Financial Disclosure

• There is no conflict of interest or relevant financial interest by the faculty or planners of this activity.
Goals

• Upon completion of this educational activity, you will be able to:
  – Identify warning signs of non-accidental trauma including:
    • Patterns/types of child physical abuse
    • Common presentations for children with inflicted injury
  – Understand the importance of obtaining a detailed, accurate history
  – Understand the application of photography in child abuse investigation/prosecution
  – Sexual Assault Exam-brief overview

Child Abuse in Kentucky

• Over 80,000 reports of abuse/neglect (up 13.4% from 2013)
• Over 25,119 cases of substantiated abuse in 2017, and 22,410 child victims (up 27.4% from 2013)
  – Medical neglect 487, neglect 21,313, physical abuse 1,533, sexual abuse 852, psychological maltreatment 44
• Kentucky victims rate of 22.2/1000 children is the highest in the nation and double the national rate (national average 9.1)
• 53.4% of victims had drug abuse caregiver risk factor
• Vulnerable regions require appropriate levels of education and intervention to shift outcomes

"Child Maltreatment 2017" report released recently by the U.S. Department of Health & Human Services’ Children’s Bureau on Jan 28, 2019
Types of maltreatment

- Physical abuse
  - Bruises
  - Burns
  - Fractures
  - Abusive head trauma
- Neglect
  - Food
  - Environmental
- Sexual Abuse

Physical Abuse: Contusions (bruises)

- Earliest, most common, most easily recognizable sign of child maltreatment
- Can be caused by blunt force (rapid strike) or continually applied pressure (pinching, squeezing)
Contusions (bruises)

- **Contusion** - hemorrhage into tissue, usually from blunt force trauma
- **Ecchymosis** - the visible tracking of blood beneath the skin, can appear in areas remote from the actual trauma (from gravity effects)
- **Hematoma** - a collection of blood outside the blood vessels (not intermixed with other tissue)
- **Petechiae** - pinpoint hemorrhages into the skin
Contusions (bruises)
Hematoma

"He woke up this way"... 3 year old in care of mother’s boyfriend. Mom dropped off to grandfather for childcare the next morning with no explanation of his appearance/injuries.

Petechiae
More about bruises...

- Bruising is directly related to the developmental level of child
  “Those who don’t cruise, rarely bruise”
- Location, location, location………………
  93% of accidental bruises occur over bony prominences such as knees, shins, forehead
  Most are located on the front of the body
- Cannot be “dated” with any accuracy

N. Sugar et al, Arch Ped Adolesc Med, 1999

---

Bruises in Children

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Study design</th>
<th>Study setting</th>
<th>Study population</th>
<th>Outcome</th>
<th>Bruising prevalence</th>
<th>Bruising frequency</th>
<th>Bruising sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar N et al; 1999</td>
<td>cross-sectional</td>
<td>pediatric clinics</td>
<td>973 children &lt; 36 months of age</td>
<td>Bruise location, age, developmental stage</td>
<td>0.6% in children &lt; 6 mo; 1.7% in children &lt; 12 mo</td>
<td>Pre-cruisers: mean of 1.3 (range 1-2); Walkers: mean of 2.4 (range 1-11)</td>
<td>Common: Cruisers/Walkers: anterior tibia, knee, upper leg, forehead; Rare or not observed: hands, buttocks, face, trunk</td>
</tr>
<tr>
<td>Carpenter RF; 1998</td>
<td>cross-sectional</td>
<td>child health clinics</td>
<td>177 infants 6-12 months of age</td>
<td>Bruising prevalence and distribution</td>
<td>12%</td>
<td>mean of 1.4 (range 1-4)</td>
<td>Common: All bruises were located on the front of the body over bony prominences on the face, head, and shins</td>
</tr>
<tr>
<td>Labbe J et al; 2001</td>
<td>cross-sectional prospective</td>
<td>emergency department</td>
<td>1476 children 0-17 years of age</td>
<td>Prevalence, number, distribution, and type of skin injury</td>
<td>11.4% for 0-8 month old group</td>
<td>0-8 mo: mean of 1.3 lesions* (range 1-3); 9 mo+ yrs: mean of 3.9 lesions* (range 1-19)</td>
<td>Common: 0-8 mo: face and head; Mobile children: legs/extremities; Rare: total sample: &lt;2% had injuries to the thorax, abdomen, penis, buttocks, &lt;1% had injuries to the chin, ears, neck.</td>
</tr>
</tbody>
</table>
Mythbuster... 

Determination of Contusion Age Is Unreliable!!

Mythbuster... 

Determination of Contusion Age Is Unreliable!!
**Documentation 101**

- Important to document child’s development
- Important to document if child goes to daycare or around other kids (especially for bites).
- Try to write the history early – many times the story changes.

