The Importance of Sentinel Injuries in Protecting Children

Dr. Deanna St. Germain
Medical Director
Kids' FIRST Center
Eugene, OR

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Objectives

1. Identify that the younger the infant the more at risk they are for fatal non-accidental trauma.
2. Identify that the most common sentinel injury (in cases of child abuse) is a bruise.
3. Name three areas of the body where bruises raise concern for inflicted injury, in children under the age of four years.
WARNING!

Disturbing photographs of abused children will be shown to illustrate key points.

PLAN

Child abuse stats
Discuss sentinel injuries
Review child physical abuse
Resources
New app: Child Protector
Child Abuse and Neglect

At least one in four children have experienced child neglect or abuse (including physical, emotional, and sexual) at some point in their lives, and one in seven children experienced abuse or neglect in the last year.


37.4% of all children experience a child protective services investigation by 18 years of age.

Child Abuse and Neglect

2016 National data: 676,000 children indicated as abused.

Mortality and Serious morbidity in child abuse

2016

- 1750 child fatalities, increasing for the past 6 years.
- That’s nearly 5 children dying per day.
- Still under-reported, particularly if you include supervisory neglect deaths that are seldom coded as child abuse deaths.

https://www.acf.hhs.gov/sites/default/files/cb/cm2016.pdf#page=67
### Exhibit 4-F Child Fatalities with Selected Caregiver Risk Factors, 2016

<table>
<thead>
<tr>
<th>Caregiver Risk Factor</th>
<th>Reporting States</th>
<th>Child Fatalities from Reporting States</th>
<th>Child Fatalities With a Caregiver Risk Factor</th>
<th>Child Fatalities With a Caregiver Risk Factor Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol Abuse</td>
<td>27</td>
<td>896</td>
<td>51</td>
<td>5.7</td>
</tr>
<tr>
<td>Drug Abuse</td>
<td>31</td>
<td>1,120</td>
<td>169</td>
<td>15.1</td>
</tr>
<tr>
<td>Financial Problem</td>
<td>30</td>
<td>1,156</td>
<td>114</td>
<td>9.9</td>
</tr>
<tr>
<td>Inadequate Housing</td>
<td>32</td>
<td>952</td>
<td>71</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Data are from the Child File. For each caregiver risk factor, the analysis includes only those states that reported at least 1.0 percent of child victims' caregiver with the risk factor. States were excluded from these analyses if they were not able to differentiate between alcohol abuse and drug abuse caregiver risk factors and reported both risk factors for the same children in both caregiver risk factor categories. If a child was reported both with and without the caregiver risk factor, the child is counted once with the caregiver risk factor.

### Table 4-5 Child Fatalities by Relationship to Their Perpetrators, 2016

<table>
<thead>
<tr>
<th>PERPETRATOR</th>
<th>Child Fatalities</th>
<th>Reported Relationships</th>
<th>Reported Relationships Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARENT</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Father</td>
<td>-</td>
<td>216</td>
<td>16.8</td>
</tr>
<tr>
<td>Father and Nonparent(s)</td>
<td>-</td>
<td>24</td>
<td>1.9</td>
</tr>
<tr>
<td>Mother</td>
<td>-</td>
<td>347</td>
<td>27.0</td>
</tr>
<tr>
<td>Mother and Nonparent(s)</td>
<td>-</td>
<td>137</td>
<td>10.7</td>
</tr>
<tr>
<td>Mother and Father</td>
<td>-</td>
<td>258</td>
<td>20.1</td>
</tr>
<tr>
<td>Mother, Father, and Nonparent</td>
<td>-</td>
<td>20</td>
<td>1.6</td>
</tr>
<tr>
<td>Total Parents</td>
<td>-</td>
<td>1,002</td>
<td>78.0</td>
</tr>
</tbody>
</table>

Oregon 2016 = 43% of all CPS cases

17% non-parent
# 10 Leading Causes of Death, United States
## 2016, All Races, Both Sexes

