Learning Objectives
At the end of this presentation the participant will be able to:
1. Discuss the clinical, radiological, and laboratory approach to evaluating suspected child abuse
2. Detect skin, bone, intracranial and intra-abdominal injuries with high specificity for abuse
3. Recognize the role of bias in diagnosing suspected child abuse

Overview of child abuse in Texas
- Texas CPS (Fiscal Year 2012):
  - Initial intake alleging abuse/neglect: 241,681
  - Do not include law enforcement referrals for children or adolescents abused by non-family members
  - Confirmed victims of child abuse/neglect: 64,106
  - Most common: supervision neglect
  - Child abuse/neglect related fatalities: 222

Child Maltreatment
- Introduction: what’s at stake?
- Lesson 1: The Devil is in the Details
- Lesson 2: If the baby doesn’t cruise, he shouldn’t bruise
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- Concluding remarks

Challenges for health care professionals
- The “dark side” of pediatrics
- Injuries may be subtle or nonexistent
- Clinicians rely more on familiarity with family even when suspicion of abuse is high in deciding to report (Jones et al., Pediatrics, 2009)
- Legal involvement
Case 1

- 3 month old taken to pediatric dentist for sore in mouth
- “Sore” is diagnosed as a lacerated lingual frenulum
- Infant is referred to child abuse center immediately

Missed abuse

- Missed abusive head trauma (Jenny et al., 1999)
  - 31% of children and infants with abusive head trauma initially misdiagnosed with various medical causes
  - Misdiagnosed group: younger, had less severe symptoms, while, lived with both parents
- Missed abusive fractures (Ravichandiran, et al, Pediatrics 2009)
  - Of 258 children with abusive fractures, 21% had previous visits at which abuse was missed
  - Misdiagnosed group: boys, extremity fractures, presenting to primary care or general ER settings

Challenges for investigators

- Rely on opinion of referring or examining physician, but do not know when a second opinion may be helpful
- Do not know what information from the scene or caretakers may be helpful to the physician

Case 2

- 16 month old former premie rolls off her parents’ bed with her arm caught in oxygen tubing
- Presents immediately to ER with a painful left arm
- Skeletal survey shows spiral fracture of left humerus, as well as a skull fracture and rib fractures
- CPS calls child abuse center for consultation

Case consultation

- Child abuse team reviews radiographs with pediatric radiologist
- Rib fractures/rib anomalies appear to be related to past surgery
- Skull fracture is a prominent vascular channel
- Family provided with letter explaining unusual findings

Does a second review by a child abuse specialist make a difference?

- Reviewed 200 cases reported to CPS that were evaluated by another physician, then re-evaluated by child abuse specialists at Center for Miracles
  (Anderst, Kellogg, Injkung, Child Abuse & Neglect, 2009)
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Is the explanation from the caretaker(s) consistent with the injury(s)?

- Is there an explanation?
- Does the explanation change (vs become more detailed)?
- Is the explanation consistent with injury
  - Pattern
  - Age
  - Severity
- Is the explanation consistent with the child’s developmental / physical capabilities?

Examples of suspicious histories:

- Vague explanation: “He probably fell on something”
  - May be an unwitnessed accident but if injury is serious, somebody should know something!
- No explanation: “He woke up with bruises”
- Benign accident: “He fell into the edge of a table”
- Self-inflicted injuries in context of normal playing “He fell down several steps of the football bleachers”
  - Often accompanied by comments that child is “very active” or “has ADD” or “bruises very easily”
- Sibling-caused injuries: “His brother likes to play rough and was chasing him with a belt”

General approach to the child

- Interview child alone whenever possible
- Reassure, give support, gain trust
- Be concrete and make no assumptions about what the child is saying
- Speak at the child’s level – physically and psychologically
- Compare child’s history of how they are disciplined with the parents’ history of how they discipline
In general, risk factors are more useful for **management**, rather than **diagnosis**

