I have no disclosures.
Objectives

To discuss history taking, work up, diagnosis and management of children with child physical abuse:

- Bruises
- Neurologic trauma
- Abdominal trauma
- Skeletal trauma
- Burns
Legal Definition of Child Abuse
The Child Abuse Prevention and Treatment Act (CAPTA)

A recent act or failure that results in death, serious physical or emotional harm, sexual abuse or exploitation, or imminent risk of serious harm; involves a child; and is carried out by a parent or caregiver who is responsible for the child’s welfare.
Child Abuse Statistics

• Every 10 seconds, a report of child abuse is made
• More common than asthma
• Child abuse does not discriminate – it occurs in every gender, age, race/ethnicity, religion, SES, and spans all education levels
• More then 4 children die every day
• Approximately 70% of children that die from child abuse are under the age of 4
• Estimated annual cost = $124 billion

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Children At Risk

Family characteristics
- Low SES
- Unemployment
- Lack of education
- Single parent home
- Young maternal age
- Multiple children
- Families with drug/etoh abuse, domestic violence, or mental illness
- Homes where there are unrelated people living there

Child characteristics
- Prematurity
- Physical or developmental disabilities
- Under the age of 4 years

*Male and female children are abused at the same rate
Consequences of Child Abuse

- Risk for psychological disorders, substance abuse, suicide
- More likely to engage in sexual risk taking, putting them at increased risk for STIs
- 25% more likely to be a pregnant teen
- 30% will later abuse their own children
- 9 times more likely to be involved in criminal activity

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Clues in the History Concerning for Abuse

• History does not match the physical exam
  – i.e. a newborn cannot roll off the couch
  – Requires that you know developmental milestones of children

• Delay in care seeking
Questions to Ask

- Event witnessed? Who are the caregivers when injury/event occurred? If unwitnessed, who are the caregivers for the child in general?
- Identify the last witness(es) to well/asymptomat behavior
- Last location/point in time where the child was well/asymptomatic?
- Specific location where injury occurred?
- Timing of injury/event
- Identify the position/location of child immediately prior to injurious event and what the child was doing
Questions to Ask

• Identify mechanics of injurious event (twisting/falling backwards, forward, etc.)
• Surfaces/objects potentially impacted during injurious event?
• Specific body part(s) impacted during injurious event?
• Child’s physical position after the injurious event?
• Nature of the child’s first symptoms/reaction to injurious event
• Determine the first person that identified the child’s symptoms/reaction to injurious event
• Order of appearance of ill symptoms
• Duration of ill symptoms
• Clothing worn at time of injury
Physical Exam

• A thorough head to toe physical exam with the patient completely undressed to examine all of their skin/body

• Document all abnormalities in your exam and also in pictures if possible
  – It’s ok to ask the child, “how did you get this ouchie?” “and this ouchie?”
Case 1

2 month old term infant presents to the PCP’s office for her WCC. Pt has been growing appropriately and developmentally normal. On your physical exam, there is bruising to the back without any other findings. Neuro exam is normal.

What is your differential?
What is work up needs to be done?
CHILD ABUSE PART 1: BRUIISING
Bruising is the single most common presentation of child physical abuse
Young Infants and Bruises

• Bruises rare in children less than 6 months of age
• Increases as become more mobile and adventurous
• Relate to developmental stage
• “No cruise, no bruise”
“Those who don’t cruise rarely bruise”
N=930 children
Bruise Colors

- As blood cells and hemoglobin metabolized, bruise changes color
- Colors include red, purple, black, violet, blue, yellow, green and/or brown
- No predictable order or chronology
- Many factors affect rate of resolution
Factors Affecting Resolution

- Amount of blood
- Depth of leakage to surface
- Amount of force
- Amount of tissue damage
- Age of person
- Underlying skin color
- Vascularity of underlying tissue
- Location of the bruise
  - Loosely attached skin (periorbital or genital) bruise easier than skin under tension
- Drugs
- Concurrent medical conditions
It is Not Possible to Date Bruises