<table>
<thead>
<tr>
<th>Rank</th>
<th>&lt;1</th>
<th>1-4</th>
<th>5-9</th>
<th>10-14</th>
<th>15-24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Congenital Anomalies 4,518</td>
<td>Unintentional Injury 1,261</td>
<td>Unintentional Injury 787</td>
<td>Unintentional Injury 847</td>
<td>Unintentional Injury 13,805</td>
</tr>
<tr>
<td>1</td>
<td>Short Gestation 3,027</td>
<td>Congenital Anomalies 433</td>
<td>Malignant Neoplasms 440</td>
<td>Suicide 430</td>
<td>Suicide 5,723</td>
</tr>
<tr>
<td>2</td>
<td>SIDS 1,850</td>
<td>Malignant Neoplasms 377</td>
<td>Congenital Anomalies 203</td>
<td>Malignant Neoplasms 431</td>
<td>Homicide 5,172</td>
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<tr>
<td>3</td>
<td>Maternal Pregnancy Comp. 1,402</td>
<td>Homicide 339</td>
<td>Homicide 139</td>
<td>Homicide 147</td>
<td>Malignant Neoplasms 1,431</td>
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<tr>
<td>4</td>
<td>Unintentional Injury 1,219</td>
<td>Heart Disease 118</td>
<td>Heart Disease 77</td>
<td>Congenital Anomalies 149</td>
<td>Heart Disease 943</td>
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<tr>
<td>5</td>
<td>Placenta Cord Membranes 841</td>
<td>Influenza &amp; Pneumonia 103</td>
<td>Chronic Low. Respiratory Disease 68</td>
<td>Heart Disease 111</td>
<td>Congenital Anomalies 363</td>
</tr>
<tr>
<td>6</td>
<td>Bacterial Sepsis 563</td>
<td>Septicemia 70</td>
<td>Influenza &amp; Pneumonia 46</td>
<td>Chronic Low. Respiratory Disease 75</td>
<td>Diabetes Mellitus 211</td>
</tr>
<tr>
<td>7</td>
<td>Respiratory Distress 468</td>
<td>Perinatal Period 60</td>
<td>Septicemia 40</td>
<td>Cerebrovascular 50</td>
<td>Chronic Low. Respiratory Disease 206</td>
</tr>
<tr>
<td>8</td>
<td>Circulatory System Disease 400</td>
<td>Cerebrovascular 55</td>
<td>Cerebrovascular 38</td>
<td>Influenza &amp; Pneumonia 39</td>
<td>Influenza Pneumonia 189</td>
</tr>
<tr>
<td>9</td>
<td>Neonatal Hemorrhage 398</td>
<td>Chronic Low. Respiratory Disease 51</td>
<td>Benign Neoplasms 31</td>
<td>Septicemia 31</td>
<td>Complicated Pregnancy 184</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Morbidity

NSCAW researchers found that, at some point during the 3 years following a maltreatment investigation, 28 percent of children had a chronic health condition (Administration for Children and Families, Office of Planning, Research and Evaluation, 2007)

https://www.childwelfare.gov/pubPDFs/long_term_consequences.pdf

Annually there are 1200 seriously head injured children and 80 deaths from abuse.


The mortality rate for children with abusive head trauma ranges up to 35.7%. Among survivors, 42% – 96% suffer long-term neurologic morbidity. Both mortality and survivor neurologic outcome are worse in abusive head trauma compared with accidental TBI.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3437227/
About half of all children in the United States will experience some kind of adversity. One third of all mental disorders are attributable to ACEs, worldwide.

Children who experience threat:
- Information processing biases resulting in the rapid identification of anger
- Heightened emotional reactivity to negative cues that might signal threat
- Generalization of threat responses to a wide range of stimuli (poor emotional regulation)

Children who experience deprivation (including poverty):
- Experience persistent deficits in cognitive functioning, including executive functioning
- Extreme over pruning of synaptic connections and branching
- Pervasive deficits in working memory, inhibitory control, and cognitive flexibility
Morbidity

Adverse Childhood Experiences: graded relationship between the number of ACEs and each adult health risk behaviors and diseases.

Smoking, obesity, attempted suicide, drug use, >50 sexual partners and alcoholism
Ischemic heart disease, cancer, chronic lung disease and liver disease

Previous sentinel injuries, defined as inflicted injuries that are minor and recognized by physicians or parents before the recognition that the child has been abused, are common in abused infants but rare in those not abused.\textsuperscript{54} For example, previous sentinel injuries are identified in 25\% of abused infants and in one-third of those with AHT.\textsuperscript{54,55} The majority of sentinel injuries are bruises, intraoral injuries, including frena tears, or fractures.\textsuperscript{57–60}
Sentinel injuries: Recognizing the symptoms of the canary in the coal mine before it’s too late.

Who might see a sentinel injury?