- Most abusers are family members or individuals living in the home
- Risk factors
  - Poverty
  - 3 or more children under age 5 in the home
  - Alcohol abuse / drug abuse
- Caretaker mental illness
- Financial / social / relationship stressors
  - Recent changes in jobs/income
  - Domestic violence
  - Disagreements over caretaking responsibilities
  - History of past abuse to child or parent

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**Patterns of bruising associated with abuse**

- Developmental capabilities of child: only 2.2% of pre-cruising infants have bruises
  (Sugar, et. al., Arch Ped Adolesc Med 1999)
- Shape
  - Patterned
- Negative and positive imprints
- Size (Maguire, Mann, Sibert, Kemp, Arch Dis Child 2003)
  - larger bruises more common with abuse
- Quality: petechial bruises more common with abuse

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**Location of bruises associated with abuse**

- 60% of abusive injuries involve the oro-facial area
  (Cairns, Mok, & Welbury, 2005)
- Location
  - Face (sides and ears)
  - Back
  - Buttocks
  - Genitalia
  - Thighs
  - Abdomen
  - Back of upper arms

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**Problems with “dating” bruises**

- Bruises can change color at different rates, and color may vary with lighting
- Several colors in one bruise
- Vascularity, skin color, location can effect bruise characteristics
  - In general, red bruises are <7 days and yellow/green are more than 1-2 days old (Maguire, Mann, Sibert & Kemp, 2005)
  - We’re bad at it: fewer than 50% of physicians can date bruises within 24 hours of actual age (Baricak et al., 2007)

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**Absence of bruising**

- Among 192 children with inflicted fractures, no bruising was noted in 58% (Mok, et al., 2008)
  - When skull fractures were excluded, only 45 of 555 (8%) fractures had bruising near fracture site
- Penetrative injuries to the abdomen are more likely to cause internal damage and may not leave external bruises (Thompson, 2005)
- 29% of 24 fatal abusive head trauma cases had no bruises (Avell, 1994)
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15 month old presents as a near drowning victim
- Mother left child for "5 seconds" in bathtub
- Chest x-ray showed some atelectasis
- Also presented at age 7 months of age with fever
- Chest x-ray at that time read as "normal"

- Duodenal perforation or hematoma, and injuries to hollow viscus more common with abusive vs accidental injuries
- Solid organ injuries most common type of injury for both abuse and accident (Wood, 2005)
- Second most common cause of death in child physical abuse homicides
- Mortality often related to delayed clinical presentation and lack of external signs of trauma

Only 50% of internal head injuries are associated with external signs of trauma
- Mechanisms of injury involve contact or inertial forces, but many injuries involve both
- Inertial forces exert tension on various brain structures as they move at different speeds
- Tears of the blood vessels, brain tissue
- Contact forces puncture/crush bone, blood vessels, brain tissue
Intracranial injuries

- Subdural/subarachnoid hematomas
  - Caused by impact and non-impact injuries
  - Usually signals serious intracranial injury, but is not the actual cause of death
  - Detection may be delayed in severe cases due to tamponade effect of edema
  - May estimate age based on variations in CT or MRI signal, due to breakdown of hemoglobin
- Traumatic axonal injury

Recommended work-up for suspected abuse

- Skeletal survey, including oblique views of the ribs, and hands and feet (children and infants <2 y)
- Head CT scan (if child stable, MRI may be more sensitive in detecting subtle intracranial findings)
  - Infants < 6 and in older infants and children with head injury
- Abdominal trauma: ALT, AST; abdominal CT with IV contrast, lipase, amylase, urinanalysis if intra-abdominal trauma is suspected
- Severe bruising: CPK, urine myoglobin, BUN, creatinine
- Repeat skeletal survey in 2 weeks for infants and for children with injuries highly concerning for abuse