• No predictable order or progression

• One study Schwartz AJ, Ricci LR. How accurately can bruises be aged in abused children? Literature review and synthesis. Pediatrics 1996;97:254-257. concluded that yellow = older than 18 hrs

  – Timing of yellow unclear
  – Physician accuracy of timing < 40%
  – Inter-observer, intra-observer reliability poor
  – Concluded use of color to date should be avoided
Patterns of Bruising in Childhood Suggestive of Abuse


• Systematic review – investigate what patterns of bruising are diagnostic or suggestive of abuse
• 1951 – 2004, studies describing patterns of bruising in non-abused and abused children
• 23 studies: 7 non-abusive, 14 abusive, 2 both
Patterns of Bruising in Childhood Suggestive of Abuse

Non Abusive Bruising:
• The prevalence, number, and location of bruising is related to increased motor development
• Non-mobile babies < 1%, crawling or cruising 17%, walking 53%
• Majority of school aged children have bruises
• Bruises are small, over bony prominences, and located in the front of body
Patterns of Bruising in Childhood Suggestive of Abuse

Bruising common in abused children:
• Away from bony prominences
• Most common = head and neck, esp. face
• Second most common = buttocks, trunk, arms
• Bruises are large, multiple, clustered
• Patterned, imprint of object or uniform shape
### Classification of Bruising

(Jenny & Reece, 2009; Maguire, Mann, Sibert, & Kemp, 2005; Sugar, Taylor & Feldman, 1999)

<table>
<thead>
<tr>
<th>CONCERNING FOR ABUSE</th>
<th>NOT CONCERNING FOR ABUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face (not including forehead)</td>
<td>Head, not including face or ear</td>
</tr>
<tr>
<td>Ears</td>
<td>Forehead</td>
</tr>
<tr>
<td>Neck</td>
<td>Oral</td>
</tr>
<tr>
<td>Proximal arms (above the elbows)</td>
<td>Distal arms (including elbow)</td>
</tr>
<tr>
<td>Wrist/hand</td>
<td>Spinous/paraspinous</td>
</tr>
<tr>
<td>Anterior or lateral chest</td>
<td>Hips</td>
</tr>
<tr>
<td>Abdomen</td>
<td>Anterior and posterior legs (shins, knees and calves)</td>
</tr>
<tr>
<td>Back (excluding spinous/paraspinous)</td>
<td>Ankle</td>
</tr>
<tr>
<td>Buttock/genitalia</td>
<td></td>
</tr>
<tr>
<td>Anterior/posterior thigh</td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td></td>
</tr>
<tr>
<td>Patterned/symmetric</td>
<td></td>
</tr>
<tr>
<td>Any bruising in a child &lt; 9 months of age</td>
<td></td>
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</tbody>
</table>
Interpret Bruises in the Context of:

- Medical, social history
- Explanation given
- Clinical exam
- Developmental level of child
- Relevant work up
• Other causes of unusual bruising
  – Cultural practices
  – Alternative medicine
  – Illnesses associated with bruising
    • Lab evaluation
    • ITP, leukemia, Von Willebrand’s
Challenges in the evaluation for possible abuse: Presentations of congenital bleeding disorders in childhood


- 29/189 (15.3%) children in the study that had bleeding disorder dx had an initial presentation of bruising that was concerning for child physical abuse
  - 75.9 % of those 29 kids were <5 years of age
  - 44.8% had von Willebrand disease (vWD)
  - 51.8% had hemophilia
  - 48.3% had a family history of a named bleeding disorder

- Children with bleeding disorders may present with bruising/bleeding that is clinically highly suggestive of child physical abuse
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
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

*Abnormal test results or further testing desired - consult a pediatric hematologist
Bruising in children: Practice patterns of pediatric hematologists and child abuse pediatricians (CAP)


