Extremity Trauma and External Hemorrhage Management

Aliases

None noted

Patient Care Goals

1. Minimize blood loss from extremity hemorrhage.
2. Avoid hemorrhagic shock as a result of extremity hemorrhage.
3. Minimize pain and further injury as a result of potential fractures or dislocations.

Patient Presentation

Inclusion Criteria

1. Traumatic extremity hemorrhage (external hemorrhage)
2. Potential extremity fractures or dislocations

Exclusion Criteria

No recommendations

Patient Management

Assessment

1. Evaluate for obvious deformity, shortening, rotation, or instability
2. Assess neurologic status of extremity
    a. Sensation to light touch
    b. Distal movement of extremity
3. Assess vascular status of extremity
    a. Pallor
    b. Pulse
    c. Capillary refill
    d. Degree of bleeding/blood loss with assessment of the color of the blood (venous or arterial) and whether it is pulsatile or not

Treatments and Interventions

1. Manage bleeding
    a. Expose the wound and apply direct pressure to bleeding site followed by pressure dressing.
    b. If direct pressure and/or pressure dressing is ineffective or impractical:
        i. If the bleeding site is amenable to tourniquet placement, apply tourniquet to extremity:
            1. Tourniquet should be placed 2–3 inches proximal to wound, not over a joint, and tightened until bleeding stops and distal pulse is eliminated.
            2. If bleeding continues, place a second tourniquet proximal to the first.
            3. For thigh wounds, consider placement of two tourniquets, side-by-side, and tighten sequentially to eliminate distal pulse.
    c. Wound packing: [EMR]
        i. Indications: Groin/axillary (“junctional”) injury or any limb wound with persistent bleeding despite direct pressure and/or application of commercial tourniquet(s).
        ii. Materials: hemostatic gauze, regular gauze, or any available material.
        iii. Procedure: pack tightly and fully to the depth of the wound until bleeding stops (may require significant packing for deep, large wounds), then apply direct pressure and/or pressure dressing; do not remove packing to assess bleeding.
            1. Pack around (do not remove) bone fragments or foreign objects
    d. Junctional tourniquets may be considered for groin or axillary wounds, if available.

    e. Consider tranexamic acid (TXA) for injury associated with hemorrhagic shock if within three hours of injury [PARA].
2. Manage pain [see Pain Management guideline]
    a. Pain management should be strongly considered for patients with suspected fractures.
    b. If tourniquet placed, an alert patient will likely require pain medication to manage tourniquet pain.
3. Stabilize suspected fractures or dislocations
    a. Strongly consider pain management before attempting to move a suspected fracture.
    b. If distal vascular function is compromised, gently attempt to restore normal anatomic position.
    c. Use splints as appropriate to limit movement of suspected fracture.
    d. Elevate extremity fractures above heart level whenever possible to limit swelling.
    e. Apply ice/cool packs to limit swelling in suspected fractures or soft tissue injury. Do not apply ice directly to skin.
    f. Reassess distal neurovascular status after any manipulation or splinting of fractures or dislocations.
    g. Dress open wounds associated with fractures with saline-moistened gauze
4. Partial/complete amputations, major soft tissue injuries (e.g., mangled extremity) and open fractures
    a. Wrap the amputated part in a sterile dressing moistened with a sterile solution. Seal in a plastic bag and, if available, place the bag in a container of ice and water. DO NOT place part directly on ice
    b. Consider Antibiotic Administration
        i. **Cefazolin**:
            1. Adults: 2 gm IV/IO
            2. Pediatrics: 30 mg/kg [Maximum dose 2 gm] IV/IO
5. Remove wet or blood-soaked clothing and use measures to prevent heat loss.
6. Remove jewelry and potentially constricting clothing from the injured limb.
7. Do not remove impaled foreign bodies.

Patient Safety Considerations

1. If improvised tourniquet has been placed by bystander, reassess, and consider placing commercial tourniquet proximal to it
2. If tourniquet use:
    a. Ensure that it is sufficiently tight to occlude the distal pulse, in order to avoid compartment syndrome.
    b. Ensure that it is well marked and visible and that all subsequent providers are aware of the presence of the tourniquet.
    c. Do not cover with clothing or dressings.
3. Mark time of tourniquet placement prominently on the patient.
4. If pressure dressing or tourniquet used, frequently re-check to determine if bleeding has restarted. Check for blood soaking through the dressing or continued bleeding distal to the tourniquet. Do not remove tourniquet or dressing in order to assess bleeding.
5. Hemodialysis access sites may result in life-threatening hemorrhage. Direct digital pressure should be used first followed by tourniquet in the setting of life-threatening hemorrhage when other means of hemorrhage control have been unsuccessful.

Key Considerations

- Tourniquets should be applied to bare skin, 2–3 inches proximal to the wound.
- Use of tourniquet for extremity hemorrhage is strongly recommended if sustained direct pressure is ineffective or impractical; use a commercially-produced, windlass, pneumatic, or ratcheting device, which has been demonstrated to occlude arterial flow, and avoid narrow, elastic, or bungee-type devices; utilize improvised tourniquets only if no commercial device is available; do not release a properly-applied tourniquet until the patient reaches definitive care.

