



Pediatric Emergency Medicine Tips

A Note: This document was put together by SickKids ED fellows and staff physicians to aid general pediatricians who may be redeployed to see pediatric patients in their emergency departments due to the COVID19 Pandemic. Please note, these are our opinions and references and institutional variation as well as physician preference may vary.

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For questions or feedback related to this document please contact us at PEMtips@gmail.com

We hope you find this useful.

Dr. Alisha Jamal, Dr. Jovian Collins and Dr. Krishna Anchala (Authors)

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Pediatric Emergency Medicine Resources

- TREKK, Translating Emergency Knowledge for Kids
<https://trekk.ca>
 - Choose pediatric condition from drop down menu on homepage
 - Variety of resources including bottom line recommendations, treatment algorithms, clinical practice guidelines etc.
- PEM Guide
<https://coreem.net/blog/pem-guides/pem-guides-version-6-0-2019/>
 - Available for free download as pdf or Apple Book
 - Excellent resource with great ~5 page summary of nearly all PEM topics
- SK POP (SickKids Pediatric Orthopedic Pathways)
<http://www.sickkids.ca/POP/index.html>
 - Outlines work up, imaging findings, management of many common pediatric MSK injuries
 - Organized by body part
- SickKids Hospital Clinical Practice Guidelines
<https://www.sickkids.ca/clinical-practice-guidelines/clinical-practice-guidelines/index.aspx>
 - SickKids' own practice guidelines for a variety of conditions
- Royal Children's Hospital of Melbourne Clinical Practice Guidelines
<https://www.rch.org.au/clinicalguide/>
 - Extensive clinical practice guidelines available
- About Kids Health
<https://www.aboutkidshealth.ca>
 - Provides information (that can be printed out as hardcopy) for patients and families about their condition, warning signs, ongoing care required etc.

Musculoskeletal Injuries

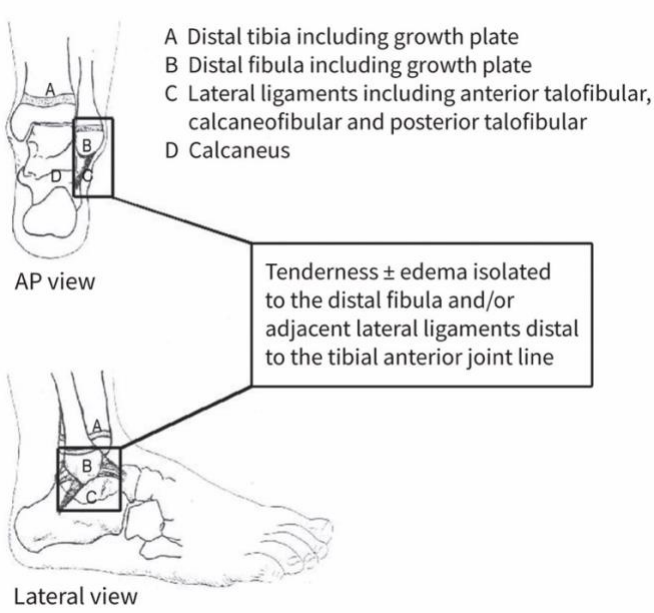
QUICK TIPS

- Keep child NPO if reduction is required
- Be sure to assess for Non-accidental trauma (NAI)
- Always assess and document the neurovascular status
- NSAIDS have been shown to be as effective as opiates for pain management for orthopedic injuries

INITIAL MANAGEMENT

- Splint affected limb for comfort
- Analgesia prior to examination
 - Ibuprofen alone or with Acetaminophen, add immediate release opioid (PO or Intranasal) agent if necessary

ASSESSMENT

History <ul style="list-style-type: none">• Mechanism of injury• Timing	Physical Exam <ul style="list-style-type: none">• Neurovascular status<ul style="list-style-type: none">○ See neurovascular checklist• Compare with uninjured side• Examine joint above and below the injury• Assess for open fracture
Investigations <ul style="list-style-type: none">• X-ray for any injury with focal swelling or pain, deformity or change in status<ul style="list-style-type: none">○ AP and lateral ± special views <p>Exception: Low Risk Ankle Rule for ankle injuries in children states “If tenderness and swelling is isolated to the distal fibula and/or adjacent lateral ligaments distal to the tibial anterior joint line, then ankle x-ray is probably not necessary”</p>  <p>A Distal tibia including growth plate B Distal fibula including growth plate C Lateral ligaments including anterior talofibular, calcaneofibular and posterior talofibular D Calcaneus</p> <p>AP view</p> <p>Lateral view</p> <p>Tenderness ± edema isolated to the distal fibula and/or adjacent lateral ligaments distal to the tibial anterior joint line</p> <p>From Boutis K, Komar L, Jaramillo D, et al. Sensitivity of a clinical examination to predict need for radiography in children with ankle injuries: a prospective study. <i>Lancet</i> 2001;358:2118–21</p>	

Need a refresher on reading x-rays?

This website includes several x-ray reading modules as well as additional resources

<http://www.sickkids.ca/PEMCurriculum/index.html>

This website reviews Salter Harris classifications of growth plate fractures

https://www.rch.org.au/fracture-education/growth_plate_injuries/Physeal_growth_plate_injuries/#Salter-Harris

MANAGEMENT

- SKPOPs:

<http://www.sickkids.ca/POP/index.html>

- website developed by the orthopedic surgeons at Sick Kids and we typically use this resource to guide the management of MSK injuries.
- Search the specific injury under “**Trauma and Infection Pathways**”. It will provide necessary information on appropriate splinting, referrals, need for reductions etc.
- Forearm buckle fractures and minor distal fibula fractures can be treated conservatively with removable splint/brace and gradual return to activity (similar to a sprain type injury)
- **Soft tissue injuries** are treated using the RICE (rest, ice, compression, elevation) principles. Compression/elastic bandages can help with comfort and to reduce swelling but DO NOT provide support. For mild/moderate injuries early movement with help with a faster recovery.
- See **Splinting** section of this document for more information on immobilization

REFERRAL CRITERIA

Emergent Ortho Referral (<1 hour)	<ul style="list-style-type: none">• Pulseless on exam• Any sign/symptoms of compartment syndrome
Urgent Ortho Referral (<4 hours)	<ul style="list-style-type: none">• Open fracture or skin tenting• Nerve injury• Decreased pulses• Obvious deformity• Growth plate fractures (Salter-Harris III and above)
Outpatient Ortho Referral	<ul style="list-style-type: none">• Closed• Stable• No deformity• Not complicated (ie. not comminuted or causing damage to surrounding tissues)
Ortho Referral not indicated (may be followed up by PCP)	<ul style="list-style-type: none">• Distal radius buckle fracture• Distal fibula minor fracture• Salter Harris 1• Avulsion Fracture• Mid shaft clavicle fracture

When in doubt, do not hesitate to contact your local tertiary care pediatric ED. They will be able to provide you with advice on the most appropriate next steps in management

DISCHARGE INFORMATION FOR FAMILIES

- Cast care instructions for families:
<https://www.aboutkidshealth.ca/Article?contentid=1178&language=English>
- Pain control with Ibuprofen is as effective as morphine for uncomplicated outpatient fractures
- Reasons for patient to return to emergency care
 - Increased pain
 - Swelling
 - Fever
 - Cast feeling too tight
 - cold/blue fingers and toes
 - Loss of sensation/function

RESOURCES

- SK Pediatric Orthopedic Pathways (SK POPs)
<http://www.sickkids.ca/POP/index.html>
- TREKK
https://trekk.ca/resources?utf8=✓&tag_id=D050723&external_resource_type=All
- Royal Melbourne Childrens Hospital Pediatric Fracture Pathways (often linked through SKPOP)
<https://www.rch.org.au/clinicalguide/fractures/>

REFERENCES

Boutis K, Komar L, Jaramillo D, et al. Sensitivity of a clinical examination to predict need for radiography in children with ankle injuries: a prospective study. *Lancet* 2001;358:2118–21

Boutis, Kathy, and Mark Camp. "Bottom Line Recommendations: Pediatric Fractures." TREKK, 2018, trekk.ca/resources?utf8=✓&tag_id=D050723&external_resource_type=All.