- 369 total subjects, 275 CAP, 94 Pediatric Hematology
- 304 with bruising concerning for abuse – CAP saw 242 and 62 went to Heme
  - 12.4% in CAP got head CTs, 0 in Heme
  - 31% in CAP got skeletal surveys, 0 in Heme
  - 157 seen by CAP dx with abuse, 0 in Heme dx with abuse
- 61 with bruising not concerning for abuse – Heme saw 28 and CAP saw 33
  - 75% in Heme had testing for bleeding disorders, 0 in CAP
  - 11 in Heme dx with bleeding disorder, 0 in CAP

In conclusion, Pediatric Hematologists and CAPs may perform different evaluations resulting in different diagnoses for similar clinical findings. Thus, where they are referred may play a big part in their final diagnosis
Case 1 Continued

2 month old term infant presents to the PCP’s office for her WCC. You are discussing the bruises that you saw on your exam with the mom when the pt starts to have a generalized tonic clonic seizure x 5 minutes that self resolves. Afterwards, she is sleepy but arousable with normal vital signs. Head is atraumatic and normal in size/shape.

Mom says that pt has been sleeping a little more since mom’s boyfriend watched pt earlier this AM while mom went to work. Otherwise has been acting normal. Has not eaten since mom returned home about an hour ago.

What is your differential?

What is work up needs to be done?
CHILD ABUSE PART 2: NEUROLOGIC TRAUMA
Abusive Head Trauma

- Main cause of death from abuse
- Direct blow +/- or shaking
- Subdural, subarachnoid, or intraparenchymal injury
- Evaluate for retinal hemorrhages
The most common trigger for abusive head injury – but let’s not call it the cause
Presentation of Inflicted Traumatic Brain Injury (TBI)

• Spectrum of severity
• May be missed due to nonspecific symptoms:
  – Vomiting
  – Irritability
  – Sleepiness → Coma
  – Seizure
  – ALTE → Apnea → Cardiac Arrest
Who Needs A Head CT or MRI?


- All patients with neurological symptoms and with concerns of child physical abuse
- If neurologically asymptomatic:
  - Rib fractures
  - Multiple fractures
  - Facial injury
  - All children < 6 months of age with suspicious injury

* 30% of these children will have occult injury on imaging
Subdural

Subarachnoid

Intraparenchymal
Retinal Hemorrhage

- Caused from repetitive acceleration-deceleration forces due to shaking, causing shearing of the vessels in the eye
Sequelae of TBI

- Cognitive impairment
- Cerebral palsy – loss/impairment of motor function
- Feeding problems
- Blindness
- Deafness
Case 1 Continued

2 month old term infant in your office for WCC. She had a bruising to the back and a seizure.

Do you need to do any further work up?
CHILD ABUSE PART 3: ABDOMINAL TRAUMA
Abdominal Trauma

- 2nd most common cause of death in abuse
- Usually blunt trauma
- May have delayed presentation
Blunt injury to abdomen
Who Needs Screening for Occult Abdominal Injury?

- <5 years old
- Suspected victim of physical abuse

- Screening test – AST and ALT
  - If AST or ALT >80 → obtain abdominal CT

* 3.2% of these children will have occult abdominal injuries
CHILD ABUSE PART 4: SKELETAL TRAUMA
Who Needs a Skeletal Survey?