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Differential diagnosis

- The most common diagnostic consideration will be whether the injury was accidental or intentionally inflicted
- Mimics of trauma are uncommon
- Unusual or extensive injuries:
  Consider work up for coagulopathy/bone fragility/congenital causes (depending on type of injury) in addition to assessing accidental and abusive causes of trauma
Too many margaritas

When cough meds and platelets don’t mix

Grandma and the garlic

Chocolate flavored Ex-Lax

Dermal melanosis

Work up for differential diagnoses

- Coagulopathy: CBC, platelets, PT, aPTT, PFA-100
  - Second tier: VWF antigen, Factors VIII and IX, Ristocetin cofactor; possibly Thrombin time, Factor XIII
  - If considering second tier, should consult Hematology
- Bone fragility: alkaline phosphatase, calcium, phosphate, PTH, 25 OH Vitamin D, DNA sequencing for OI
- Intracranial injuries: urine organic acids
- Indistinct or uncertain fractures: repeat radiographs
**Center for Miracles Assessments**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Bruises(N=1967)</th>
<th>Fractures(N=1944)</th>
<th>Head injuries (N=1944)</th>
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</thead>
<tbody>
<tr>
<td>High/probable abuse</td>
<td>38</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Nonspecific</td>
<td>35</td>
<td>31</td>
<td>40</td>
</tr>
<tr>
<td>No abuse</td>
<td>20</td>
<td>33</td>
<td>35</td>
</tr>
<tr>
<td>Supervision neglect</td>
<td>7</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

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**Neglect**

- Definition:
  - Failure to provide: inadequate nutrition, shelter, and / or care necessary to meet the basic needs of a child, allowing him to grow and develop.
  - Failure to protect: inadequate supervision, placing the child in imminent and significant danger, particularly if on a frequent basis.
- Examples
  - Injuries that occur because adult supervision is inappropriate or inadequate
  - Ignoring or failing to follow important medical / dental advice

**Case 5**

- 1 yo wanders into kitchen
- Pot of hot soup on a hot plate
- 1 yo reaches up, grabs cord, dumps soup on self
- Sustains 2nd and 3rd degree burns

**Is this neglect?**

- Where was the parent when it happened?
- How did the parent respond to the event?
  - Did they seek medical care promptly?
  - Did they recognize an error in supervision?
- If there was a minor burn, would this still be considered neglect?
- Are there prior referrals to CPS for neglectful care?
Case 6

- 3 year old brought to ER
- Mother changing diaper and noticed burn
- Mother is sole caretaker, but has no explanation for the burn
- Child and siblings noted to have extensive scabies and other signs of physical neglect

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Serving our Texas Children: Forensic Assessment Center Network and MEDCARES

- Goals: to provide medical expertise and evaluations of children who are suspected victims of abuse or neglect
- 7 current Centers of Excellence identify and mentor developing and new child abuse assessment programs
- Identify and meet needs of CPS and other referral services, especially primary care physicians, law enforcement and school health.
- Center for Miracles evaluated 1964 cases and children in 2012

MEDCARES

MEDCARES centers of excellence (2011):
- Austin (Dell Children’s)
- Corpus Christi (Driscoll Children’s)
- Dallas (Children’s Medical Center)
- Fort Worth (Cook Children’s)
- Houston (Texas Children’s Hospital)
- San Antonio (CHRISTUS Santa Rosa CFM)

Targeted/developing sites (2012):
- Killeen
- Lubbock
- Waco
- El Paso
- Tyler
- Kerrville
- Beaumont
- Hidalgo
- Galveston
- Abilene

Ultimate Goals: Saving kids, families and money

- Identify “false positives” earlier
- Reduce costs of investigation, legal proceedings, foster care, family anguish
- Identify serious injuries with high likelihood of abuse/neglect
- Reduce likelihood of re-injury and death
- Reduce health care costs
- Facilitate better reporting decisions by health care systems and schools, further reducing costs
“Children are the guests of humanity and should be treated with all honor, care and kindness.”
- Robert Owen

To report child abuse or neglect, call 1-800-252-5400