- Parent
- Caregiver
- Medical provider
- Other family members

Types of injuries:

- Bruises in infants
- Intra-oral injury
- Ear injury
- Subconjunctival hemorrhage
- Nursemaid’s elbow (in an infant)

2017. Antoinette Laskey, MD, Child Abuse Summitt PDX.
Additional injuries in young infants with concern for abuse and apparently isolated bruises.

*J of Pediatr* 2014;165:383-8, by Harper et al.

2890 children (children<10 yrs seen in 20 centers for concern of child abuse)

- 57.7% had apparently isolated bruises at presentation
- Neuro-imaging identified new injury in 27.4%
- Skeletal survey identified new injury in 23.3%
- Abdominal injury identified in 2.7%

Overall, 50% had at least one additional injury

- 70% had bleeding disorder testing, no disorders were found

50% had high likelihood of abuse.
Sentinel injuries

Bruises are TRAUMA

April 2017- International Journal of Child Abuse and Neglect

“History, injury and psychosocial risk factor commonalities among cases of fatal and near-fatal physical child abuse”

- Small study of 20 children < 4 years old.
- Median age=7.5 months
- 95% with traumatic brain injury
- 90% with bruises
- Of cases with available prior medical records, 64% had prior atypical bruising.
Prior opportunities to identify abuse in children with abusive head trauma.


Multicenter study

232 children with AHT

31% (73) had a total of 120 prior opportunities for diagnosis.

- 25% in medical setting
  - Most common complaint was vomiting but for 12% it was bruising.
- 6% in CPS setting
- 10% died.

*Median age was 5.4 months*
Sentinel Injuries Precede Abusive Head Trauma in Infants.

2009 *Pediatric Academic Societies Meeting.* Baltimore, MD by Sheets et al.

100 children with discharge diagnosis of abusive head trauma

- 30% had a history of sentinel injury
  - Bruise was most common
  - Average of one month before the head injury
  - 97% before 6 months of age
  - 60% before 2 months of age
Risk factors for recurrent injuries in victims of suspected non-accidental trauma: a retrospective cohort study.

2014, *BMC Pediatrics* by Deans et al.

1361 children with suspected NAT

26% *had a recurrent NAT event within 1 year*

40% *within 2 years*

*Risk factors:*
- Rural
- Young age (<30 months)
- Fewer injuries (1 or 2 detected)
Barriers and facilitators to detecting child abuse and neglect in general emergency departments.

Annals of Emergency Medicine, 2015 by Tiyyagura et al.

29 interviews at 3 emergency depts.

Barriers:

Believing the caregiver
Failure to recognize a child’s condition could be due to CAN
Challenges of working in ED such as lack of on-going contact with family
Provider biases
Factors associated with reporting
Negative outcomes such as testifying in court
Lack of follow up on reported cases

Facilitators

Real time discussion with peers
Belief that it is better to report when suspicious
April 17, 2009 – Amelia Ann Ashton asked her mother 53,297,518 questions in 15 minutes.
Think about child abuse…

Box 2
Six B’s: high-risk chief complaints

- Bruises
- Breaks
- Bonks (head injuries)
- Burns
- Bites
- Baby blues (excessive crying, poor feeding)

BRUISES
Bruising characteristics discriminating physical child abuse from accidental trauma.

2010 *Pediatrics*. Pierce et al.

Children ages 0-48 months admitted to PICU for trauma

- 42 victims of physical abuse
- 53 victims of accidental trauma
- 71 (of 95) had bruising

Bruises associated with abuse were:

- Torso
- Ear
- Neck

Any bruising in a child <4 months of age
“Got skin? Examine it!”

“Bruises are injuries” think TRAUMA.
Non-cruising infant-age matters
Age less than or equal to 4 years, get child undressed and examine!

Focus on high risk chief complaints:
BRUE/ALTE
Vomiting
Rolled off the couch/bed.

Social risks:
MCP: attributions of child; discipline practices; new paramours
Also: DV; substance abuse; criminality; mental illness

“get a social work consult if bleeding disorder is ruled out EVEN if other NAT work up is negative”
Incidental bruising

**Characteristics**

- Child developmentally capable of causing the bruise (NMB no go)
- Occur after mobility starts
- 9 months of age and above, prevalence rates go up for bruising
- Typically no definitive associated bruise history, but often there is a speculated cause
- Always over bony prominent areas; Never over “soft” areas or protected areas

**Typical or Accidental bruising**

**Characteristics**

- Clear and discrete trauma hx that matches the location of the discrete impact
- **“One and Done”**