Finger/Hand Fractures

QUICK TIPS

- At SickKids these are managed by plastic surgery, but can be plastics or orthopedics depending on your institution
- Document hand dominance
- In general hand specialist referral is important if fracture is:
 - Unstable
 - Extra articular fracture that has displacement > 10 degrees or any rotational deformity
 - intra-articular fracture

ASSESSMENT

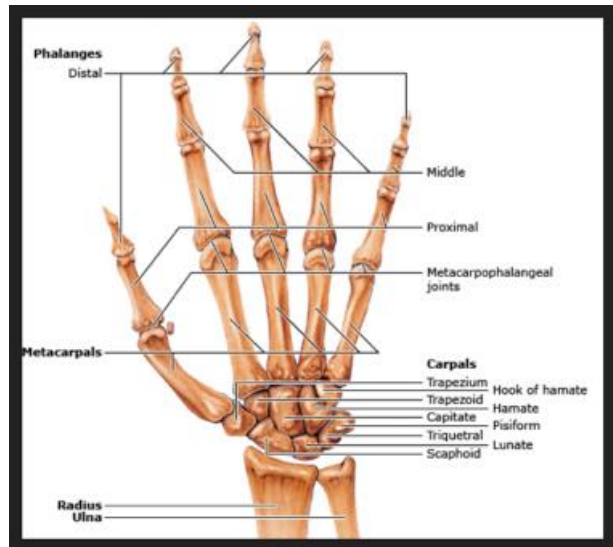
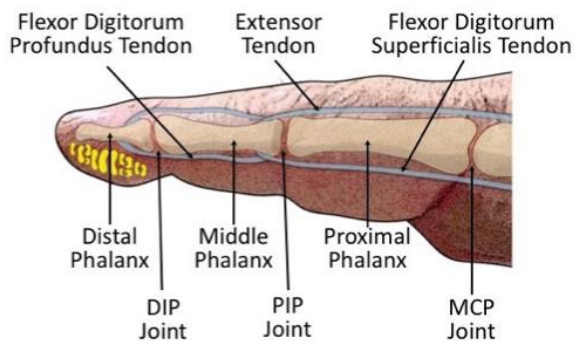
History

- Mechanism of Injury
- Handedness
- General activity/use of hands (ie. Pianist, gymnast etc.)

Physical Exam

Adapted from PEM Guide (p.524), by K Fawcett, 2019.

- **Inspection:** deformity, laceration/amputation, bone exposure, nail involvement, alignment
- **Palpation:** tenderness, capillary refill, sensation (radial, median, ulnar nerves)
- **Range of Motion:** open and close hands, flexion/extension at MCP, PIP, DIP passively and against resistance



Reprinted from PEM Guide (p.524), by K Fawcett, 2019.

Investigations

- X-ray to diagnose fractures, dislocation and foreign bodies. Xray may not identify tendon injuries and rotational injuries

Need a review of the physical exam of the hand?

Physical Exam of the Hand

<https://www.orthobullets.com/hand/6008/physical-exam-of-the-hand>

Neurologic Exam of the Hand

<https://www.youtube.com/watch?v=jYvBlK3KZWc>

MANAGEMENT

- Consult hand surgeon if the fracture is:
 - Unstable
 - Extra articular fracture that has displacement > 10 degrees or any rotational deformity
 - Displaced intra-articular fracture
 - Rotated fracture
- If there is no displacement, can splint vs. buddy tape (at the discretion of the provider)
 - Splinting (see section in this document) is preferred for younger child that won't tolerate buddy taping, or anyone that you feel will be unreliable to prevent secondary injury and displacement or for comfort (ie. if there is significant pain associated with the injury)
 - Buddy taping can be done if the child is reliable, will tolerate it and if it is a non-displaced fracture
 - The advantage of buddy taping is that it allows them to move their joints so they will be less likely to have stiffness
- Immobilizations should be for at least **3 weeks** and these patients should be followed up in the Plastic Surgery Clinic

DISCHARGE INFORMATION FOR FAMILIES

- Cast care instructions for families
<https://www.aboutkidshealth.ca/Article?contentid=1178&language=English>
- Pain control with Ibuprofen is as effective as morphine for uncomplicated outpatient fractures
- Reasons for patient to return to emergency care (ie. concern for compartment syndrome)
 - Increased pain
 - Swelling
 - Fever
 - Cast feeling too tight
 - cold/blue fingers and toes
 - Loss of sensation/function

RESOURCES

- PEM Guide: Finger Injuries (p. 524-529)
<https://coreem.net/blog/pem-guides/pem-guides-version-6-0-2019/>
- OrthoBullets: Hand Section
<https://www.orthobullets.com/topic/dashboard?id=6&specialty=6&expandLeftMenu=true>

REFERENCES

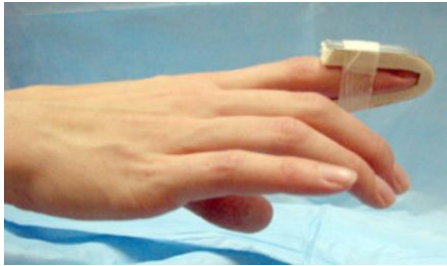


Fawcett, K. "Finger Injuries." *PEM Guides*, 2019, pp. 524-529.



Orthobullets, Hand High-Yield Topics. Internet cited on April 2 2020. Available from www.orthobullets.com/topic/dashboard?id=6&specialty=6&expandLeftMenu=true.



Splinting

- In the ED, we prefer a splint instead of a circumferential cast to allow for swelling and reduce the risk of compartment syndrome
- Neurovascular status should be assessed both prior to the splint application as well as after. Instructions should be provided to the family to monitor for signs of compartment syndrome.
- General rule is immobilize joint above and below the site of the injury
- Typically, circumferential casts will be applied at follow up appointment in fracture clinic
- There are a variety of resources available to determine the best immobilization for particular fractures. We typically follow what is recommended on SKPOPS.

Table below adapted from: Boyd et al. Boyd, Anne, et al. "Splints and Casts: Indications and Methods."

HAND, FINGER, CARPAL BONE INJURIES		
Type of Splint	Indications	
Aluminum U shaped splint	<ul style="list-style-type: none"> • Distal phalangeal fractures 	
Dorsal extension-block splint	<ul style="list-style-type: none"> • Middle phalangeal fractures • Volar plate avulsions • Stable reduced PIP joint dislocations 	
Ulnar Gutter Proper position includes: MCP joints at 50-60°flexion PIP and DIP joints at extension	<ul style="list-style-type: none"> • Some metacarpal fractures • 4th and 5th proximal/middle phalangeal shaft fractures 	 <p>Source: Scott C. Sherman Simon's Emergency Orthopedics, Eighth Edition Copyright © McGraw-Hill Education. All rights reserved.</p> <p>Ensure that you put padding between the fingers</p>

