This is done when direct pressure is inadequate or a tourniquet is not possible [103].
- A **hemostatic dressing** is impregnated with a chemical that promotes clot formation [104].
- It can be used with wound packing and direct pressure [105].
- Follow the skill drill for wound packing [106].
- **junctional tourniquets** provide proximal compression for bleeding in areas like the groin or axilla [108].
- They are indicated for severe hemorrhage at the junction of the torso with limbs [109].
- A **pelvic binder** is a type of junctional tourniquet [109].
- **air splints** can control internal and external bleeding associated with severe extremity injuries [109].
- They also immobilize fractures and act as a pressure dressing for an entire extremity [109].
- A **pelvic binder** is indicated for suspected closed unstable pelvic fractures [110].
- It helps control internal bleeding from open-book pelvic fractures [111].

8. Emergency Care for Internal Bleeding and Special Cases

- Controlling internal bleeding or bleeding from a major organ usually requires **surgery or other hospital procedures** [120].
- Try to keep the patient **calm, reassured, and quiet** [120].
- Provide **high-flow oxygen** [121].
- Maintain the patient's **body temperature** [121].
- **Splint the injured extremity**, usually with an air splint [121].
- **Never use a tourniquet** to control bleeding from a closed internal or soft tissue injury [121].
- Follow the skill drill for caring for patients with internal bleeding [121].
- Bleeding from the **nose, ears, or mouth** can result from several conditions [112].
- These include skull fracture, facial injury, sinusitis, infection, nose drop abuse, dried nasal mucosa, high blood pressure, coagulation disorders, digital trauma, or cancer [112].
- **Epistaxis (nosebleed)** is a common emergency [114].
- It can occasionally cause enough blood loss to lead to shock [114].
- Much of the blood may pass down the throat into the stomach [115].

- Swallowing a large amount of blood can cause nausea and vomiting [115].
- Most non-traumatic nosebleeds occur from sites in the septum [115].
- Pinching the nostrils together is usually effective for this type of bleeding [115].
- Bleeding from the nose or ears after a **head injury** may indicate a skull fracture [116].
- This type of bleeding may be **difficult to control** [116].
- **Do not attempt to stop this blood flow** by applying excessive pressure [116].
- Excessive pressure may force blood to collect in the head [116].
- Loosely cover the bleeding site with a sterile gauze pad to collect blood [117].
- This also keeps contaminants away [117].
- Apply light compression by wrapping a bulky dressing around the head [118].
- A **target or halo shaped stain** on the dressing may indicate the presence of cerebrospinal fluid [119].

9. Communication and Documentation

- **Do not delay transport** of any patient to complete assessments [86].
- It is essential to **communicate and document** in bleeding emergencies [86].
- Recognize, estimate, and report the **amount of blood loss** [86].
- Report how rapidly the bleeding occurred [87].
- Communicate all relevant information to the staff at the receiving hospital [87].
- This includes **all injuries**, the **care provided**, and the **patient's response** [87].

10. Conclusion and Review

- What is not a component of the cardiovascular system? The lungs are part of the respiratory system [123].
- How is perfusion most accurately defined? It is the circulation of enough oxygen and nutrients in significant amounts [124].
- Which injury is the highest treatment priority for a man in a motorcycle crash with multiple abrasions and lacerations? A one-inch laceration on the thigh squirting blood (arterial bleeding) is the highest priority [126].
- Which set of vital signs is least indicative of internal bleeding? Vital signs that do not show significant changes are least indicative [128].
- When caring for a patient with internal bleeding, what must the EMT do first? The EMT must first take appropriate standard precautions [129].
- What is the quickest and most effective way to control external bleeding from an extremity? Direct pressure is the quickest and most effective way [130].
- When applying a tourniquet to an amputated arm, what should the EMT do? The EMT should avoid applying it over a joint [131].

- What is the most likely contributing factor to a nosebleed in a 70-year-old man with a history of cardiac issues and high blood pressure? High blood pressure is the most likely contributing factor [132].
- When caring for epistaxis, what is the most effective way to prevent aspiration of blood? Leaning the patient forward and tilting them forward is most effective [135].
- What does controlling internal bleeding typically require? Controlling internal bleeding usually requires surgical intervention [136].
- This concludes the chapter on bleeding [137].