ADVANCED FIRST AID AND EMERGENCY RESPONSE FOR EXTERNAL AND INTERNAL BLEEDING

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Abstract. *Hemorrhage remains one of the leading preventable causes of death following trauma, particularly in prehospital and emergency settings. This article provides a comprehensive overview of first aid management for external and internal bleeding, incorporating current evidence-based practices, including tourniquet use, hemostatic agents, trauma-induced coagulopathy recognition, and damage control principles used in modern trauma systems.*

Keywords: *Trauma-Induced Coagulopathy (TIC), Tourniquet Science, "STOP THE BLEED", "Lethal Triad"*

Introduction

Bleeding can rapidly progress to hypovolemic shock, multi-organ failure, and death if not promptly addressed. While external bleeding is often visible and treatable, internal bleeding is insidious and harder to detect. With advances in trauma science, first responders and trained laypersons now play a vital role in hemorrhage control prior to hospital care.

Classification of Bleeding

External Bleeding

Visible blood loss due to damage to skin and underlying vessels.

- Arterial: Bright red, pulsatile spurting; high pressure.
- Venous: Dark red, steady flow; lower pressure.
- Capillary: Oozing, superficial wounds.

Internal Bleeding

Blood loss occurring inside the body, not visible externally, due to:

- Blunt trauma (e.g., spleen/liver rupture, pelvic fractures)
- Penetrating trauma (e.g., gunshot or stab wounds)
- Gastrointestinal bleeding (e.g., ulcers, esophageal varices)
- Aneurysm rupture or ectopic pregnancy

Pathophysiology of Hemorrhage

Hemorrhage causes decreased circulating blood volume, leading to:

- ↓ Oxygen delivery to tissues
- Compensatory vasoconstriction and tachycardia
- Progressive hypovolemic shock
- Activation of coagulation cascade, followed by exhaustion and trauma-induced coagulopathy (TIC)

The "Lethal Triad" in trauma:

1. Hypothermia
2. Acidosis
3. Coagulopathy

Early control of bleeding is essential to avoid entering this cycle.

First Aid for External Bleeding

Modern First Response: The "STOP THE BLEED" Campaign

Globally supported by trauma organizations like the American College of Surgeons, the

Stop the Bleed program trains the public and responders in rapid hemorrhage control using:

• Direct pressure • Tourniquets • Hemostatic dressings

Step-by-Step Management

1. Ensure safety & use personal protective equipment (PPE)

Gloves, mask, and eye protection reduce infection risk.

2. Apply direct pressure

• Use a clean gauze or cloth and press firmly for at least 5–10 minutes.

• Reinforce without removing soaked material.

3. Elevate the injured limb (if no fracture suspected)

Helps reduce hydrostatic pressure and bleeding.

Use a tourniquet

• Indicated for life-threatening extremity hemorrhage.

• Apply 5–7 cm above the wound.

• Tighten until bleeding stops (not based on patient comfort).

• Note time of application — tissue necrosis risk rises after 2 hours.

Apply hemostatic agents if available

• Hemostatic dressings (e.g., QuikClot™, Celox™): impregnated with agents like kaolin or chitosan.

• Used in junctional areas (e.g., groin, axilla) where tourniquets are ineffective.

First Aid for Internal Bleeding

Recognition is critical. Signs include:

• Pallor, cold/clammy skin • Weak, rapid pulse and hypotension

• Abdominal distension or rigidity • Altered mental status

• Hematemesis (vomiting blood), melena (black stool), hematuria

Immediate Actions:

1. Lay patient flat and elevate legs. Improves venous return to the heart (Trendelenburg position if tolerated).

2. Maintain body temperature. Prevent hypothermia with blankets and warm fluids.

3. Monitor consciousness and breathing. Prepare to initiate basic life support (BLS) if airway or breathing is compromised.

4. Do not give anything orally. To avoid aspiration or complications if surgery is needed.

5. Rapid EMS activation. Time is critical — definitive care requires hospital-based imaging, blood transfusion, and possible surgery or interventional radiology (e.g., embolization).

Special Considerations in Modern Practice

Tourniquet Science

• Use of commercial tourniquets (e.g., CAT™, SAM XT™) is now standard.

• Studies show improved survival in battlefield and civilian mass casualty events.

Hemostatic Agents

• Widely used by military and EMS.

• Shown to reduce time to hemostasis and improve survival in junctional and scalp bleeding.

Junctional Bleeding

• Tourniquets can’t control bleeding in groin, axilla, or neck.

• Junctional tourniquets and wound packing with hemostatic gauze are used.

Trauma-Induced Coagulopathy (TIC)

• Starts within minutes of severe bleeding.
• Early IV administration of tranexamic acid (TXA) (within 3 hours) reduces mortality:
• 1 g over 10 minutes IV, then 1 g over 8 hours.
• Used in prehospital trauma protocols (e.g., CRASH-2 trial).

When to Refer or Transfer

• Bleeding not controlled after 10 minutes of firm pressure
• Signs of internal bleeding
• Bleeding from the chest, abdomen, or major vessel injury
• Hemorrhage associated with penetrating trauma or multiple injuries.

Conclusion

Effective management of bleeding, whether external or internal, is a cornerstone of trauma care. With the evolution of trauma systems and emergency medicine, modern bleeding control incorporates tourniquets, hemostatic dressings, and early pharmacologic interventions like TXA. First responders and trained laypeople alike must be empowered through education (e.g., Stop the Bleed) to act decisively and save lives in the critical prehospital window.

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