Radial Gutter Proper position includes: MCP joints at 50-60° flexion PIP and DIP joints at extension (or 5-10° flexion)	<ul style="list-style-type: none"> • Some metacarpal fractures • 2nd and 3rd proximal/middle phalangeal shaft fractures 	 <small>Source: Scott C. Sherman Siman's Emergency Orthopedics, Eighth Edition Copyright © McGraw-Hill Education. All rights reserved.</small> Ensure that you put padding between the fingers
Thumb Spica Note: scaphoid fractures are often hard to see on X-ray. If there is tenderness on examination, splint and send to orthopedics for F/U	<ul style="list-style-type: none"> • Scaphoid fractures • Thumb (stable, non-displaced) • First metacarpal • Carpal bones • Ligamentous injuries to the thumb 	

WRIST /FOREARM INJURIES		
Type of Splint	Indications	
Volar/dorsal short arm splint	<ul style="list-style-type: none"> • Carpal bone fractures (except scaphoid/trapezium) • Buckle fractures of distal radius 	
single sugar tong	<ul style="list-style-type: none"> • Fractures/injuries of the wrist and distal forearm <p>Note: for non buckle distal radius/ulnar fractures you can also consider putting on a long arm cast</p>	

ELBOW AND PROXIMAL FOREARM INJURIES (AND SOME WRIST INJURIES)

Double sugar tong splint

- Proximal and midshaft non displaced radial/ulnar fractures
- Colles Fracture (complete fracture of radius with posterior displacement of radius)

Note: often we use a posterior back slab (above elbow) + sugar tong for Type 1 supracondylar fractures



LOWER LIMB INJURIES

Above knee posterior back slab

- Toddler's fracture (can also apply an above knee walking cast)
- Undisplaced tibial shaft fracture
- Non displaced distal tibia/fibular fracture



Stiff soled shoe, walking cast, or if not available, short leg cast

- Non-displaced Distal metatarsal and phalangeal fractures

REFERENCES

Boyd, Anne, et al. "Splints and Casts: Indications and Methods." *Am Fam Physician*, vol. 80, no. 5, ser. 49499, 1 Sept. 2009. 491-499.

Foreign Bodies

Ear Foreign Bodies

QUICK TIPS

- If the foreign body is not **adequately visualized** or you are not confident- don't attempt to take it out
- If you inadvertently cause trauma to the external canal, discharge patients' home on an antimicrobial drop (ie. Ciprodex otic x 10 days or something similar)
- Your first attempt is your best one!

ASSESSMENT

History <ul style="list-style-type: none">• History of foreign body insertion• Otalgia• Ear discharge• Ear fullness• Decreased hearing• Asymptomatic	Physical Exam <ul style="list-style-type: none">• Note size, shape, location, texture• Note presence of trauma to ear canal• Examine other ear canal and nare
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MANAGEMENT

- Urgent Removal required for:
 - Button batteries
 - Live insects
 - TM penetration
 - ataxia/vertigo, hearing loss or nerve injury

REMOVAL TECHNIQUES

Irrigation	can use an angiocath with a 60 cc syringe and try to feed the tip of the catheter behind the foreign body. Ensure that you use room temperature water only!
Alligator forceps	All of these techniques rely on directly visualizing and removing FB
Right angle ball hooks	
Cerumen loops	
Suction catheter	
Glue applied at the end of a Qtip	Visualize the foreign body. Remove the otoscope but leave the speculum in place. Place glue at the end of a Qtip and insert it through the speculum. Hold it for 30 seconds once you make contact with the object and remove the speculum, Qtip and foreign body together. https://emblog.mayo.edu/2017/04/04/stick-glue-and-cone-for-ear-foreign-bodies/

RESOURCES

- PEM Guide: Ear Canal Foreign Bodies
<https://coreem.net/blog/pem-guides/pem-guides-version-6-0-2019/>
- Foreign Bodies in the Ear, Nose and Throat. Article in American Family Physician.
<https://www.aafp.org/afp/2007/1015/p1185.html>
- Excellent video on foreign body removal in the ear or nose:
<https://www.nejm.org/doi/full/10.1056/NEJMvcm1207469>

REFERENCES

Mojica, M. "Ear Canal Foreign Bodies." *PEM Guides*, 2019, pp. 246-248.

Heim S, Maughan K. Foreign bodies in the ear, nose, and throat. *Am Fam Physician*. 2007 Oct 15; 76(8): 1185–1189.

Nasal Foreign Bodies

QUICK TIPS

- If the object is a **button battery** (or **could** be a battery OR **paired magnets** consider urgent referral. These can cause septal perforations and require **urgent removal**
- The removal of a nasal foreign body is generally **elective**. An outpatient referral to a pediatric ENT is appropriate if you are not comfortable.

ASSESSMENT

History <ul style="list-style-type: none">• History of foreign body insertion• Foul smell• Mucopurulent discharge from one nostril• Nasal obstruction• Epistaxis	Physical Examination <p>Direct visualization with a headlamp if available, or otoscope light with nasal speculum is usually sufficient</p>
Investigations <ul style="list-style-type: none">• Usually not required if the foreign body can be visualized• If the foreign body CANNOT be visualized in the anterior nasal cavity, can consider doing an Xray• Although most objects will likely be radiolucent, an xray can be helpful as button batteries or magnets will be radioopaque.	

MANAGEMENT

- Referral to ENT should be made if:
 - Location is in the posterior aspect of the nasal cavity
 - Penetrating foreign body
 - Unable to be removed

REMOVAL TECHNIQUES

Positive Pressure 1 st line technique for nasal foreign body	<ul style="list-style-type: none"> • Best for smooth/soft foreign bodies in the anterior nasal canal • If the child is cooperative, have them occlude unaffected nostril and pretend to blow their nose. • If the child is not cooperative, use “Mother’s Kiss” <ul style="list-style-type: none"> ○ Have the parent occluded the unaffected nostril while blowing hard into the child’s mouth
Nasal Washout	<ul style="list-style-type: none"> • Good technique for friable objects • A small syringe (5-10ml) of saline injected with pressure into the unaffected nasal passage
Manual Extraction	<ul style="list-style-type: none"> • Should only be used for well visualized, anterior objects • Can anaesthetize the nose with topical anaesthesia and a vasoconstrictor • Proceed cautiously as this can cause mucosal damage
Alligator forceps	<ul style="list-style-type: none"> • Best for soft, irregular objects
Right angle hook	<ul style="list-style-type: none"> • Best for hard, smooth objects that are difficult to grasp
Suction catheter	
Katz extractor	
Foley catheters	<ul style="list-style-type: none"> • Advance the Foley beyond the foreign body, then inflate the cuff and pull whole apparatus out

RESOURCES

- PEM Guide: Nasal Foreign Bodies
<https://coreem.net/blog/pem-guides/pem-guides-version-6-0-2019/>
- Foreign bodies in the ear, nose and throat. Article in American Family Physician.
<https://www.aafp.org/afp/2007/1015/p1185.html>
- Excellent video on foreign body removal in the ear or nose
<https://www.nejm.org/doi/full/10.1056/NEJMvcm1207469>

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Heim S, Maughan K. Foreign bodies in the ear, nose, and throat. Am Fam Physician. 2007 Oct 15; 76(8): 1185–1189.

Isaacson, Glenn, and Aderonko Ojo. “Diagnosis and Management of Intranasal Foreign Bodies.” Edited by Anne Stack and James Wiley, My.access - University of Toronto Libraries Portal, Mar. 2020, [www.uptodate.com/contents/diagnosis-and-management-of-intranasal-foreign-bodies?search=nasal%2Bforeign%2Bbody&source=search_result&selectedTitle=1~23&usage_type=default&display_rank=](http://www.uptodate.com/contents/diagnosis-and-management-of-intranasal-foreign-bodies?search=nasal%2Bforeign%2Bbody&source=search_result&selectedTitle=1~23&usage_type=default&display_rank=1)

Mojica, M. “Nasal Foreign Bodies.” *PEM Guides*, 2019, pp. 269-271.