• All children <2 years of age with concerns of physical abuse
  – Regardless of presentation (bruises, burns, TBI, or abdominal trauma)
• Patients 2-5 years of age should be handled on individual basis based on specific clinical indicators of abuse

*Skeletal survey or bone scan has little value in children >5 years
Skeletal Survey – Not a Babygram

- Skull – frontal and lateral
- Spine – frontal and lateral
- Chest – frontal
- Pelvis
- Extermities
  - Upper frontal
  - Lower frontal
  - Hands
  - Feet
  - Wrists
  - Knees
  - Ankles
Spiral Fracture

• Spiral fractures are associated with twisting mechanism
Rib Fractures

• 90% of rib fractures in children <2 yo are due to abuse
• Often posterior, acutely hard to identify
• Usually unsuspected
• Rarely accidental due to compliance of thoracic rib cage
Rib Fractures
Skull Fracture
Skull Fracture

• Common fracture in abuse
• Can occur from accidental fall
• Complex fractures or neurologic findings are rarely compatible with a short fall
Classic Metaphyseal Lesion (CML)

- AKA – corner fracture or bucket handle fracture
- Fracture through the zone of provisional calcification of the physis
- Highly specific for child abuse
- Usually from a hard pull or twist
Dating Fractures

• Most pertinent for rib and long bone fractures
• May see different stages of healing
  – Callus development and calcification
• Not accurate for skull fractures
• Follow up skeletal survey may be useful
Skeletal Injury
Differential Diagnosis

- Accidental injury – toddler’s fracture
- Rickets
- Osteogenesis imperfecta
Case 2

9 mo female presents to the PCP for bilat feet burns. Parents report that they were getting the bath ready and turned their back for a few seconds and then found pt had stepped into the bathtub and gotten burned. On exam, bilat feet with 2\textsuperscript{nd} burns to both feet but sparing the soles and there is a sharp demarcation where the burn starts at ankle level. Pt moves her feet and pulses are 2+ distally.

What is your differential?
What should you do?
Abusive Burns

- Scalding hot water immersion, most commonly reported mechanism
- Abusive burns more severe and complicated
- Typically < 6 yrs, on average 2 to 4 yrs
- Youngest child in sibship at greatest risk
- Abusive burn victims more likely to have signs abuse/neglect and/or CPS reports
- 14 – 19% children with suspicious burns have + skeletal survey
Clues to Abusive Burns

- Prior accidental burns
- History does not match burn pattern
- Burn history not consistent with child’s development
- Delay in seeking care
- Certain patterns
- Burns localized to genitalia, perineum, buttocks, bilateral lower extremities, hands
- Presence of additional or older injuries
Examination of the Child with Burns

- Head to toe evaluation
- Photographs of the injury with multiple different views and positions
- Work up for other injuries – skeletal survey for children < 2 yrs
- * Scene investigation from law enforcement and CPS
Patterns of Abusive Burns

- Scald
  - Uniformity of burn depth – restrained
  - Bilateral symmetry without splash marks - immersion
- Dry contact
  - Silhouette of object (ie iron)
- Cigarette or cigar
  - Circular pattern
Abusive Immersion Burns

- Spare flexor creases – restrained or withdraw reflex
- Spare soles of feet or point of contact with cooler surface
- Linear or clear demarcation between burned and unburned (glove and stocking)
- Uniformity of burn depth
- Absence of splash
- Hands, feet, genitalia, buttocks
Accidental Scald Burn

• Splash marks
• Hot water splash >140F results in burn
• Burn less intense as liquid runs down and dissipates heat
• Flexor creases spared due to withdraw reflex
• Distribution and margins are asymmetric
• Pattern influenced by clothing and type liquid
Duration of Exposure Required to Produce Full-thickness Burns

<table>
<thead>
<tr>
<th>Water temperature</th>
<th>Duration of Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>120°F</td>
<td>10 minutes</td>
</tr>
<tr>
<td>130°F</td>
<td>10 seconds</td>
</tr>
<tr>
<td>140°F</td>
<td>1 second</td>
</tr>
<tr>
<td>150°F</td>
<td>0.5 seconds</td>
</tr>
</tbody>
</table>
Child versus Adult Skin

- Children's skin thinner (>5 yr approximate adult thickness)
- Inverse relationship thickness, temperature and time necessary to induce burning
- >130° F (54° C) children burn in a quarter of the time it takes adult skin to burn
Accidental Contact Burns