- Bony prominent areas
- NOT multi-planar
- NOT over soft tissue areas
- NOT bilateral
- NOT clustered
- NOT patterned (no geometric shapes like loop marks or hand slaps)

**Regions**

- Forehead-Head
- Zygoma
- Chin
- Knees
- Elbows
- Shin
- Spine

**FHZC^3KES^2**
Atypical bruising Physical Assault

**Characteristics**
- May or may not offer a history to explain the findings
- Often the bruise is “2nd fiddle” to the reason for presentation
- Grab or “box” ears, face, neck (jaw line) with choking, shoulder, arms, chest
- Hit or slap the side of the head
- Punch in the eye or mouth or stomach
- Kick in the stomach or back
- Spank the buttocks and upper legs
- Bilateral injuries to eyes, ears, cheeks, jaw: Yikes!
- Ear, eyes (sclera, eyelids), jaw line, buccal check, frenulum, neck, upper chest, shoulder bruising: Double yikes!
Bruises
Beware: forehead bump with migration
TEN-4-FACES
TEN-4-FACES
TEN-4-FACES
"There aren't any icons to click. It's a chalk board."
TEN-4-FACES
TEN-4-FACES
TEN-4-FACES
TEN-4-FACES
Bleeding Disorder Evaluation

**Bruising: Does the child need an evaluation for bleeding disorders?**

Situations in which a bleeding disorder evaluation may not be needed:
- Clear disclosure of or independently witnessed abuse or nonabusive trauma
- Other medical findings consistent with abuse or nonabusive trauma
- Object- or hand-patterned bruising
- History clearly explains bruising

Clues to presence of a bleeding disorder:
- Petechiae at clothing line pressure sites
- Bruising at sites of object pressure, such as in the pattern and location of infant seat fasteners
- Severe bleeding disorders may also present with excessive diffuse bruising

**Intracranial hemorrhage: Does the child need an evaluation for bleeding disorders?**

Situations in which a bleeding disorder evaluation may not be needed:
- Independently witnessed trauma (abusive or otherwise)
- Other medical findings consistent with abuse

**2a. Initial Testing Panel**
- Prothrombin time
- Activated partial thromboplastin time
- VWF antigen
- VWF activity (Ristocetin cofactor)
- Factor VIII level
- Factor IX level
- Complete blood count with platelet count

**2b. Initial Testing Panel**
- Prothrombin time
- Activated partial thromboplastin time
- Factor VIII level
- Factor IX level
- Complete blood cell count with platelet count
- DIC panel (d-dimer and fibrinogen)

**3. Abnormal test results or further testing desired**
- Consult a pediatric hematologist

*Pediatrics April 2013, VOLUME 131/ ISSUE 4*
Patterns
Patterns
Think about child abuse...

Child maltreatment is a public health problem with lifelong health consequences for survivors and their families.

Histories that raise concern for abuse:
- No explanation or vague explanation given for a significant injury
- Denial of trauma in a child with an obvious injury
- An important detail changes over time in a substantive way
- Explanation inconsistent with child’s developmental level/ability
- Explanation inconsistent with the pattern or severity of the injury
- Unexplained or unexpected delay in seeking care
- Different witnesses provide markedly different explanations

The Evaluation

| TABLE 1 Factors and Characteristics That Place a Child at Risk for Maltreatment |
|---|---|---|
| **Child** | **Parent** | **Environment (Community and Society)** |
| Emotional/behavioral difficulties | Low self-esteem | Social isolation |
| Chronic illness | Poor impulse control | Poverty |
| Physical disabilities | Substance abuse/alcohol abuse | Unemployment |
| Developmental disabilities | Young maternal or paternal age | Low educational achievement |
| Preterm birth | Parent abused as a child | Single parent |
| Unwanted child | Depression or other mental illness | Nonbiologically related male living in the home |
| Unplanned pregnancy | Poor knowledge of child development or unrealistic expectations for child | Family or intimate partner violence |
| | Negative perception of normal child behavior | |

Reproduced with permission from Flaherty et al.34
Fractures

Fractures concerning for abuse:
Non-ambulatory infants (without a clear history of trauma or known bone fragility)
Multiple fractures
Rib fractures

Just this fx noted in children less than 3 years old is associated with 95% positive predictive value for NAT.
CPR rarely causes rib fx, usually anterior.