Division of Paediatric Emergency Medicine Foreign Body Ingestion Algorithm

SUSPECTED FOREIGN BODY (FB) INGESTION

- ✓ **KEEP NPO** until disposition is clear
- ✓ Ascertain whether FB could be **BUTTON BATTERY** (directly observed ingestion, halo sign on AP view, step off sign on lateral view)
- ✓ For suspected **BUTTON BATTERY**, upon triage or enroute notes:
 - Call ENT if BB in esophagus or severe respiratory Sx**

CLINICAL ASSESSMENT

HISTORY	EXAM	IMAGING
<ul style="list-style-type: none"> ▪ Timing of ingestion ▪ NPO time ▪ FB characteristics: size, shape, composition, number ▪ Symptoms: cough, stridor, drooling, odynophagia, vomiting, gagging, oral intake tolerance, GI bleed, sternal/abdo pain, etc. 	<ul style="list-style-type: none"> ▪ OVERALL: vitals, distress ▪ RESP: drooling, stridor, wheeze, work of breathing, unequal breath sounds ▪ HEENT: oral lesions, neck crepitus, check ears and nose for FB ▪ ABDO: distention, tenderness 	<ul style="list-style-type: none"> ▪ Obtain foreign body X-ray series (exposing neck, chest and abdo) ▪ Laterals especially important if: battery/magnet suspected, location of FB is esophageal or unknown

	BUTTON BATTERY (BB)	COINS / BLUNT OBJECTS	MAGNETS	SHARP OBJECTS	FOOD IMPACTION	DEFINITIONS
ESOPHAGUS (ENT)	<p>ALL PATIENTS:</p> <ul style="list-style-type: none"> ▪ Call ENT STAT for emergent* endoscopic removal ▪ Admit, NPO, IV ▪ +/- direct to OR ▪ Consider possibility of aortic injury (may require CT angio) 	<p>SEVERE SYMPTOMS**?</p> <p>YES:</p> <ul style="list-style-type: none"> ▪ Call ENT for emergent* removal <p>NO:</p> <ul style="list-style-type: none"> ▪ Urgent* removal by ENT ▪ Admit, NPO, IV, repeat x-ray prior to endoscopy to R/A FB location 	<p>SINGLE MAGNET:</p> <ul style="list-style-type: none"> ▪ Consult ENT ▪ Consider removal only if having symptoms or at risk of further ingestions <p>≥ 2 MAGNETS:</p> <ul style="list-style-type: none"> ▪ Call ENT +/- surgery for emergent* removal if symptomatic, otherwise urgent* ▪ Admit, NPO, IV 	<p>RADIO-OPAQUE:</p> <ul style="list-style-type: none"> ▪ Call ENT for emergent* removal if severe symptoms**, otherwise urgent* <p>RADIOLUCENT:</p> <ul style="list-style-type: none"> ▪ If symptomatic, call ENT for endoscopy ▪ If no symptoms but history concerning – consider CT, MRI, U/S, or esophagram 	<p>SIGNS OF ESOPHAGEAL NEAR-COMPLETE OBSTRUCTION? (drooling, neck pain)</p> <p>YES:</p> <ul style="list-style-type: none"> ▪ Call ENT for emergent* removal +/- esophageal biopsy <p>NO:</p> <ul style="list-style-type: none"> ▪ Consult ENT for urgent* removal +/- Gastrografin study <p>Consider GI referral</p>	<p>*ENDOSCOPY TIMING:</p> <p>Emergent</p> <p><2 hr from presentation, regardless of NPO status</p> <p>Urgent</p> <p><24 hr from presentation, follow usual NPO status</p>
STOMACH AND DUODENUM (GI)	<p>If BB >20 mm and <5 years old:</p> <ul style="list-style-type: none"> ▪ Call GI for urgent* endoscopic removal ▪ Admit, NPO, IV <p>If BB <20 mm:</p> <ul style="list-style-type: none"> ▪ Consult GI, may not require admission ▪ If not passed in BM, repeat X-ray: in 48 hrs for BB >20 mm, or in 10-14 days for BB <20 mm ▪ Consider elective* removal if in stomach still on repeat X-ray 	<p>SYMPTOMATIC?</p> <p>YES:</p> <ul style="list-style-type: none"> ▪ Call GI to discuss need for removal ▪ Admit, NPO, IV, repeat X-ray prior to endoscopy <p>NO:</p> <ul style="list-style-type: none"> ▪ Safe for discharge ▪ Repeat X-ray in 2-3 weeks, or sooner if patient becomes symptomatic ▪ Consider GI consult if object is very large (e.g. > 5cm) 	<p>SINGLE MAGNET:</p> <ul style="list-style-type: none"> ▪ Consider conservative management if no symptoms ▪ Consult GI if having symptoms, suspected co-ingestion with another metal, or at risk of further ingestion <p>≥ 2 MAGNETS:</p> <ul style="list-style-type: none"> ▪ Consult GI for emergent* removal if symptomatic, otherwise urgent ▪ Admit, NPO, IV 	<p>RADIO-OPAQUE:</p> <ul style="list-style-type: none"> ▪ If symptomatic, call GI to consider endoscopy ▪ If no symptoms, consider conservative management for low risk*** object <p>RADIOLUCENT:</p> <ul style="list-style-type: none"> ▪ If symptomatic, call GI to consider endoscopy ▪ If no symptoms but history concerning – consider CT, MRI, U/S for further assessment 		<p>Elective</p> <p>>24 hr from presentation, follow usual NPO status</p> <p>**SEVERE SYMPTOMS:</p> <ul style="list-style-type: none"> ▪ respiratory distress ▪ hemodynamic instability ▪ not tolerating secretions <p>***LOW RISK:</p> <ul style="list-style-type: none"> ▪ <5 cm ▪ blunt end advancing
BEYOND DUODENUM	<p>SYMPTOMATIC?</p> <p>YES:</p> <ul style="list-style-type: none"> ▪ Consult Gen Surgery <p>NO:</p> <ul style="list-style-type: none"> ▪ Monitor stool, conservative Mgmt 	<p>SYMPTOMATIC?</p> <p>YES:</p> <ul style="list-style-type: none"> ▪ Consult Gen Surgery <p>NO:</p> <ul style="list-style-type: none"> ▪ Monitor stool, conservative Mgmt 	<p>≥ 2 MAGNETS and/or SYMPTOMATIC:</p> <ul style="list-style-type: none"> ▪ Consult Gen Surgery <p>SINGLE MAGNET with no symptoms:</p> <ul style="list-style-type: none"> ▪ Conservative Mgmt 	<p>SYMPTOMATIC?</p> <p>YES:</p> <ul style="list-style-type: none"> ▪ Consult Gen Surgery <p>NO:</p> <ul style="list-style-type: none"> ▪ Conservative Mgmt, unless concerning 		
USEFUL TIPS	Must consult for all BB. On X-ray, look for halo sign on AP and step-off on lateral. Assume hearing aid batteries are < 12 mm.	Width >2.5 cm less likely to pass through pylorus. Consider possible toxic composition, bezoars	Single vs multiple might be difficult to differentiate, must obtain 2 views and confirm with radiologist if there is uncertainty	Sharp objects may include nails, pins, fish bone, tacks, toothpicks, needles. "Advancing points puncture, trailing do not"	Often secondary to underlying esophageal pathology: eosinophilic esophagitis, achalasia, stricture, TEF repair, etc	

Lacerations

QUICK TIPS

- Whenever possible, chose an absorbable suture material to avoid a second procedure for suture removal
- Bite wounds are dirty, frequently need plastics involvement for washout
- Consider involving plastics if you are not confident with complicated/deep/multiple lacerations, particularly if located in an area of important cosmesis (ie. face or neck)
- Don't forget to ask about tetanus status and give prophylaxis if necessary

