Sentinel Injuries: Early Recognition of Physical Abuse
Middlesex Hospital Grand Rounds
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Conflicts of interest

• Nothing to disclose
• Note: Cases and images from live presentation not included here
Learning Objectives

• Recognize the significance of sentinel injuries in infants
• Make a plan for evaluation of an infant with a possible sentinel injury
• Identify barriers to reporting suspected abuse in the medical setting and resources that can help you to overcome these barriers
This talk will cover

• Why focus on infants?
• What is a sentinel injury?
• When to worry?
  – Bruises
  – Oral Injuries
  – Symptoms of Abusive Head Trauma
• How to evaluate
• Reporting
### Table 4–3 Child Fatalities by Age, 2013

<table>
<thead>
<tr>
<th>Age</th>
<th>Child Population</th>
<th>Number</th>
<th>Percent</th>
<th>Rate per 100,000 Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>3,128,301</td>
<td>566</td>
<td>46.5%</td>
<td>18.09</td>
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<td>1</td>
<td>3,143,634</td>
<td>207</td>
<td>17.0%</td>
<td>6.58</td>
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<td>2</td>
<td>3,164,046</td>
<td>126</td>
<td>10.4%</td>
<td>3.98</td>
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<td>3</td>
<td>3,173,755</td>
<td>86</td>
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<td>8</td>
<td>3,265,583</td>
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<td>0.40</td>
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<tr>
<td>9</td>
<td>3,275,045</td>
<td>8</td>
<td>0.7%</td>
<td>0.24</td>
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<td>10</td>
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<td>3,243,839</td>
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<td>0.34</td>
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<td>12</td>
<td>3,324,353</td>
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<td>1.0%</td>
<td>0.36</td>
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<td>13</td>
<td>3,375,798</td>
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<td>0.18</td>
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<td>14</td>
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<td>0.4%</td>
<td>0.15</td>
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<tr>
<td>15</td>
<td>3,310,446</td>
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<td>0.7%</td>
<td>0.27</td>
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<td>16</td>
<td>3,311,986</td>
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<td>0.6%</td>
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<tr>
<td>17</td>
<td>3,333,105</td>
<td>5</td>
<td>0.4%</td>
<td>0.15</td>
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<tr>
<td>Unborn, Unknown, and 18–21</td>
<td>3</td>
<td>0.2%</td>
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</tbody>
</table>

**National**

<table>
<thead>
<tr>
<th>Child Population</th>
<th>Number</th>
<th>Percent</th>
<th>Rate per 100,000 Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>58,642,703</td>
<td>1,217</td>
<td>100.0</td>
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</table>

*Based on data from 45 states.*


46.5% Under 1

73.9% Under 3
<table>
<thead>
<tr>
<th>Perpetrator</th>
<th>Child Fatalities</th>
<th>Reported Relationships</th>
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</thead>
<tbody>
<tr>
<td>Father Only</td>
<td>131</td>
<td>12.4</td>
</tr>
<tr>
<td>Father and Nonparent(s)</td>
<td>17</td>
<td>1.6</td>
</tr>
<tr>
<td>Mother Only</td>
<td>292</td>
<td>27.7</td>
</tr>
<tr>
<td>Mother and Nonparent(s)</td>
<td>132</td>
<td>12.5</td>
</tr>
<tr>
<td>Mother and Father</td>
<td>260</td>
<td>24.6</td>
</tr>
<tr>
<td><strong>Total Parents</strong></td>
<td><strong>832</strong></td>
<td><strong>78.9</strong></td>
</tr>
</tbody>
</table>

78.9% of fatalities perpetrated by parents

Most often a bioparent, not a step-parent

Case (not included)
Case illustrates:

• Difficulty of making diagnosis in absence of trauma history
• Infants at highest risk of physical abuse
• Infants often suffer repetitive injury with multiple medical presentations before diagnosis reached
• Head, face and mouth are common sites of inflicted injury
What is a sentinel injury?