---

**Bruising**

- Patterned bruising
  - Bite
  - Loop
  - Parallel Linear bruising

Some photos courtesy of UK Kosair Charities Division of Pediatric Forensic Medicine
Bite marks

- Inflicted adult bite marks are very worrisome—typically indicate a more sadistic abuse
- Measurement (ABFO ruler) of diameter can be helpful, but determination of adult vs. child can still be difficult.
- Swabbing fresh bite marks can help identify perpetrator by DNA
- Photography of bite marks (and all inflicted injuries) is very important—include scale

Don’t forget the most common perps of bites: toddlers!

Loop Marks

- “Whipping” impact with a thin, flexible object that can conform to the contours of the body
- Diagnostic of inflicted injury - can’t get this pattern by bumping into (or falling onto) something rigid
- Most common objects are belts, electrical/phone cords, wire coat hangers and fly swatter handles
Loop Marks

- Parallel linear contusions
- Separated by areas of sparing
- Conforms to the contours of the face/body
- We do not see this pattern from impact with a rigid surface
- Usually on the left side of the face
Slap marks

Buttocks Bruising

Contusions

• TEN-4 Bruising Rule

  ANY bruising of the
  – TORSO
  – EARS
  or
  – NECK
  in a child 4 years of age or younger

  OR

  ANY bruising, ANYWHERE, on a child 4 months of age or younger

Contusions

• TEN-4 Bruising Rule

<table>
<thead>
<tr>
<th>TEN Body Regions</th>
<th>Abuse</th>
<th>Accident</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MVC</td>
<td>Non-MVC</td>
</tr>
<tr>
<td>Chest</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Abdomen</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Back</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Buttocks</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Genitourinary area</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Hip</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Ear</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Neck</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
<td>3</td>
</tr>
</tbody>
</table>

Torso

Abdominal Injuries

- Peak incidence in toddlers
- Small bowel, liver, pancreas most common
- Abdominal bruising common (may be subtle)
- Mechanism most likely direct blow (punch or kick) with compression against underlying structures/spinal column
- Trauma labs → CT
Some photos courtesy of UL Kosair Charities Division of Pediatric Forensic Medicine

**Torso**

![Torso diagram]

**Abdominal Injuries**

Amylase of 489 (normal 29-103), lipase 1184 (normal 11-82), AST 71 (normal 15-46), ALT 57 (normal 13-69) and sodium of 126 (normal 137-145). Her initial hemoglobin was 13.0, dropping to a low of 8.5. Transected pancreas......
Neck

• ANY bruising, ANYWHERE on a child 4 months of age or younger

TEN-4

• ANY bruising, ANYWHERE on a child 4 months of age or younger
FACES-p

- Frenulum
- Auricular Area
- Cheek (buccal)
- Eyelids (black eye)
- Scleral hemorrhage
- Patterned

AND remember: early photography is important!

Burns

- Genitalia
- Circumferential
- Pattern burn
- Classic immersion pattern

AND remember: early photography is important!

Just 6 hours later. . .
**Classic immersion pattern**

Immersion burns often result in typical patterns that give clues to mechanism of injury.

- **ACCIDENTAL**
  - Splash marks
  - Varying depth of burn
  - Indistinct borders
  - Burns in flexion creases

- **INFLICTED**
  - Uniform depth of burn
  - Very distinct borders
  - Buttocks, perineum, extremities
  - Characteristic spared areas (ex, flexion creases)
  - Few splash marks
**Burns: Splash/Flow burns**

- Irregular margins
- Nonuniform depth
- Fluid flows to dependent regions
- Accidental or abusive
- Accident: child usually looking up

**Fractures**

**Highly specific**
- Posterior rib fx
- Classic metaphyseal
- Scapula fracture
- Sternum fracture

**Relatively nonspecific**
- Clavicle
- **Long bone spiral**, buckle or lesion (CML) oblique
- Simple linear parietal skull fx

**Concerning**
- Any fracture in a child 12 months or younger
- Any unexplained fracture
- Anterior or lateral rib fx
**Posterior rib fractures**

- Posterior rib fractures are caused by violent squeezing of the chest
- Back is *unsupported*, so that ribs bend back over the sides of the backbone
- Posterior fractures are *not* a result of direct impact
- Highly specific for physical abuse

---

**Posterior rib fractures**

![X-ray image of posterior rib fractures](image)
**Metaphyseal fractures**

- Highly specific for abuse in otherwise healthy infants
- Very unusual in accidental injury, OI, birth
- Involves shearing force applied across a joint
- Implies twisting, yanking, flailing of extremity

**Multiple fractures**

2 month old with 26 fractures

13 month old found unresponsive
Abusive Head Trauma (Brief)

• Most lethal form of child abuse with 20-30% mortality rate and up to 90% of survivors with long term disabilities
• Global brain injury caused by rotational/angular forces
• Involves shaking, impact or both
• Subdural hematomas, +/- retinal hemorrhage
• Often triggered by crying, potty training (doesn’t just happen in babies...)
• It is not typically a one-time event.