ASSESSMENT

History <ul style="list-style-type: none">• Mechanism of injury• Time of injury• Foreign body?• Potential for contamination?• Tetanus Vaccine status	Physical Examination <ul style="list-style-type: none">• Location• Type of wound<ul style="list-style-type: none">○ Length, depth, condition of surrounding tissue• Foreign body• Damage to underlying tissue<ul style="list-style-type: none">○ Neurovascular status○ Tendon/muscle functions
Investigations <ul style="list-style-type: none">• X-ray if necessary, for damage to underlying bones +/- look for radio-opaque FB	

MANAGEMENT

- Goal of laceration repair:
 - repair skin integrity
 - Cosmesis
 - Prevent infection

ANESTHESIA

- LET (Lidocaine, Epinephrine, Tetracaine) can be applied directly with gauze, takes ~40 minutes for effect
- Local anaesthetic infiltrated into wound
 - Lidocaine dosing
 - 4.5 mg/kg without epi
 - 7 mg/kg **with** epi

Calculating Maximum Lidocaine Dose:

Maximum allowable dose in mg/kg x Weight in kg/10 x 1/Concentration of local anesthetic (ie. 2% = 2)

Ex. Max dose of 2% lidocaine **without** epi for a 15kg child

$$4.5 \times 15/10 \times 1/2 = 3.4 \text{ ml}$$

notice how small the dose is for a small child

WOUND REPAIR

Step 1: Clean

- Tap water is equivalent to sterile water/saline
- 50-100cc of water per 1 cm laceration
- Can use a 60cc syringe with IV catheter attached as a makeshift “squirt gun”
- Anaesthetize **prior** to washout as cleaning can be very painful

Step 2: Wound closure

There are several techniques for closing wounds, some of which are outlined below:

- **Gluing with skin adhesive**
 - Good alternative to sutures if:
 - LINEAR Wound edges should be easily approximated (linear, shorter wounds)
 - Not in area of significant tension (not crossing joints)
 - Clean, Low risk of infection (NOT contaminated, no significant surrounding hair, not a bite, Not an old wound etc.)
 - Not deep
 - Slightly higher chance of dehiscence
- **Sutures**
 - To be used on lacerations not amenable to skin adhesive
 - Simple interrupted stitch most commonly used and generally sufficient for repairs in ED

Choosing Suture Material

Size:

Smaller suture results in better cosmesis. 6-0 (or 5-0) is best for the face, 5-0 (or 4-0) for other areas of the body.

Material:

Whenever possible absorbable suture material (vicryl, vicryl rapide, chromic gut) is preferable to avoid another painful procedure (suture removal). When choosing sutures for lacerations on the face (or other cosmetically important areas), some sources suggest that removable sutures result in better cosmesis. This decision must be weighed with the inconvenience of suture removal.

Recommendations from Dr. Joel Fish, Pediatric Plastic Surgeon:

5-0 or 6-0 Vicryl Rapide is a usually good choice for clean lacerations that are easy to close

6-0 or 5-0 Prolene is usually a good choice for a non-absorbable suture in a cosmetically important area

Suture Removal:

- Face: 3-5 days
- Skin under no tension: 7-10 days or leave to dissolve
- Skin under tension: 14 days or leave to dissolve

- **Hair apposition technique**
 - For scalp lacerations
 - Twist together several strands of hair from either side of the laceration and apply a drop of glue to secure the “hair twist”

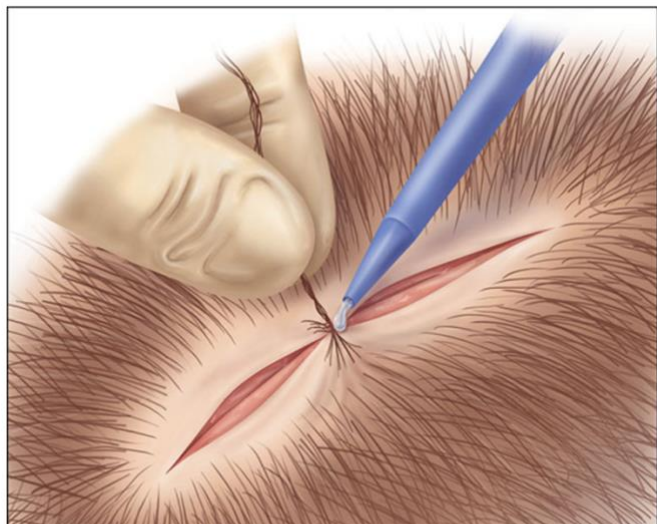


Figure 5.

Hair apposition technique for laceration closure. Opposing strands of hair are brought together with a simple twist and are secured with a drop of tissue adhesive.

Reprinted with permission from Forsch RT. Essentials of skin laceration repair. Am Fam Physician. 2008;78(8):949.

From: Forsch R, Little S, Williams C. Laceration repair: a practical approach. Am Fam Physician. 2017 May 15; 95(10):628-635

- **Staples**
 - Work for scalp wounds/wounds that are not of cosmetic concern
- **Steri strips**
 - Simple, low tension, superficial wounds

AFTERCARE

- Antibiotics should be considered for deep wounds, contaminated wounds including bites
- Tetanus prophylaxis:

	Clean Wound		“Dirty” Wound	
History of vaccination	Td/DTP	Tetanus Ig	Td/DTP	Tetanus Ig
<3 doses	Yes	No	Yes	Yes
Last dose >10 years ago	Yes	No	Yes	No
>3 doses and last dose 5-10 years ago		No	Yes	No
>3 doses and last dose <5 years ago		No	No	No

DISCHARGE INSTRUCTIONS

- Watch for signs of infection
- Wash daily with soap and water
- NO Vaseline or ointments on wounds that have been glued (it will dissolve the glue)
- Once scab is gone can massage scar daily to help with scarring
- Sunscreen on wound to avoid hyperpigmentation
- Would care for families:
 - <https://www.aboutkidshealth.ca/Article?contentid=1191&language=English>

RESOURCES

- Video of simple interrupted sutures
<https://www.youtube.com/watch?v=z8oWv-nVO6g>
- Laceration Repair: A Practical Approach
<https://www.aafp.org/afp/2017/0515/p628.html>

REFERENCES

Forsch R, Little S, Williams C. Laceration repair: a practical approach. Am Fam Physician. 2017 May 15; 95(10):628-635.

Eye Injuries

QUICK TIPS

- Ophthalmology is an area of discomfort for many of us in the ED- consults are common!
- If there is a chemical burn, ocular lavage should occur before anything else
- Beware of impaired EOM, particularly upward gaze with diplopia (think orbital fracture!)
- If there is concern of penetrating eye injury or globe rupture DO NOT MANIPULATE eye

DIFFERENTIAL DIAGNOSIS OF TRAUMATIC EYE INJURIES

Adapted from PEM Guide (p.926), by J Agnant, 2019.