Indistinct margins

Do not occur in multiples

Usually on parts of body not clothed (hands, feet, face)
Mimics

- Toxic Epidermal Necrolysis
- Stevens Johnson Syndrome
- Staphylococcal Scalded Skin Syndrome
- Blistering distal dactylyitis

- Epidermolysis bullosa
- Bullous impetigo
- Focal pyoderma
- VZV scaring
- Ammoniacal diaper dermatitis
- Cultural practices
  - Cupping, coining, etc.
Burn Prevention

- Smoke alarms
- Water heaters set to 120 degrees F
- Assistance with utility bills
  - Prevents the dangerous use of using the stove or oven for heating water for bathing or laundry
- Proper use of space heaters
- Flame resistant sleepwear
- Proper handling, supervision of clothing and curling irons
- Appropriate supervision of children in the kitchen, bathroom
The child disclosed physical abuse/you found injuries consistent with child physical abuse, NOW WHAT?
Informing the Parents

- State only what you know for sure
- Delineate the injuries
- Explain the care and prognosis
- Stress mutual concern for the child
- “This is not accidental” or “With injuries like these…”
Informing the Parents

- Explain social services involvement
- Coordinate explaining CPS/LE involvement
  - “With injuries like these/situations like this, we are required by law to inform the state child protection/law enforcement”
  - Explain community agency involvement
Documentation

BE METICULOUS!!!

• Include conversations
• Include quotations in the history
• Diagram soft tissue injuries
• Photo documentation
Disposition

• Safety plan must be in place
  – If you don’t feel comfortable with the plan or there is not a safety plan (i.e. in Kansas on the weekend), you may have to take protective custody of the child or admit the child
  – Maybe ok to dc home with parents vs. other family members vs. foster parents

• +/- Law enforcement involvement

• +/- Follow up in the SCAN Clinic

• +/- Forensic Interview
Disposition

• Decision to admit:
  – Treat/monitor physical injuries
  – Provide safe environment
Mandatory Reporters

• Mandatory reporters - those professionals who are responsible for the care and protection of children
  – Doctors, nurses, PAs, police, teachers, counselors, social workers

• Overall, remember if you are concerned about any type of abuse or neglect of a child, you are a Mandatory Reporter
Doctors Did Not Report Abuse, Hit For $2M

Statute: Physicians Must Relay Suspicions To DFS

BY STEPHANIE S. MANISCALCO
maniscalco@mo.lawyers-weekly.com

A $2 million verdict against two doctors who did not report signs of abuse suffered by a baby girl could be a harbinger of many similar judgments against health care professionals, experts say.

State law requires doctors, nurses, day-care workers and others to report suspicions of child abuse to the Division of Family Services.

But the attorney for little Samantha Thomas, who suffers from permanent brain damage after multiple skull fractures, said lawyers could be doing more to protect vulnerable members of society.

"The statute does a pretty good job of creating the reporting obligation, but it is not being enforced by the plaintiffs' bar, the prosecutors or the Division of Family Services," Stuart H. King of Springfield said.

"The message here is that those who provide care to children have potential..."
Investigative and Justice Systems

- Child Protective Services
- Law Enforcement
- Legal System
  - Juvenile/Family Court
  - Criminal Court
Role Definition

- Our role is addressing the child’s health needs
- Perform and document the evaluation in a forensically sound fashion

Medical Role is Not:
- Bad guy detection
- Child custody/placement decision
- Crime investigation
- Enforcement of criminal wrongdoing
Taking Care of Yourself

• Child abuse work can prompt intense emotional response
• Most children will return to their families of origin
• Vicarious trauma is a particular risk for health care workers in these cases
• Nurture your own and your coworkers’ resilience

Be good to each other
Child Protector App

- Developed by the Child Abuse Pediatricians at Children’s Mercy Hospital and Texas Health Science Center
- Free app to help with the diagnosis and work up of child abuse
QUESTIONS