- Tourniquet should be reassessed at every stage of patient movement to ensure ongoing hemorrhage control.
- Survival is markedly improved when a tourniquet is placed before shock develops.
- Properly-applied tourniquets in conscious patients are painful – treat pain with analgesics, but do not loosen a tourniquet to relieve discomfort.
- Apply a topical hemostatic agent, in combination with direct pressure, for wounds in anatomic areas where tourniquets cannot be applied and sustained direct pressure alone is ineffective or impractical; only apply topical hemostatic agents in a gauze format that support wound packing; only utilize topical hemostatic agents which have been determined to be effective and safe
- Arterial pressure points may not be effective in controlling hemorrhage; however, may help slow bleeding while tourniquet is applied.
- Amputated body parts should be transported with patient for possible re-implantation.
    - It should remain cool but dry.
    - Place the amputated part in a plastic bag.
    - Place the bag with the amputated part on ice in a second bag.
    - Do not let the amputated part come into direct contact with the ice.
- Pediatric considerations:
    - External hemorrhage control to prevent shock is critical in infants and young children, due to their relatively small blood volume.
    - Most commercial tourniquets can be used effectively on children over 2 years of age.
    - Stretch-wrap-tuck elastic-type tourniquets can be used on any age patient.
    - Direct pressure and wound packing may be more suitable for infants and young children.
    - Consult with local online medical direction regarding use of traction splints for femur fractures in young children, to avoid risk of possible nerve damage.

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

- 9914097—Injury-Extremity
- 9914083—Injury-Bleeding/Hemorrhage Control

Key Documentation Elements

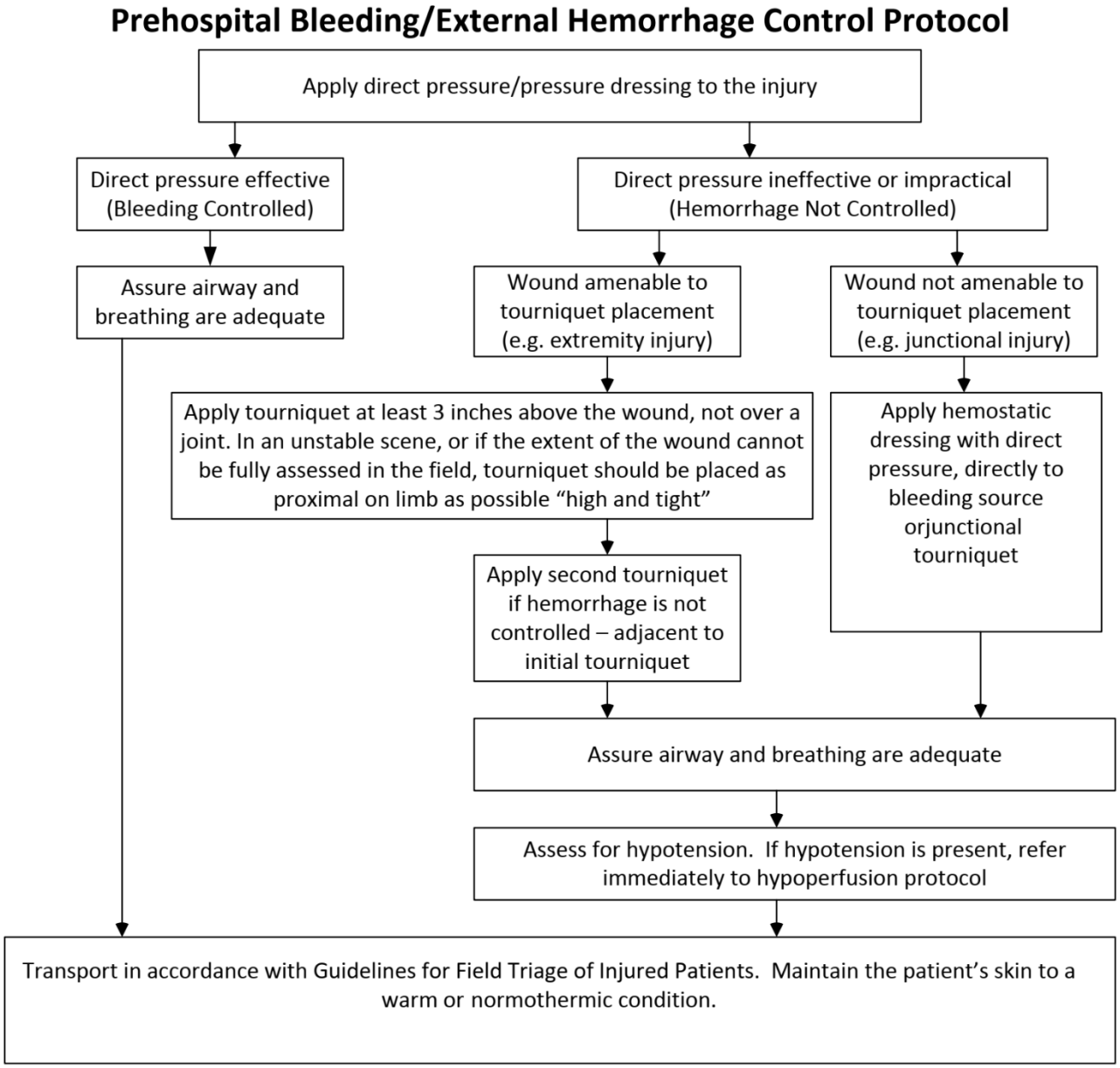
- Documentation of vital signs and vascular status of extremity after placement of tourniquet, pressure dressing, or splint
- Documentation of elimination of distal pulse after tourniquet placement
- Documentation of time of tourniquet placement

Performance Measures

- Proper placement of tourniquet (location, elimination of distal pulse)
- Proper marking and timing of tourniquet placement and notification of subsequent providers of tourniquet placement
- Appropriate splinting of fractures
- ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - PEDS-03: *Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
    - *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
    - *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
        - Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria

- * 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4.

Prehospital External Hemorrhage Control Protocol



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