Eyelid laceration	Hyphema	Vitreous hemorrhage
Subconjunctival hemorrhage	Traumatic iritis	Retinal detachment
Corneal abrasion	Lens dislocation	Globe rupture
Foreign body		Retrobulbar hemorrhage
Chemical burn		Orbital fracture

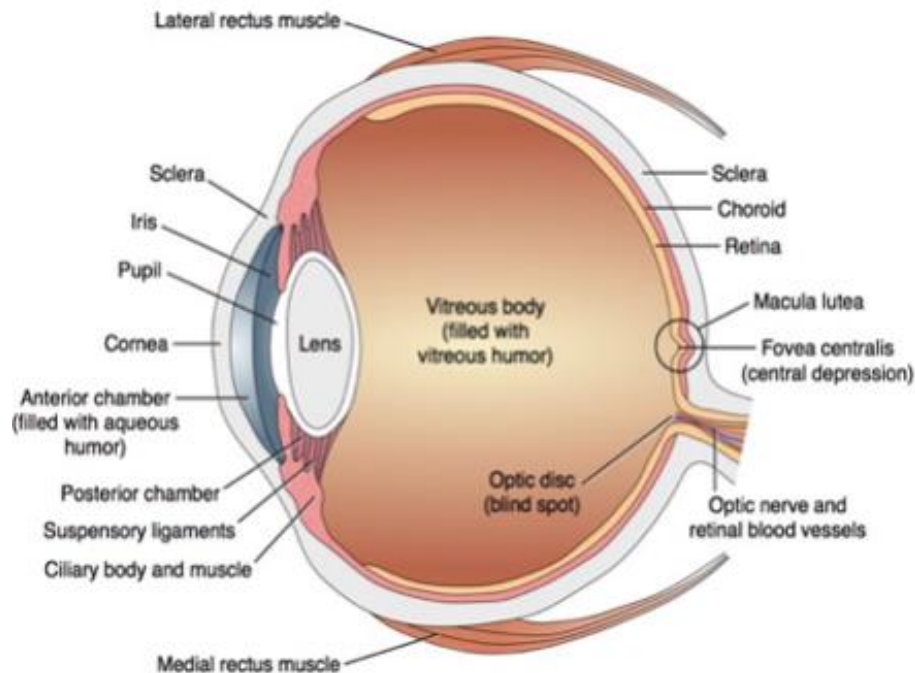
ASSESSMENT

History

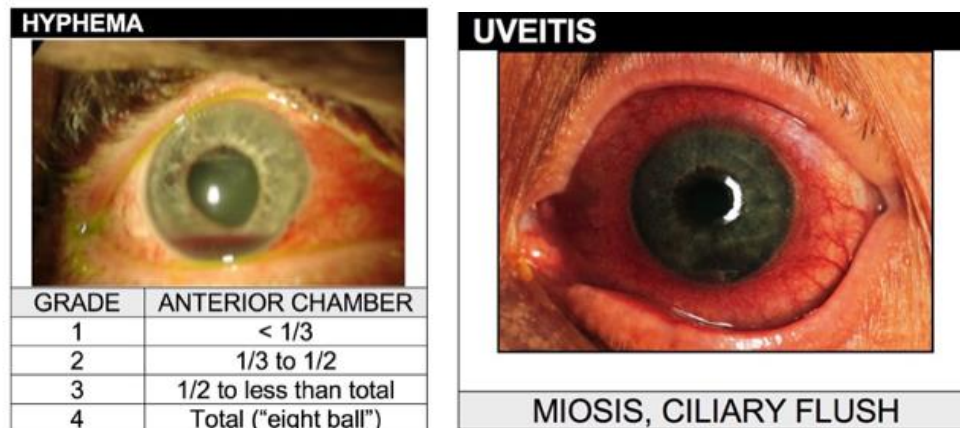
- Mechanism of Injury
- Vision loss
- Foreign body sensation
- Photophobia
- Contact Lens use

Physical Exam

****A thorough exam is most important to rule in/out significant eye injury. If adequate exam cannot be performed due to age/cooperation get help (ophthalmology, ED physician) ****

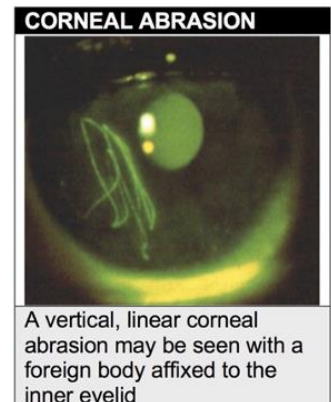


- **Visual Acuity:** Cover opposite eye, use patient's normal corrective lenses. Use Snellen Chart or Tumbling E chart/Picture Chart for pre-literate children.
- **Visual Field:** Traumatic vision loss generally gross however loss of some VF possible
- **Lids:** Look for lacerations and note depth. Important to note if lacrimal apparatus is involved. Evert eyelid (with cotton swab if necessary) to look for trauma or foreign bodies
- **Globe:** *general* examination for obvious signs of deformity, position (endophthalmos or exophthalmos)
- **Sclera, Cornea, Pupil, Iris and Anterior Chamber:**
 - Before applying fluorescein: look for pupillary light reflex, red reflex (symmetry), pupil shape, hyphema (blood in anterior chamber of eye), cloudiness of cornea, traumatic iritis/uveitis

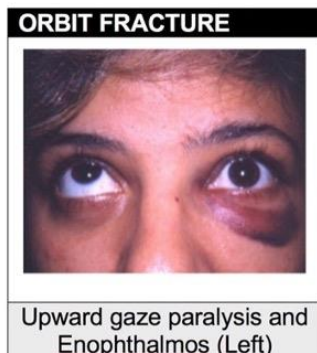


Reprinted from PEM Guide (p.926,930), by J Agnant, 2019.

- apply **fluorescein**:
 - If using strips: use saline to wet fluorescein strip then touch wet strip to conjunctiva or lower lid of affected eye
 - If using drops: apply 1 drop to affected eye
- Once fluorescein has been applied to eye, use blue light from ophthalmoscope to look for damage
 - Abrasions/lacerations will appear as green marks on conjunctiva and cornea with fluoroscein under the blue light. Linear abrasions suggest a FB under the eyelid.
 - Note the location of abrasions and if it crosses pupil
- **Eye Movements:** Rule out entrapment of extraocular muscles



Reprinted from PEM Guide (p.926), by J Agnant, 2019.



Reprinted from PEM Guide (p.926), by J Agnant, 2019.

- **Fundus:** papilledema or retinal hemorrhages
- **Slit lamp examination if it is possible is helpful but NOT required prior to consultation with Ophthalmology****

Investigations

- CT Facial Bones if concerns re: orbital fractures
- Other investigations usually ordered in conjunction with Ophthalmology

MANAGEMENT

- If foreign body present can be removed with wet cotton swab or small guage needle (if patient is compliant)
- Corneal abrasions: goal of treatment is pain management and infection prevention. Generally treated with topical antibiotics and lubricating eye agent. Generally, ophthalmology is consulted and follow up is arranged.
- Management of more significant eye injuries is typically directed by Ophthalmology

RESOURCES

- Royal Children's Hospital Melbourne Acute Eye Injury in Children
https://www.rch.org.au/clinicalguide/guideline_index/Acute_eye_injuries_in_children/
- PEM Guide: Eye Trauma (p. 926-931)
<https://coreem.net/blog/pem-guides/pem-guides-version-6-0-2019/>

REFERENCES

The Royal Children's Hospital, Melbourne, Australia, Clinical Practice Guideline on Acute Eye Injury, [Internet, cited April 2, 2020]. Available from: <https://www.rch.org.au/clinicalguide/>

Agnant, Joanne. "Eye Trauma." *PEM Guides*, 2019, pp. 926–931.

Fish, Joel. "Suture choices." Received by Jovian Collins, 2020.