- A poorly explained minor injury in a non-mobile infant
- May portend major morbidity
- Offers an opportunity for protection...if you evaluate further
Sentinel Injuries

• Retrospective study of children <3 with abusive fractures, n=258
  – 21% had at least one prior medical visit at which diagnosis of abuse was missed

• Retrospective study of children with healing fractures on skeletal survey and diagnosis of abuse, n=77
  – 33% had at least one prior medical visit where diagnosis of abuse was missed

Sentinel Injuries in Infants

- Retrospective case control study, n=401
- Infants < 12 mos evaluated for abuse in a hospital setting, assessed presence of prior “sentinel injuries” reported by caregivers and/or observed by medical personnel

Sheets et al, Pediatrics 2013
Sentinel Injuries in Infants

- Sentinel injuries preceded more severe abuse in:
  - 27.5% of cases of definite abuse
  - 8% of those with intermediate concern
  - None of cases classified as definite not abuse

- Medical providers reportedly aware of sentinel injuries: 42%

- “Prevention window” between sentinel injury and more severe abuse ranged from 1 day-7.3 months (median one month)

Sheets et al, Pediatrics 2013
Bruises: When to worry?

• Consider:
  – Developmental level
  – Location
  – Pattern
Bruises: When to worry

Developmental Level

• Those who don’t cruise rarely bruise
  – Cross sectional survey
  – 0-36 mos at well care visits, n=973
  – 2.2% of pre-cruising infants had bruise
  – 0.6% of those under 6 mo had bruise

Distribution of percentage of 2570 collections from 328 children with at least one bruise by location and development stage.

Bruises: When to worry

**Location**

- Case control study of children 0-48 mo in PICU with trauma, defined abuse cases and controls, documented bruises, n=95.
- Developed a decision rule with sens 97%, spec 84% for abuse: **TEN-4**
  - Torso, ears, neck injuries on a less than 4 year old child
  - **Any bruise** on a less than 4 month old child

Pierce et al. Bruising Characteristics Discriminating Physical Child Abuse From Accidental Trauma. *Pediatrics* 2010;125;67-74
Regions of the body (shaded area) where bruises were significantly more likely to occur in a child with **confirmed physical abuse** than in one where physical abuse was excluded.

Bruises: When to worry

Pattern

Kos and Shwayder 2006: *Pediatric Dermatology* 23 (4) 311-320
Conditions that may be confused with Abusive Bruises in Infancy

- **Traumatic:**
  - accidental injury
  - cupping/coining

- **Vascular:**
  - Hemangiomas
  - prominent veins

- **Dermatologic:**
  - slate grey nevi
  - congenital melanocytic nevi
  - urticaria pigmentosa
  - erythema nodosum
  - hyperpigmentation following inflammation
  - phytophotodermatitis

- **Oncologic:**
  - Neuroblastoma with raccoon eyes
  - thrombocytopenia secondary to leukemia

- **Hematologic:**
  - Vit K deficiency/HDN
  - Hemophilia
  - ITP
  - other inherited and acquired bleeding disorders

- **Other:**
  - Henoch Schonlein Purpura
  - other vasculitis such as infectious and drug related
  - Ehlers Danlos disease
  - Artefactual (from ink or dye)
Oral Injuries in Infants

• Inspect frena (labial and lingual) and all mucosal surfaces
• Lips are most common site of abusive oral injury in published series
• Frena tears alone are not pathognomonic for abuse and are less worrisome in ambulating children with plausible history of trauma

Case (not included)
Case illustrates

• Presentations with minor injuries (bruises, mouth injury) leading up to diagnosis

• Bruises uncommon with rib and extremity fractures (in one large series, only 8.1% of rib/extremity fractures had associated bruising)

• Symptoms of abusive head trauma (vomiting, fussiness, poor feeding) may be non-specific

