



EM CASES SUMMARY

Episode 108 Pediatric Physical Abuse

With Carmen Coombs & Alyson Holland

Prepared by Shaun Mehta & Alex Hart, March 2018

Why pediatric physical abuse matters

For those children who survive their physical trauma, there are both *short term* and *long term* effects. Short term effects include risk of escalating abuse with increased risk of morbidity and mortality. *Long term* effects include developmental delays, mental health issues, chronic disease and substance abuse according to the [ACEs Study](#).

Emergency providers' responsibility in suspected pediatric physical abuse

The unfortunate truth is, if we don't think about abuse, we'll definitely miss it. So, the most important first step is always simply to **think about it**. Then our responsibility turns to **reporting it, considering the differential diagnosis, investigating** what is medically necessary and **ensuring appropriate follow up or admission** if necessary.

Sentinel injuries are minor injuries with major significance

Much as with sentinel bleeds of subarachnoid hemorrhages, even seemingly trivial injuries of abuse can be viewed as "sentinel events" for much worse outcomes in the future. According to [Sheets et al in 2013](#), as many as 25% of abused infants had prior sentinel injuries. One reason we miss physical abuse in these kids is that most sentinel injuries are minor injuries such as bruises, intraoral injuries, or simple fractures and we overlook the real significance of these injuries, which is that they provide an opportunity for us to intervene before more serious injury occurs. As EM providers, recognizing and responding appropriately to sentinel injuries protects kids. Failure to do so can result in repeated abuse and subsequent morbidity and mortality.

Historical Indicators of Pediatric Physical Abuse

- No/vague explanation for a significant injury
- Important detail of the explanation changes dramatically
- Explanation given is inconsistent with the child's physical and/or developmental capabilities
- Different witnesses provide different explanations
- Injury occurred as a result of inadequate supervision
- Delay in seeking medical care without reasonable explanation

Risk Factors

Care Giver Factors

- Criminal History
- Mental Health History
- Substance Abuse
- Young/Single Parent
- Former Victims of Abuse/neglect

Child Factors

- Young Age
- Behavioral Problems
- Chronic Illness or Disability
- Non-biologic Relationship to Caretaker
- Prematurity/low Birth weight

Family and Environmental Factors

- High local unemployment
- Intimate partner violence in the home
- Poverty
- Social Isolation
- Lack of social supports

Remember though that **no child is immune from abuse** and an absence of the above risk factors does not preclude one from investigating suspicious injuries further. Indeed, it is in this population that abuse is often missed.

Physical Exam Findings Suggestive of Abuse: The 6 B's

As children learn to run, walk and explore new environments, they are bound to hurt themselves. Teasing apart which injuries are due to normal childhood rambunctiousness and those that are a result of abuse requires vigilance and a thorough assessment. Remember to fully undress your patients in order to complete a head to toe exam (Teeuw et al 2012) that won't miss subtler injuries.

Signs of disciplinary abuse are usually found on areas of the body that are concealed by clothing such as the back and buttocks.

Look for

- Injuries at different stages of healing
- Multiple Injuries
- Patterned Injuries
- Any injury in a young infant.

Other clues include

- Poor child hygiene
- A child who appears, anxious, withdrawn or fearful of a person in the room

6 B's – Bruises, Breaks, Bonks, Burns, Bites, Baby blues

Bruises

The most common abusive injury is a bruise. Kids bruise often, but certain scenarios should raise alarm bells.

A) Bruising in the pre-mobile infant.

“If you don’t bruise, you don’t bruise.”

Pierce et al found that only 1.3% of infants less than 5 months old had bruising.

Feldman et al found that over 50% of pre-mobile infants with bruising were victim of abuse.

Make certain you base your assessment on the child’s developmental stage and not absolute age.

Bruising in infants is very rare. Not all of these babies are abused but they almost always (ie, unless there was significant trauma in a public setting with multiple witnesses) warrant further evaluation for child abuse.

B) Bruising in an unusual/protected area

TEN-4 FACES Bruising Rule (Pierce 2010)

Any bruise found in any of the following locations should trigger the possibility of pediatric physical abuse:

Torso

Ears

Neck

Any bruise in a child younger than 4 months old

FACES

Frenulum

Angle of Jaw

Cheek

Eyelid

Subconjunctival Hemorrhage

Pearl: Think of a subconjunctival hemorrhage in an infant as a bruise on the eyeball and frenulum injury as a bruise to the frenulum. These injuries are highly suggestive of abuse in the infant.