Burns

QUICK TIPS:

- Always assess ABC's first
- It takes **72 hours** for a burn to fully declare itself, they often look much smaller and more superficial on first assessment
- Remember to address pain control which includes **covering** open areas. Burns generally need *multimodal* pain management *including* narcotics
- Do not hesitate to consult your tertiary care center. SickKids' Plastic Surgery is happy to follow up on burns in the GTA to ensure that they are healing well!
- Take pictures of the injury before and after dressing
- Keep patients **NPO** if you think they will require urgent referral
- 10-20% of burns are inflicted non-accidental injuries
 - Scald burns that are not in keeping with the history, submersion injuries (particularly if there are clear lines of immersion), patterned burns (ie. cigarette butts, portable heaters, irons) or any other suspicious story should be reported to CAS
- Start fluid resuscitation under guidance of your tertiary care center

ASSESSMENT:

**Do primary survey and assess ABCs prior assessment prior to burn specific assessment*

History	Physical Examination
<ul style="list-style-type: none">• Time of injury• Mechanism of injury and/or substance (scald, contact, flame and water, milk, oil etc.)• Location of event• Associated injuries• Tetanus status	<ul style="list-style-type: none">• Location• Burn depth classification (see below)• Total body surface Area (TBSA)<ul style="list-style-type: none">○ Child's own palm (fingers excluded) represents 1% of their TBSA○ Lund Browder Chart for children <10y○ Rule of 9s cannot be used for children under 10y

BURN CLASSIFICATIONS

****NOTE:** Burns do not declare themselves until ~72h after injury. The definitive classification is often more severe than it appears on initial assessment**

Superficial Thickness	<ul style="list-style-type: none">• Injury to epidermis only• NOT included in BSA calculation• Presents with erythema and pain (ie. sunburn)• No blistering• Sensation intact, painful• Heals in 3-5 days, no scarring
Partial Thickness Superficial	<ul style="list-style-type: none">• Injury to epidermis and superficial dermis• Thin blisters, erythematous, edematous, MOIST• Sensation intact, painful• Heals in 2-3 weeks, no scarring

Deep	<ul style="list-style-type: none"> • Injury to epidermis and superficial/deep dermis • Thick blisters, pale/red, moist OR dry • Can have decreased sensation • Heals in 3-6 weeks, potential scarring
Full Thickness	<ul style="list-style-type: none"> • Injury to epidermis and whole dermis • Pale/white, charred, leathery, DRY skin • Decreased sensation/pain • Will scar

Table modified from PEM Guide (p.241), by J Quintero-Solivan, 2019.

MANAGEMENT

- Resuscitation
 - Assessment and management of airway, early intubation if signs of airway obstruction (ie. soot in nares/mouth, singeing of nasal hairs, airway edema)
 - Fluid resuscitation (For severe burns)

Parkland Formula

IV fluid volume= 4 ml/kg x % TBSA

Use isotonic crystalloid solution (ie. Ringers lactate or D5.0.9NaCl)

Give 50% in the 1st 8 hours, remaining 50% over the next 16hrs

Don't forget to add (dextrose containing) maintenance fluids for young children!

- Pain control
 - Often require multimodal pain relief including opioids (morphine, hydromorphone, fentanyl) and other agents (ie.ketamine)
 - Covering the wound is important for pain (area is generally highly sensitive before covering)
- Wound Care
 - Needs to be done with good analgesia +/- sedation
 - Wash with soap and water
 - Gentle debridement of any loose or ruptured bullae
 - Cover with a simple NON STICK dressing such as Vaseline gauze and secure well
 - Photos before and after dressing for communication and to monitor burn progression

REFERRAL CRITERIA

- Major burns
 - CitiCall criteria for transfer to Burn Center

Physiological Criteria

CONSIDER TRANSFER TO MAJOR BURN CENTRE	CONSIDER TRANSFER TO MINOR BURN CENTRE
<ul style="list-style-type: none"> • $\geq 20\%$ TBSA partial and/or full thickness at any age • $\geq 10\%$ TBSA partial and/or full thickness for ages ≤ 10 and ≥ 50 • Full thickness burns $\geq 5\%$ TBSA at any age • Burns to hands, face, feet, joints, genitalia, perineum • Electrical burns • Chemical burns • Inhalation injury • Burns with comorbidity • Burns with patients who require special social, emotional, or rehabilitation care 	<ul style="list-style-type: none"> • Burns $>10\%$ but $<20\%$ TBSA in adults
	REMAIN AT BASE SITE
	<ul style="list-style-type: none"> • Burns $<10\%$ TBSA in adults who do not require transfer but seek medical advice or an ambulatory burns clinical referral for assessment

- Minor burns:
 - Most minor burns should be referred to a burn centre for follow up to ensure healing and after care can be provided (even very small ones!)
 - A **photo and the family's phone number** must shared with the burn team
 - If you are within the SickKids catchment area the burn team details are below
 - Dr. Joel Fish, Medical Director of Burn Team
joel.fish@sickkids.ca
 - Charis Kelly, Nurse Practitioner, Burns and Complex Wounds
charis.kelly@sickkids.ca
 - Sandy Davies, Office Administrator
Sandy.davies@sickkids.ca

AFTERCARE

- Tetanus prophylaxis:

History of vaccination	Clean Wound		“Dirty” Wound	
	Td/DTP	Tetanus Ig	Td/DTP	Tetanus Ig
<3 doses	Yes	No	Yes	Yes
Last dose >10 years ago	Yes	No	Yes	No
>3 doses and last dose 5-10 years ago		No	Yes	No
>3 doses and last dose <5 years ago		No	No	No

- Pain needs to be well treated
 - OTC Tylenol, ibuprofen
 - Morphine prescription should be provided at higher dose (~0.4mg/kg/dose) x ~10 doses (burns are very painful and opioids are often necessary, this is an appropriate time to be more liberal)
- Daily dressing changes are **no longer standard of care** and should not be done. Further dressing changes can be arranged by the burn team
- Homecare is **NOT** a good option for pediatric burns and should not be arranged
- No antibiotics for initial burn management, felt to breed resistance

DISCHARGE INSTRUCTIONS

- Watch for signs of infection
- Do not remove dressing at home
- Sunscreen on scar and scar massage will help with cosmesis
- Burn care for families:
<https://www.aboutkidshealth.ca/Article?contentid=1175&language=English>

RESOURCES

- TREKK Burns Section
https://trekk.ca/resources?tag_id=D002056
- PEM Guide: Burns (p. 241-245)
<https://coreem.net/blog/pem-guides/pem-guides-version-6-0-2019/>

REFERENCES

Quintero-Solivan, Juliette. “Burns” *PEM Guides*, 2019, pp. 241-245.
Fish, Joel. “Burn Care.” Received by Jovian Collins, 2020.

Poisoning/Toxicology

QUICK TIPS

- Call Poison Centre EARLY
- Identify a toxidrome
- Patients with acute ingestions can change rapidly in their clinical status.
- Always assess and reassess ABCs
- Don't forget to check a glucose early

ASSESSMENT

History <ul style="list-style-type: none">• Amount of substance taken (ideally have someone give you the bottle)<ul style="list-style-type: none">○ Calculate dose per weight• Timing of ingestion• Witnessed vs. Unwitnessed, intentional vs. Accidental• Consider NAI, as well as suicide risk• Potential co-ingestions	Physical Examination <ul style="list-style-type: none">• ABCs and vital signs (including temperature!)• Neurologic examination including GCS and pupils• Head to Toe examination• GI Examination (bowel sounds)• Skin Examination (sweaty, dry)• Odour• Identify TOXIDROME
Investigations <ul style="list-style-type: none">• Poison Centre will direct you towards appropriate testing• Labs:<ul style="list-style-type: none">○ CBC, electrolytes, extended electrolytes, Creatinine, Urea, VBG, lactate, serum osmolality○ Urine toxicology, serum toxicology (institution specific!)○ Specific Levels: acetaminophen, salicylates, serum for methanol, ethylene glycol and EtOH levels• ECG: assess rate, QRS (narrow vs wide) and calculate QTc• CXR/AXR: depending on substance <div><div>Anion gap: $[\text{Na}^+] - [(\text{HCO}_3^-) + (\text{Cl})]$ NORMAL: 8-12</div><div>Osmolar gap: $2 \times \text{Na}^+ \text{ glucose} + \text{BUN}$ NORMAL: < 5</div></div>	