Rib fractures
Fractures concerning for abuse cont’d

Infants and toddlers with midshaft humerus or femur fractures

*Particularly under the age of 15 months.*

Unusual fractures such as scapula, CML, vertebral, sternum

History of trauma does not explain the fracture.
Figure 3. Diagram depicts the discoid metaphyseal fracture fragment (arrows).
**TABLE 2** Indications for Obtaining a Skeletal Survey

<table>
<thead>
<tr>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>All children &lt;2 y with obvious abusive injuries</td>
</tr>
<tr>
<td>All children &lt;2 y with any suspicious injury, including</td>
</tr>
<tr>
<td>Bruises or other skin injuries in nonambulatory infants;</td>
</tr>
<tr>
<td>Oral injuries in nonambulatory infants; and</td>
</tr>
<tr>
<td>Injuries not consistent with the history provided</td>
</tr>
<tr>
<td>Infants with unexplained, unexpected sudden death (consult with medical examiner/coroner first)</td>
</tr>
<tr>
<td>Infants and young toddlers with unexplained intracranial injuries, including hemorrhage and hypoxic-ischemic injury</td>
</tr>
<tr>
<td>Infants and siblings &lt;2 y and household contacts of an abused child</td>
</tr>
<tr>
<td>Twins of abused infants and toddlers</td>
</tr>
</tbody>
</table>
Fractures

Serum:
  Calcium, phosphorus, alkaline phosphatase, 25-hydroxyvitamin D and PTH.
  Consider-vitamin C, copper, and ceruloplasmin, if abnormal X-rays.
  Consider-skin biopsy or DNA analysis for Osteogenesis Imperfecta.

Imaging:
  Skeletal survey
  
  Repeat in 2 weeks for high risk cases
  Can use bone scintigraphy to complement skeletal survey.
Fractures
“Can I get my milk from an unopened container? I just saw a documentary on Munchausen by proxy syndrome and, well...you’re not exactly the most stable person I know.”
Figure 1. Violent shaking and squeezing of an infant may result in subdural hemorrhage (top right diagram) and shear-type brain injury, rib fracture (middle right diagram), and metaphyseal fracture (lower right diagram). These injuries are fully described and illustrated in subsequent sections.
The Evaluation-head injury

Head trauma

All infants and children with suspected AHT require CT, MRI or both.

Symptomatic children-CT of the head

MRI-all children with abnormal CT’s, asymptomatic infants with non-cranial abusive injuries and for f/u of trauma.

U/S for macrocephaly, ok but-if positive get MRI. DO not use in emergency setting.

Think of ophthalmology exam for retinal hemorrhages.

Not necessary if exam and neuro-imaging are negative.

CBC w/plts, PT/INR/aPTT, Factors VIII and IX, fibrinogen, and d-dimer.

Review newborn screen

Consider urine organic acids to screen for GA1.

Cont’d

Six findings associated with abusive head trauma
   Rib fractures
   Retinal hemorrhages
   Long bone fractures
   Head/neck bruising
   Apnea
   Seizures

When 3 or more are present, PPV approaches 100% for AHT

BURNS
The Evaluation-abdomen

Abdominal injury=second leading cause of mortality in physical abuse.
- Get liver and pancreatic enzymes
- Get UA
- Consider CT with IV contrast
- Skeletal survey in children < 2 years

Oral injuries and occult harm in children evaluated for abuse


2890 child abuse consultations in 20 US cities < 120 months old.

3.3% had oral injuries (96 children)

- 43% of those had frenulum injuries
- 84% got skeletal surveys
  - 25% showed occult fractures
- 75% had neuroimaging
  - 38% had injuries
- 41% had retinal exams
  - 24% had retinal hemorrhages
Continued

70% of the children seen with oral injury had a high level of concern for child abuse.

Of children < 6 months of age with oral injury, 88% had a high level of concern for child abuse.

Of children 6-12 months of age, 80% had a HLOC for child abuse.

Of children 1-3 years of age, 64% had a HLOC for child abuse.

Of children > 3 years of age, 80% had a HLOC for child abuse.
Detecting and Reporting Child Abuse, Idaho's Invisible Children; are they your children?
http://www2.state.id.us/phd1/hp_detecting-child-abuse.pdf
Subconjunctival hemorrhages
Strangulation: manual or ligature

Potentially lethal features: but can die w/o any of these:
Loss of consciousness
Bladder or bowel incontinence
  5% of survivors
  60% of fatalities (vs. 14% of controls)
Facial petechiae
Petechiae
Strangulation

Evaluation:

* Pulse oximetry
* Chest films
* Soft tissue films of neck
* CT/CTA of neck recommended for:
  * Conscious victims with history of:
    * Loss of consciousness
    * Or petechiae (suggesting force was applied for 15-30 seconds or longer)
* Consider pharyngoscopy or laryngobronchoscopy with symptoms

Admit for observation:

* Loss of consciousness
* Evidence of vascular obstruction with facial or conjunctival petechiae
* Symptoms of soft tissue injury to the neck
* Under the influence

Missed opportunities to diagnose child physical abuse.