C) Patterned Bruises

- Linear bruises to buttock (whipping, spanking, paddling)
- Linear bruising to the pinna
- Retinal bleeding
- Hand prints or oval marks
- Belt Marks – U-shaped end or associated buckle inflicted puncture wounds
- Loop marks (rope, wire, electric cord)
- Ligature marks, circumferential rope burns to neck, wrists, ankles and gag marks to comers of the mouth

D) Too Many Bruises

It is helpful when consider whether or not a patient has too many bruises to compare with bruise prone areas such as the shins.

Don’t try to age/date bruises as physicians are unreliable at determining the age of bruises.

Breaks

While **there are no fractures that are pathognomonic for abuse, any fracture in any age group can be abusive** depending on how the fracture was sustained. Most abusive fractures occur in children < 18 months of age so again, our highest level of suspicion should be in young children. An important exception is that of the Toddler’s fracture which requires little force and can occur from simple falls.

1. **Any fracture in a nonambulatory infant or child**
2. **Femur fracture in an infant < 12-18 months of age**

Baldwin 2011: The odds of a femur fracture being abuse rather than accidental trauma was 19 times greater for children < 18 mo of age.

3. Humerus fractures in an infant < 18 months of age

Pandya 2010: Children < 18 mo with a humerus fracture had a 32 greater odds of being the victim of abuse.

Location: Proximal and mid shaft humeral fractures are more likely due to abuse whereas distal humerus/supracondylar fractures are less likely to be due to abuse.

4. Multiple fractures and/or an unexpected healing fracture

5. Skull fractures, especially if complex or bilateral

Deye 2013: A small (~5%) but not insignificant number of infants < 12 months old with apparently isolated skull fracture undergoing abuse evaluation were found to have additional unexpected fractures on skeletal surveys.

Most acute fractures are symptomatic but there are some fractures (metaphyseal fractures and rib fractures) which are often occult and only identified on imaging and are highly concerning for child abuse. These fractures may be found “incidentally” when getting imaging for a different reason (ie, a rib fracture seen on a chest xray obtained in an infant with suspected pneumonia) but need to be addressed the same as any abusive injury.

6. Classical metaphyseal fractures (bucket handle fractures) from being shaken violently back and forth

7. Rib fractures, especially posterior rib fractures (highest probability for abuse)

Every injury can be caused by abuse. Nothing is pathognomonic for abuse.

Bonks

Signs of abusive head trauma can be subtle and non-specific. The Pittsburgh Infant Brain Injury Score (PIBIS) by Berger et al (see below) can help decide which patients warrant head imaging.

Skull fractures are most often accidental, but a small proportion are associated with abuse according to Deye et al in 2013. Increase your suspicion for abuse if skull fractures are complex, bilateral, depressed, open, presenting with suture diathesis or occipital fractures.

Burns

BURNS THAT ARE HIGHLY CONCERNING FOR ABUSE	
Highly Concerning Burns	Comments
Immersion scald burns (especially if symmetric, well-demarcated) - Stocking and/or glove distribution - Symmetrically burned buttocks/genitals (often related to punishment during potty training)	* Most accidental burns in children are scald burns due to spillage of hot liquids and are located on the anterior body surface, are asymmetric, and have obvious splash marks (but even these burns can be child abuse – e.g. adult is cooking, becomes angry, and throws a pan of boiling water on a child)
Contact burns - Cigarette burns (especially if multiple and/or in protected locations) - Other well-demarcated patterned burns mirroring a hot object (e.g. clothing iron, cigarette lighter, curling iron, hair blow dryer, cooking items)	* Most accidental contact burns occur when the hot object is touched or grasped (burning the palmar surface of the hand) or falls (causing multiple irregular burns as it falls).

Bites

Human bites have typical, stereotyped pattern.

Baby Blues (Irritability)

Some severe injuries (see head trauma) can present with very non-specific symptoms. This is why it is so important to fully examine all concerning patients.

Screening for Medical Conditions Mimicking Abuse

The two most common conditions that mimic bruising are Mongolian spots and hemangiomas.

Compared to a bruise, *Mongolian spots (congenital dermal melanocytosis)* are bluish-green and located on the buttocks/lower back, present at birth, are non-tended, and fade over months to years. *Hemangiomas* are also non-tender, subcutaneous, and proliferate over time. If in doubt, use POCUS!

