

D02: Bleeding

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Introduction

Hemorrhage can result from a number of causes including traumatic, gastrointestinal and obstetrical. In the context of trauma, loss of circulating blood volume from hemorrhage is the most common cause of shock; hemorrhagic shock is a common and frequently treatable cause of death in injured patients and is second only to traumatic brain injury as the leading cause of death from trauma. Timely recognition, appropriate resources, and appropriate response are critical for preventing death.

Essentials

- Obtain rapid control of external hemorrhage
- Control compressible and extremity bleeding with direct pressure
- Recognize serious occult bleeding
- Strive to mitigate the lethal triad of trauma (hypothermia, acidosis, and coagulopathy)
- Initiate rapid transport to an appropriate lead trauma hospital

Referral Information

Select destination facilities in accordance with the pre-hospital triage and transport guidelines for adult and pediatric major trauma in British Columbia.

General Information

- Assessment and stabilization should follow the CABCDE pattern:
 - Catastrophic hemorrhage
 - Airway
 - Breathing
 - Circulation
 - Disability (Neurologic status)
 - Exposure
- The Advanced Trauma Life Support (ATLS) manual produced by the American College of Surgeons describes four classes of hemorrhage to emphasize the early signs of the shock state. Clinicians should note that significant drops in blood pressure are generally not manifested until Class III hemorrhage develops, and up to 30 percent of a patient's blood volume can be lost before this occurs.
 - Class I hemorrhage involves a blood volume loss of up to 15 percent. The heart rate is minimally elevated or normal, and there is no change in blood pressure, pulse pressure, or respiratory rate.
 - Class II hemorrhage occurs when there is a 15 to 30 percent blood volume loss and is manifested clinically as tachycardia (heart rate of 100 to 120), tachypnea (respiratory rate of 20 to 24), and a decreased pulse pressure, although systolic blood pressure (SBP) changes minimally if at all. The skin may be cool and clammy, and capillary refill may be delayed. This can be considered moderate hemorrhage.
 - Class III hemorrhage involves a 30 to 40 percent blood volume loss, resulting in a significant drop in blood pressure and changes in mental status. Any hypotension (SBP less than 90 mmHg) or drop in blood pressure greater than 20 to 30 percent of the measurement at presentation is cause for concern. While diminished anxiety or pain may contribute to such a drop, the clinician must assume it is due to hemorrhage until proven otherwise. Heart rate (≥ 120 and thready) and respiratory rate are markedly elevated, while urine output is diminished. Capillary refill is delayed. Both class III and class IV should be considered severe hemorrhage.
 - Class IV hemorrhage involves more than 40 percent blood volume loss leading to significant depression in blood pressure and mental status. Most patients in Class IV shock are hypotensive (SBP less than 90 mmHg). Pulse pressure is narrowed (≤ 25 mmHg), and tachycardia is marked (>120 beats per minute). Urine output is

minimal or absent. The skin is cold and pale, and capillary refill is delayed.

Interventions

First Responder

- Supplemental oxygen as required
 - → [A07: Oxygen and Medication Administration](#)
- Position patient based on comfort and tolerance
- Consider spinal motion restriction if clinically indicated
- Apply direct pressure to control external hemorrhage
- Prevent heat loss

Emergency Medical Responder – All FR interventions, plus:

- Splint pelvis/fractures, if clinically indicated
 - → [PR02: Pelvic Binders](#)
- Pack wounds, if clinically indicated
 - → [PR04: Wound Packing](#)
- Apply tourniquets, if clinically indicated
 - → [PR03: Tourniquets](#)
- Activate AutoLaunch/Early Fixed Wing Launch, if appropriate.

Primary Care Paramedic – All FR and EMR interventions, plus:

- Establish IV access
 - → [D03: Vascular Access](#)
- Fluid resuscitation to mentation and/or central pulses. Consider permissive hypotension in select patients. Minimize the use of crystalloid.
- [Tranexamic acid](#) in cases of occult bleeding and/or hypovolemic shock
- Apply hemostatic dressing
- Provide analgesia as needed
 - → [E08: Pain Management](#)

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Advanced assessment techniques including point of care ultrasound (POCUS)
- If clinically indicated:
 - Large-bore, single-lumen central cordis
 - Balanced blood product resuscitation
 - Reversal of anticoagulation
 - Balloon tamponade device

Evidence Based Practice

[Limb Amputation/Mangled/Major Hemorrhage](#)

[Hemorrhagic Shock](#)

References

1. Alberta Health Services. AHS Medical Control Protocols. 2020. [\[Link\]](#)
2. Ambulance Victoria. Clinical Practice Guidelines: Ambulance and MICA Paramedics. 2018. [\[Link\]](#)

3. American College of Surgeons. Advanced Trauma Life Support Student Course Manual 10th Edition. 2018. [\[Link\]](#)
4. Colwell C. Initial management of moderate to severe hemorrhage in the adult trauma patient. In UpToDate. 2019. [\[Link\]](#)
5. Kutcher M, et al. Acute coagulopathy associated with trauma. In UpToDate. 2020. [\[Link\]](#)
6. Raja A, et al. Initial management of trauma in adults. In UpToDate. 2019. [\[Link\]](#)