1466 children had a skeletal survey for concern of abuse.
100 had healing fractures.
  77 children diagnosed as abused.
  Of those 32% had a previous visit where abuse could have been diagnosed.
  Mean age 3.9 months.
  90% of these children were admitted.
  10% of them died.
61% of the healing fractures were rib fractures followed by lower extremity (40%) and upper extremity (30%) and skull (25%).
I can't find it anywhere! It's just gone!

Whenever I send my kids to find something.
Pittsburg Infant Brain Injury Score

✓ Abnormal skin exam (2 pts)
✓ Age ≥ 3 months (1 pt)
✓ Head circumference > 85\textsuperscript{th} percentile (1 pt)
✓ Hemoglobin < 11.2 (1 pt)

1040 infants with temp < 38.3\textdegree C
   214 cases and 826 controls
No history of trauma
A symptom associated with having a brain abnormality

A score of 2 showed a sensitivity and specificity for having abnormal neuroimaging was 93.3\% and 53\%. Implementation analysis needed before integration to clinical practice.
**BRUISED INFANT PATHWAY for patients < 1 year of age**

A baby with a bruise may be abused!

- **Is there a bruise ANYWHERE on the infant’s body?**
  - NO
  - **Is there a CLEAR, PLAUSIBLE, ACCIDENTAL cause?**
    - YES
    - Document bruise and cause of injury. No further workup
  - YES

- **Is the Infant cruising?** Typically begins around 9 months: Crawling, pulling to stand, cruising from object to object, or walking

- **1. Is there a bruise to a HIGH RISK REGION?**
  - Torso-Ear-Neck-Eye-Mouth
  - (See diagram below)

- **2. Are there more than 4 non-shin bruises?**

- **3. Is there a patterned bruise?**
  - Ex: hand or finger prints from a slap or grab, object imprint (belt, hanger, cord), linear marks or loops

- **If the answer is YES to ANY OF THE ABOVE**
  - **Is there a CLEAR, PLAUSIBLE, ACCIDENTAL cause?**
    - NO

**Components of a PHYSICAL ABUSE SCREENING EVALUATION:**

1. Social service consult to evaluate for psychosocial risk factors
2. Child protection team consult if available in your facility or region
3. Complete 19 Image skeletal survey (NOT A BABYGRAM)
4. Strongly consider a head CT or brain MRI, especially in infants under six months of age
5. Strongly consider trauma labs: CBC, LFTs, amylase, lipase, UA, CPE if bruising is extensive or muscles are swollen or tender, troponin if chest bruising is present
6. Strongly consider abdominal imaging if abdominal labs are abnormal or if bruising is on the abdomen

**Screening bleeding disorder studies:**

1. CBC including platelets
2. PT/PTT
3. Careful family history for bleeding disorders

**Are bleeding studies abnormal?**

- **YES**
  - Consult hematologist and a child abuse specialist prior to discharge.
  - Abnormal labs may not represent significant bleeding disorder, or may not account for injuries.
  - Report all injuries, including the bruise, to social services as suspicion of physical abuse of an infant. A report is indicated even if no additional injuries are found.

- **NO**

**HIGH RISK AREAS FOR BRUISING:**

- Eye
- Ear
- Mouth
- Neck
- Torso
- Chest
- Abdomen
- Back
- Buttocks
- Gluteal
Excellent resources:


Bruising studies

2015. *Arch Dis Child.* Kemp et al. **Patterns of bruising in preschool children-a longitudinal study.**

3523 bruises

2.2% of children who could not roll over.

Ears, neck, buttocks, genitalia and hands were rarely bruised.


973 children < 36 months old

21% with bruises

0.6% in children less than 6 months
1.7% in children less than 9 months
Goes up to 18% in cruisers and 52% of walkers.
Contact info:

Deanna St. Germain, DO
2675 MLK Jr Blvd
Eugene, OR 97401
541-682-3938
541-728-8770 cell
deanna@kidsfirstcenter.net