Many conditions may predispose a child to bruising and bleeding including HSP, ITP, leukemia and hemophilia, and consider osteogenesis imperfecta and rickets in children who present with fractures as a result of a minimal force mechanism.

Screening for occult injuries: The workup in suspected pediatric physical abuse

The basic medical evaluation for suspected physical abuse in a young child includes a skeletal survey, head imaging, and trauma labs.

Screening for Occult Injuries

	Brain CT vs. MRI	Skeletal Survey	Labs ¹
0-12 mo	· CT if symptomatic or concern on physical exam · Admit + schedule MRI for asymptomatic infants	√	√
12-24 mo	X	√	√
2-6 yrs	X	X ²	√
7-18 yrs	X	X	X

¹CBC, PT/PTT, lytes, creatinine, glucose, LFTs, amylase, lipase, U/A

²SCAN team may recommend skeletal survey in children ages 2-3

*Obtain abdominal CT if patient is symptomatic, or there is concern on physical exam.

Which children suspected of abuse require a skeletal survey?

As a general guide: Any child < 2 yo in whom you suspect abuse should undergo a skeletal survey.

Pediatric abusive head trauma

Head trauma in young children may present with non-specific symptoms. Signs and symptoms of abusive head trauma in an infant or young child can be subtle or non-specific (sleepy, vomiting, fussy, lethargic) or even completely absent and these are the cases we often fail to recognize.

Pittsburgh Infant Brain Injury Score (PIBIS) for Abusive Head Trauma

The 5-point PIBIS

1. Abnormality on dermatologic examination (2 points),
2. Age \geq 3.0 months (1 point),
3. Head circumference $>$ 85th percentile (1 point), and
4. Serum hemoglobin $<$ 11.2g/dL (1 point).

At a score of 2, the sensitivity and specificity for abnormal neuroimaging was 93.3% (95% confidence interval 89.0%–96.3%) and 53% (95% confidence interval 49.3%–57.1%), respectively.

INTRACRANIAL INJURY	
Intracranial Injuries Highly Concerning for Abuse	Comments
Any intracranial injury in an infant or young child without a clear history of definite major trauma	* Most fatal head injuries in infants and young children are due to abuse rather than accidental injury.
Subdural hematoma	* Signs and symptoms of intracranial injury may be dramatic (e.g., seizure, apnea, altered mental status), subtle and nonspecific (e.g., sleepy, vomiting, irritability, macrocephaly), or absent.
Cerebral Edema	
Hypoxic Ischemic Injury	* Subdural hematomas are the most common form of abusive head injury but any type of intracranial injury can be abusive in etiology. * Epidural hematomas are usually associated with accidental injuries. * Retinal hemorrhages are present in 70-80% of children with abusive head injuries and are rare in those with accidental head injuries.

3 Ds – Documentation, Disclosure & Disposition in pediatric physical abuse

Documentation in pediatric physical abuse

Proper documentation can be challenging but is extremely important in these scenarios. The chart is a medicolegal document that may be called upon if an investigation takes place.

History

- Who is providing the history
- What, when, who
- Use quotations to document exact statements from child and caregiver
- Any pain that the child is experiencing

- Activities that may affect forensic evidence recovery (eg. bathing)
- Review of systems – changes in behaviour, non-specific symptoms
- The usual (past medical history, social history, meds, allergies)

Physical Exam

- Head-to-toe
- Fully expose the child – this is a trauma patient
- Describe, draw or even photograph any injuries

Impression

- Summary statement
- If comfortable, offer an interpretation of the findings in the context of the history

Disclosure tips in pediatric physical abuse

Be direct and professional. “As a physician, I worry when I see X, Y and Z and it makes me concerned that someone may have hurt your child.”

Refrain from being accusatory. “It’s not my role to say who hurt your child but it is my obligation to report my concern.”

Encourage the family to focus on the child. “Right now, we need to make sure that your child gets the medical care that he/she needs.”

Call for help. Discuss the case with social work, child protective services, a child abuse consultant (eg. SCAN team), and the primary care physician.

Disposition in pediatric physical abuse

To admit or not to admit? If you are concerned about the child’s *safety*, then admit to hospital for observation and further work up. *Discharge* from ED only if the medical evaluation is complete and safe disposition can be arranged by child protective services from the ED.

What is our responsibility in reporting of suspected pediatric physical abuse?

