

H09: Extremity Trauma

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Introduction

Extremity trauma is a common, potentially life-threatening phenomenon. Injuries to the limbs include fractures and bleeding, which should be immobilized and controlled, respectively. Paramedics and EMRs/FRs should endeavour to resolve neurological or vascular compromise wherever possible.

Essentials

- Bleeding from limbs can be life threatening. Control using direct pressure. Apply tourniquets as necessary.
- If a limb is pulseless and severely angulated, it should be repositioned to allow for the restoration of pulses.
- Fractures require stabilization with good splinting practices.

Additional Treatment Information

- Altered sensation, loss of a pulse, or cold and dusky skin in a limb distal to a fracture or dislocation is an indicator of neurological or vascular compromise. This is a limb threatening injury and is time critical.
- The general principles of reducing a fracture are:
 - Provide procedural analgesia ([→ E08: Pain Management](#))
 - Irrigate open wounds with 500 mL to 1 L of saline
 - Apply traction and gentle counter-traction in the line of the limb
 - If required, further manipulation should be done while the limb is still under traction
 - Splint the limb following reduction
- Amputated limb portions should be rinsed with cool sterile saline prior to being wrapped in loose, saline-moistened sterile gauze. The limb can then be placed inside a plastic bag and kept in a cool, protected place while being conveyed with the patient. Do not immerse the amputated limb in water, keep the limb cool, and do not place directly on ice or use dry ice to cool.
- The use of traction splints should be reserved for isolated, closed, mid-third femoral fractures. In major trauma cases, or with multiple injuries, splint the injured leg to the opposite leg (anatomical splinting) and use a clamshell to immobilize.

Referral Information

- Triage according to the [Pre-hospital Triage and Transport Guidelines for Adult and Pediatric Major Trauma](#) decision tool, including Physiological Criteria, Anatomical Criteria, Mechanism of Injury Criteria, and Special Considerations.
- All patients with extremity trauma should be conveyed to the closest appropriate trauma receiving hospital as per local trauma destination guidelines or clinical pathway.

General Information

- Fractures are a condition in which there is a break in the continuity of a bone. It may be caused by direct force or indirect impact. The aging process causes significant changes to the skeletal system; bones become less flexible, more brittle, and more susceptible to fractures. Additionally, pathological conditions such as tumours of the bone, periosteum, cartilage, or other diseases, can also increase the likelihood of fractures.
- Fractures are characterized by deformity, swelling, pain, bruising, crepitus, and instability.
- Fractures are categorized as:
 - Closed; surrounding skin remains intact
 - Open; disruption in the surrounding skin with or without protruding bone ends
- Dislocations are a separation of two bones where they meet at a joint. In a complete displacement of a bone

end from its normal joint position, the bone sits in an abnormal position. Risks associated with dislocations include trapping, compressing, or tearing of blood vessels and nerves. Dislocations are usually characterized by obvious deformity, pain, swelling, and immobility of the joint.

- Paramedics and EMRs/FRs should exercise a high degree of suspicion with possible knee dislocations (as distinct from patellar dislocations): assume that a significant underlying arterial injury exists requiring careful management.
- Isolated knee or ankle/foot injuries may be evaluated using the [Ottawa Knee Rule](#) and the [Ottawa Ankle Rule](#).
 - Ottawa Ankle Rule (for ankle and/or foot trauma):
 - Bone tenderness at the posterior edge, or tip, of either the lateral or medial malleolus, or
 - An inability to bear weight for four steps (both immediately after injury and in the emergency department), or
 - Bone tenderness at the base of the fifth metatarsal, or
 - Bone tenderness at the navicular.
 - Note: palpate the entire 6 cm distal of the fibula and tibia; "bearing weight" counts even if the patient limps; be cautious in patients under age 18.
 - Ottawa Knee Rule: imaging required if:
 - Patient age \geq 55, or
 - Isolated tenderness of the patella and no bone tenderness of knee other than the patella, or
 - Tenderness of the head of the fibula, or
 - The patient is unable to flex the knee to 90 degrees, or
 - The patient is unable to bear weight for four steps (both immediately after injury and in the emergency department), or
 - The patient is unable to transfer weight twice onto each lower limb, regardless of whether they are limping.

Interventions

First Responder

- Control life threatening bleeding
- Direct pressure to sites of obvious ongoing blood loss
- Rapid application of tourniquet for catastrophic extremity injury or significant bleeding uncontrollable through direct pressure
 - → [PR03: Tourniquets](#)
- Consider wound packing to control ongoing bleeding
 - → [PR04: Wound Packing](#)
- Stabilize obvious fractures

Emergency Medical Responder – All FR interventions, plus:

- Consider traction splint for isolated mid-third femoral fracture for prolonged conveyance

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

- Consider vascular access and fluid replacement
 - → [D03: Vascular Access](#)
- Consider [tranexamic acid](#)
- Provide analgesia as required
 - → [E08: Pain Management](#)

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

- Consider procedural sedation for re-positioning fractures
 - → [PR17: Procedural Sedation](#)

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

- Consider [blood products](#) for significant hemorrhage

Evidence Based Practice

Extremity Trauma

Supportive

- [Antibiotic \(open fracture\)](#)

Neutral

- [Procedural Sedation](#)

Against

Limb Amputation/Mangled/Major Hemorrhage

Supportive

- [Hemostatic dressing](#)
- [Pre-alert \(massive transfusion protocol\)](#)
- [Tourniquet \(limb\)](#)

Neutral

- [Direct Pressure](#)
- [Tourniquet \(junctional\)](#)

Against

References

1. International Trauma Life Support. Utilization of traction splints with open femur fractures. 2011. [\[Link\]](#)
2. The Ottawa Rules. [\[Link\]](#)