TABLE 3. Toxic Syndromes

GROUP	BP	P	R	T	MENTAL STATUS	VITAL SIGNS			OTHER
						PUPIL SIZE	PERISTALSIS	DIAPHORESIS	
Anticholinergics	-/↑	↑	±	↑	Delirium	↑	↓	↓	Dry mucous membranes, flush, urinary retention
Cholinergics	±	±	-/↑	-	Normal to depressed	±	↑	↑	Salivation, lacrimation, urination, diarrhea, bronchorrhea, fasciculations, paralysis
Ethanol or sedative-hypnotics	↓	↓	↓	-/↓	Depressed, agitated	±	↓	-	Hyporeflexia, ataxia
Opioids	↓	↓	↓	↓	Depressed	↓	↓	-	Hyporeflexia
Sympathomimetics	↑	↑	↑	↑	Agitated	↑	-/↑	↑	Tremor, seizure
Withdrawal from ethanol or sedative-hypnotics	↑	↑	↑	↑	Agitated, disoriented	↑	↑	↑	Tremor, seizure
Withdrawal from opioids	↑	↑	-	-	Normal, anxious	↑	↑	↑	Vomiting, rhinorrhea, piloerection, diarrhea, yawning

↑=increased, ↓=decreased, ±=variable, --=change unlikely, BP=blood pressure, P=pulse, R=respirations, T=temperature.

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From Toce M, et al. *The Poisoned Pediatric Patient. Pediatrics In Review*, May 2017.

TABLE 5. Toxicologic Differential Diagnosis for Anion Gap Metabolic Acidosis

M	Methanol, metformin
U	Uremia
D	Diabetic ketoacidosis, alcoholic ketoacidosis
P	Paraldehyde, paracetamol (massive), propylene glycol, phenformin
I	Iron, isoniazid, ibuprofen (massive)
L	Lactate (including cellular asphyxiants [carbon monoxide, cyanide, hydrogen sulfide, sodium azide])
E	Ethylene glycol
S	Salicylates

From Toce M, et al. *The Poisoned Pediatric Patient. Pediatrics In Review*, May 2017.

MANAGEMENT

- Poison Centre is excellent at directing ongoing care
- Principles of management are:
 1. Decontamination (eg. Activated charcoal, Gastric Lavage)
 2. Enhanced Elimination (eg. Whole bowel irrigation)
 3. Antidotes
 4. Supportive Care

RESOURCES

- Ontario Poison Centre: 1 800 268 9017



Ontario Centre[®]
Poison antipoison
Centre de l'Ontario

CALL US AT

1-800-268-9017

REFERENCES

McGregor et al. Evaluation and Management of Common Childhood Poisonings. *Am Fam Physician*. 2009 Mar 1;79(5):397-403.]
Michael S. Toce and Michele M. Burns. The Poisoned Pediatric Patient *Pediatrics in Review* May 2017, 38 (5) 207-220; DOI:
<https://doi.org/10.1542/pir.2016-0130>

Pediatric Anaphylaxis Algorithm

Recognition of Anaphylaxis:

Acute onset of

- Skin changes (urticaria, erythema/flushing and/or angioedema)
PLUS: Respiratory +/- Cardiovascular +/- GI symptoms
OR
- Hypotension, Bronchospasm or Upper Airway obstruction with exposure to known allergen

If pre-hospital care (home or EMS) was given, please note:

- Epinephrine, salbutamol or antihistamine may have altered the signs and symptoms at presentation
- Anaphylaxis diagnosis is based on full history of symptoms

Initial Management:

- Place patient in supine position (unless in respiratory distress or vomiting)
- Assess ABCs, vital signs (including BP and SpO₂)
- Provide O₂ 10-15 L/min by non-rebreather mask (if signs of shock or respiratory distress)
- Identify and remove allergic trigger, if possible

Administer IM EPINEPHRINE

- Dose: 0.01 mg/kg (1 mg/mL), MAX 0.5 mg (see dosage chart)
- Route: **INTRAMUSCULAR (IM)** in anterolateral thigh
 - **Never administer the IM preparation of epinephrine (1mg/mL) through IV/IO route**
 - **Never give IV epinephrine bolus dose for initial anaphylaxis management**
- Repeat IM EPINEPHRINE every 5-10 min as needed (see below)

Do not delay IM EPINEPHRINE administration

Persistent symptoms after 1st dose of IM EPINEPHRINE?

1-5 min

Respiratory symptoms:

- Sitting position
- Administer high flow O₂, consider need for intubation
- If stridor or upper airway obstruction, give nebulized epinephrine
- If wheeze or lower airway obstruction, give nebulized salbutamol

Hypotension or poor perfusion/decreased LOC:

- Supine position (*Do not sit up*)
- Secure large bore IV or obtain intraosseous (IO) access
- Bolus NS, 20 mL/kg IV/IO rapid push

If no improvement, give 2nd dose of IM EPINEPHRINE

5-10 min

Secure IV/IO access (if not yet done)

Respiratory symptoms:

- Repeat nebulized epinephrine (upper airway obstruction) or salbutamol (lower airway obstruction)
- Prepare for difficult airway intubation

Hypotension or ↓ LOC:

- 2nd bolus NS, 20 mL/kg IV/IO rapid push
- Prepare for possible epinephrine infusion (see Drug Dosing Binder for details)

Alert Pediatric Referral Centre

If no improvement, give 3rd dose of IM EPINEPHRINE

10-20 min

Respiratory symptoms:

- Consider 3rd nebulized epinephrine or salbutamol
- Consider IV hydrocortisone
- Proceed with intubation if no improvement

Hypotension or ↓ LOC:

- Start epinephrine infusion 0.05 mcg/kg/min IV, titrate up by 0.02 mcg/kg/min to effect

Alert Pediatric Referral Centre

If no improvement

Refractory Anaphylaxis

Norepinephrine infusion (For persistent hypotension)

Start at 0.05 mcg/kg/min IV, titrate up by 0.02 mcg/kg/min to effect (MAX 2 mcg/kg/min)

Glucagon bolus (For persistent anaphylaxis symptoms or patients on beta blockers)

Dose: 20 - 30 mcg/kg/dose (MAX 1 mg) IV over 5 minutes, followed by infusion of 5 - 15 mcg/min, titrated to clinical effect

IM EPINEPHRINE DOSAGE CHART

Weight (Kg)	Epinephrine dose (1mg/mL) amp	Epinephrine Auto-injector Dose
5-10	0.1 mg	0.15 mg (EpiPen® Junior)
11-15	0.15 mg	
16-20	0.2 mg	
21-25	0.25 mg	
26-30	0.3 mg	
31-35	0.35 mg	0.3 mg (EpiPen®)
36-40	0.4 mg	
41-45	0.45 mg	
≥46	0.5 mg	

CAUTION!

Administering epinephrine:

- Give epinephrine dose by INTRAMUSCULAR (IM) route only
- If no improvement after ≥3 doses of IM epinephrine, consider IV epinephrine infusion
- Do not give boluses of IV epinephrine unless indicated for advanced life support

Potentially Difficult Airway:

- Prepare equipment and personnel for difficult airway intubation while giving epinephrine neb for upper airway obstruction.

Discuss with Pediatric Referral Centre

Disposition

Refer to TREKK Anaphylaxis Bottom Line Recommendations (trekk.ca) for further details.

Pediatric Referral Centre Discussion

Issues related to:

- Difficult vascular access
- Airway management
- Need for epinephrine infusion
- Refractory anaphylaxis/shock
- Admission/transfer and disposition decisions