The specific rules around reporting abuse vary across the jurisdictions, but the fundamental principle is the same: health care providers need only reasonable suspicion that a child is being harmed to report, not “proof”. We are penalized for failing to report suspicion, not for reporting unsubstantiated suspicion. Reporting to the provincial or state child welfare office is legally mandated. Reporting to pediatric specialists and healthcare centers specializing in child abuse pediatrics is often useful but does not fulfill that legal mandate.

Child Presenting with Injury		
Historical Indicators of Abuse	The Physical Exam's 6 B's of Abuse	Injuries Suggestive of Abuse
<ul style="list-style-type: none"> - Changing of evolving history - Injury not consistent with mechanism - Injury not consistent with developmental stage - Delay in seeking medical care - History of past injuries - Unexplained injuries/deaths in siblings 	<p>Bruises: Pre-mobile; TEN-4 (Torso, Ear, Neck) F.A.C.E.S. (Frenulum, Angle of Jaw, Cheek, Eyelid, Subconjunctival); Pattern; Too many</p> <p>Breaks: Needs a clear history. Unusual in very young. Ignore Toddler's Fracture</p> <p>Bonks: Worry if complex, bilateral, depressed, open, suture diathesis or occipital fractures</p> <p>Burns: Worry if bilateral, well demarcated, immersion pattern (glove & stocking)</p> <p>Bites: Unlikely to have innocent mechanism</p> <p>Baby Blues: Unexplained behavioral change</p>	<ul style="list-style-type: none"> - Posterior rib fractures - Long bone fractures if <6mo - Metaphyseal fractures - Scapular fractures - Vertebral fractures - Sternal fractures - Hand/foot fractures - Facial fractures - SDH - Unexplained TBI
Consider Reporting		
Screening For Occult Injuries		
0-12mo: Brain CT if symptomatic or concern of physical exam. Admit for MRI if no symptoms.	12mo to 18 years: No need for imaging if no symptoms/concerns.	
Skeletal Survey Recommendations		
<i>In general, perform in any child < 2 years old in whom you suspect abuse.</i>		
<24 mo + bruising if - Concerning Hx or PE findings - No Hk of trauma to explain fracture, except Distal spiral or buckle # of tibia/fibula/radius/ulna in ambulatory patients	12-23 mo if: - Rib # - Metaphyseal # - Complex skull # - Humeral # + epiphyseal separation from fall <3 ft - Femur diaphyseal # from fall of any height	<12 mo if: - Concerning Bruising (TEN-4, F.A.C.E.S.) - Any # except distal buckle/spiral #, linear, unilateral skull # if >6 months + good hx or clavicle # @ birth
	<9 mo >1 bruise in ANY location	<6 mo + bruising: Over bony prominences (head T-shaped area, frontal scalp, extremity bony prominences) except if a single bruise and patient presents with history of fall
Documentation Tips		
History - Who is providing the history - Use quotations - Any pain - Activities that may affect forensic evidence recovery (e.g. bathing) - ROS – changes in behaviour, non-specific symptoms	Physical Exam - Head-to-toe - Fully expose the child – this is a trauma patient - Describe, draw or even photograph any injuries	Impression - Summary statement - If comfortable, offer an interpretation of the findings in the context of the history

Take home points for Detection and Management of Pediatric Physical Abuse

Sentinel injuries are minor injuries with major significance. These may appear minor, but are often missed and provide an opportunity for us to intervene before serious injury.

No child is immune from abuse. While risk factors for abuse may be helpful in triggering a suspicion for abuse, many children who suffer from abuse have no identifiable risk factors.

The most common abusive injury is a bruise. *If you don't cruise, you don't bruise.* Keep an eye out for the **6 B's of child abuse**.

Head trauma in young children may present with non-specific symptoms. Be suspicious in the right clinical context.

Concerning features for abuse are subtle. These include delay in seeking care, vague or changing history of trauma, mismatch of history and injury or developmental stage of child, and multiple or patterned injuries.

Certain injury patterns should always raise concern for abuse. These include posterior rib fractures, subdural hematomas, immersion burns, patterned bruises and others. None are pathognomonic. Use the **TEN-4 FACE decision tool**.

The basic medical evaluation for suspected physical abuse in a young child includes a skeletal survey, head imaging, and trauma labs. There are recommendations when and when not to investigate.

Report abuse when you are suspicious – it is your legal responsibility. Regional guidelines vary, but report based on suspicion, not on proof.

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