Signs and Symptoms of Abusive Head Trauma

- Vomiting
- Poor feeding
- Lethargy
- Irritability
- Decreased tone
- Decreased responsiveness
- Seizures
- Hypothermia
- Bradycardia
- Hypoventilation or apnea

May have no external sign of injury!
Missed Abusive Head Trauma

- Jenny et al reviewed 173 cases of AHT
  - 54 (31%) had been seen with symptoms of AHT and misdiagnosed (mean time to dx 7 d)
  - Factors increasing missed diagnosis: Very young infant, white, intact family, no seizures or resp compromise
  - 15 (28%) reinjured before diagnosis, 4 of 5 deaths might have been prevented by early recognition

JAMA (1999) 282 (7): 621-626
Think about AHT with:

• Infants and toddlers with lethargy, poor feeding, vomiting, change in level of consciousness, seizure, changes in tone

• ALTEs

• Bloody LP

• Signs of head trauma, especially with vague or inconsistent history

• Another sign of inflicted trauma in infants, even if normal neuro exam (e.g. bruise in pre-cruiser)
When possible sentinel injury or AHT suspected

- Careful PE and history
- Treat as trauma! Refer to Pediatric ED urgently
- May use ambulance for transport
- Report to DCF
- May call child abuse pediatrician for triage support
Imaging for occult injuries

- **Skeletal Survey:**
  - ALL children <2 yrs with suspicion of abuse

- **Head imaging:**
  - ALL children with suspected AHT
  - Infants with:
    - Head or facial injury
    - Rib fracture
    - Multiple fractures
    - Age <6 months

Case (not included)
Case illustrates:

- Finding of even minor unexplained or poorly explained injuries in infants should trigger:
  1. Reframing as a trauma pt
  2. Urgent thorough evaluation for possible child abuse, transfer to pediatric ED for admit to allow complete evaluation
  3. Mandated report to DCF
Documentation—Diagram!
Documentation: History

• Write down presenting history from caregivers, in exact words/quotes when possible

• Ask about any history of trauma since birth
  – If present, document in detail
  – If absent, note that caregivers deny any history of trauma
How to report

• Must report “reasonable suspicion” of abuse/neglect to DCF Careline by phone within 12 hours: 800.842.2288

• Must mail written report within 24 hours:
Barriers to reporting

- 434 pediatricians collected data on 15,003 injury visits, including likelihood of abuse
- 1683 (10%) visits with some suspicion for abuse
- Clinicians did NOT report:
  - 27% of injuries thought likely or very likely abuse
  - 76% of injuries thought possibly abuse

Barriers to Reporting

• Common reasons given for NOT reporting:
  – Long relationship with family
  – Negative perceptions of CPS process/outcomes
  – Feeling they could manage it themselves
  – Low or no use of consultant resources

• More likely to report if:
  – Previous suspicions or involvement with CPS
  – Consideration of case specific elements

Overcoming barriers

- Evaluate case elements objectively
- Recognize that child protective services (DCF) involvement can be positive
- Understand the limits of medical providers’ ability to manage risks to child
- Understand civil and criminal liability for failure to report
- Use consultant resources
Talking with families

- Assure safety of child first
- Focus on child, language objective, tone neutral
- Tell them that child needs further evaluation, and multiple possibilities will be considered
- Remember that you may be talking with a non-offending caregiver
- Remember that the ultimate diagnosis may not be abuse
Conclusions

• Infants at highest risk for physical abuse
• Often no history of trauma provided
• “Minor” injuries may portend major morbidity
• Keep inflicted injury on your differential
  • Bruises
    – Those who don’t cruise rarely bruise
    – TEN-4
  • Oral injuries
  • Symptoms that could be AHT
• Report, refer, and call us if you need help!
Contact information

SCAN Program
CT Children’s Medical Center
(860) 837.5890
nllivingston@connecticutchildrens.org
(Email for non-clinical communication only—call number above if you have a case to discuss)