BOTTOM LINE RECOMMENDATIONS

Pediatric Fractures

DIAGNOSIS AND INITIAL MANAGEMENT

Manage the child's pain

- To rate the pain and for specific medication and dosing recommendations, refer to TREKK Recommendations for Pain Treatment.
- Use a splint to immobilize the joints above and below the injured bone. Elevate the injured limb. Apply ice.
- Provide analgesia early and allow adequate time for analgesia to take effect (depending on route of administration) before imaging or examination.
    - Mild-Moderate Pain: Ibuprofen PO alone or in combination with acetaminophen PO
    - Persistent Moderate Pain: Consider adding hydromorphone, morphine, or oxycodone PO
    - Severe Pain: Fentanyl intranasal, morphine IV, fentanyl IV
- For infants less than 12 months old, consultation with Pediatric Referral Centre is advised for recommendations regarding assessment/diagnostic work-up, possible transport, and if opioids or IV analgesics are required.

Assess the injury

- Document child/caregiver's description of injury mechanism and when it happened. If there is a high energy mechanism of injury, assess the child for other injuries. Refer to TREKK Recommendations for Multisystem Trauma.
- For extremity injuries, assessment should also include: examining above and below the injury on the same limb, comparing with the uninjured opposite limb, examining neurovascular status, and assessing for an open fracture.
- Children may continue to have clear fluids during their assessment in the ED, unless they need emergent operative management.

DIAGNOSTIC IMAGING

- All injuries that demonstrate focal swelling, pain, deformity, or change in use of limb should have x-ray imaging.
- Use musculoskeletal clinical decision rules validated in children to aid with imaging decisions: [1,2]

    i. Low Risk Ankle Rule ii. Ottawa Ankle Rules iii. Ottawa Knee Rules iv. Amsterdam Wrist Rules
- The Low Risk Ankle Rule demonstrates excellent sensitivity and specificity.[2]
- The Ottawa Ankle Rule demonstrates excellent sensitivity but very limited specificity.[1]
- Identify the specific bone(s) injured, location of fracture (proximal, middle, distal), type of fracture (spiral/oblique, transverse, comminuted, buckle, greenstick, growth plate, avulsion), and degree of displacement and/or angulation.
- Use the Salter-Harris classification to describe fractures involving the growth plate in children who are not skeletally mature.
- About 10% of pediatric fractures are not identified on the initial emergency department visit.[3] The most commonly missed serious fractures are the Tillaux fracture (Salter-Harris III fracture of anterolateral distal tibia) and the Monteggia fracture (proximal ulna fracture with radial head dislocation).[4]
- For additional practice in pediatric musculoskeletal radiograph interpretation, refer to www.imagesim.com, a non-profit, on-line, and evidence-based image interpretation learning system.

ASSESS FOR POTENTIAL INJURY DUE TO MALTREATMENT

- Ensure that the history provided fits with injury pattern seen. If not, child protection specialist consultation at Pediatric Referral Centre is warranted. Refer to TREKK Recommendations for Suspected Physical Child Maltreatment.

Indicators of fracture due to maltreatment could include (but are not limited to):

- Any fracture in a non-ambulatory infant or child
- Femur fracture in an infant less than 12 months old
- Humerus fracture in a child less than 18 months old
- Rib fracture
- Classical metaphyseal lesion/corner or bucket-handle fracture
- Multiple fractures (or other evidence of trauma)
- Non-linear skull fracture
- Non-ambulatory infant with bruising
- History not consistent with child's developmental abilities
- Injury not consistent with mechanism/history given
- Significant delay in seeking care
- Features of failure to thrive or neglect

BOTTOM LINE RECOMMENDATIONS

Pediatric Fractures

MANAGEMENT OF SPECIFIC FRACTURE TYPES[4]

» Please refer to your site's specific protocols, if applicable.
» Clinically suspected distal fibular Salter-Harris I fractures are more often ligamentous injuries (i.e. ankle sprains).
» Distal forearm buckle fractures and minor distal fibular fractures (avulsion, non-displaced Salter-Harris I/II) can be treated with a removable device (wrist splint/ankle brace) and self-regulated return to activities.
» A reliable pediatric fracture management guideline can be found at https://www.rch.org.au/clinicalguide/fractures/.
» Further information about casting/splinting can be found at http://www.med.uottawa.ca/procedures/cast/#03.

Emergent orthopedic consultation

» Fractures associated with significant vascular compromise (pulselessness)
» Fractures with signs or symptoms of compartment syndrome (5Ps: pain, pulselessness, pallor, paresthesia, paralysis)

Urgent orthopedic consultation

» Open fracture or impending open fracture (skin tenting)
» Fractures with associated nerve injury
» Fractures associated with vascular compromise (reduced pulse with good perfusion to extremity)
» Fractures associated with deformity (as per local practice)
» Growth plate fractures classified as Salter-Harris III, IV, V

Non-urgent outpatient follow-up (as per local practice)

» Closed, stable, uncomplicated fractures or those which are reduced during ED visit (except those detailed below). Schedule follow-up for 7-10 days post injury or as per local practice.

Minor fractures that can be followed by the primary care physician

» Distal radius buckle (with or without associated ulnar buckle/styloid) fractures
» Minor non-displaced distal fibular fractures: Salter-Harris I, Salter-Harris II, avulsion fractures[5]
» Uncomplicated mid-shaft clavicle fractures

DISCHARGE INSTRUCTIONS

» Ibuprofen (10 mg/kg/dose, MAX 600 mg) PO every 6-8 hours as needed is as effective as morphine in children.[6] Acetaminophen can be added or used alternately if needed for additional pain management.
» Fractures requiring reduction and other more complex injuries may require a short-course (i.e. typically 3 days duration or 10 doses in total) of adjuvant opioids post-discharge to adequately manage pain and function.
» Provide information on management of injury that includes home care of immobilization device, anticipatory guidance on recovery and participation in sports, scheduled follow-up with a physician.
» Provide information on reasons to return to the ED prior to scheduled physician visit - e.g. increased pain, swelling, fever, cold fingers/toes, cast too tight and/or other concerns.
» Use these links for sample discharge instructions for cast care and buckle fractures.

The purpose of this document is to provide healthcare professionals with key facts and recommendations for the diagnosis and treatment of fractures in children. This summary was produced by the fracture content advisors for the TREKK Network, Dr. Kathy Boutis of the Hospital for Sick Children, and uses the best available knowledge at the time of publication. However, healthcare professionals should continue to use their own judgment and take into consideration context, resources and other relevant factors. The TREKK Network is not liable for any damages, claims, liabilities, costs or obligations arising from the use of this document including loss or damages arising from any claims made by a third party. The TREKK Network also assumes no responsibility or liability for changes made to this document without its consent. This summary is based on:

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