AHT

– May just present with:
  • Vomiting
  • Irritability
  • Lethargy/difficult to arouse
  • Unusual sleepiness, sluggishness, or seeming “spaced out”
  • Seizures
  • Breathing difficulty/gasping respirations/apnea (stopped breathing)
  • Bradycardia (slow heart rate)/cardiac arrest/death
**AHT**

- OR-no outward sign of trauma...
  - If impact is involved, may see skull fracture, scalp bruise, or scalp swelling - but not necessarily.
  - Impact onto a soft surface can leave no evidence of impact.
  - When considering occult injury, never be falsely reassured by the absence of bruising.
  - It is astounding the severity of injury in children that can remain clinically occult.
  - Majority of fractures are not associated with overlying bruising-
    - Bruising associated with a fracture was found for 26% of abused and 25% of nonabused children. Most children (61%) had no bruises anywhere on the body.

---

**Suspecting maltreatment**

- You find what you look for, you look for what you know
- Keep it in the differential of ALL cases (injuries, failure to thrive, behavioral issues)
- Be aware of red flags
- We have a responsibility to the child to take advantage of our opportunity to gather a detailed, unguarded history
- Only by documenting in detail the “first version” can we identify a change in a subsequent version
- If the information is not documented, it may as well have not been obtained
The work-up

- Deliberate skin exams to identify cutaneous damage
  - Identify “atypical” cutaneous injuries (TEN-4 FACES)
- Recognize the top 5 high-risk medical chief complaints and top false case injury histories
  - Medical cc (vomiting, ALTE/BRUE, lethargy, fussy, seizure)
  - Trauma cc (x-treme home furniture games, fell out of bed/off couch, fell down/up stairs, bouncy swing attack, young sibling (typically of an age that can not talk)

What to do if you are concerned...

- Ask the right questions and understand why you’re asking
- Record the answers as soon as possible, as close to verbatim as possible.
- Documentation is most effective when done soon after the encounter
- Don’t forget the time lag before some court proceedings
- Document everything necessary for you to remember what happened in 2-5 years
- Good documentation explains omissions (tried to interview a collateral but phone was disconnected, they moved, etc.)
Asking the questions

- Benign curiosity
- Remember that the caregiver you’re speaking to may not know the true history
- Nothing is gained by being confrontational, accusatory or judgmental
- No harm is ever done by being kind to a perpetrator; irreparable harm by being accusatory of a non-offending caregiver
- 5Ws: Who, what, when, where, why (and how)
- Two scenarios: the “known” event and the “unknown” event

The Golden Hour

- The provided vs obtained history
  - Provided: chief compliant
  - Obtained: the questions you ask
    - Delineate what happened
    - How and when it occurred
    - How the child behaved afterward
    - What the child is developmentally capable of
    - Who was there
Importance of History

• Obtained history may come from someone other than caregiver (ie DCBS)
Importance of History

- Practice standard for work-up of possible abuse cases
  - Blood work (trauma labs) including coags and CPK if bruising is extensive;
  - SS (under 2 years of age and certain circumstances >2);
  - Head CT under 6 months of age with specific injury (sign of face/head trauma such as facial or ear bruising) or high risk signs or symptoms.
  - SOCIAL WORK assessment
- Standard for reporting
The work-up - physical abuse

Child with one or more of the following: neurologic signs or symptoms, apnea, complex skull fracture, other fractures, or injuries highly suspicious for child abuse. Initial imaging evaluation.

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray skeletal survey</td>
<td>9</td>
<td>Use this procedure in the emergent setting</td>
<td>4</td>
</tr>
<tr>
<td>CT head without IV contrast</td>
<td>9</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>MRI head without IV contrast</td>
<td>8</td>
<td>This procedure typically performed in the nonemergent setting</td>
<td>0</td>
</tr>
<tr>
<td>MRI cervical spine without IV contrast</td>
<td>8</td>
<td>Consider this procedure at the time of MRI brain imaging</td>
<td>0</td>
</tr>
<tr>
<td>MRI complete spine without IV contrast</td>
<td>5</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Tc-99m bone scan whole body</td>
<td>5</td>
<td>This procedure is used as a problems-solving study rather than first-line</td>
<td>4</td>
</tr>
<tr>
<td>MRI head without and with IV contrast</td>
<td>3</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>MRI cervical spine without and with IV contrast</td>
<td>2</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>MRI complete spine without and with IV contrast</td>
<td>2</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>CT head with IV contrast</td>
<td>1</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>CT head without and with IV contrast</td>
<td>1</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level
The work-up

The work-up
The work-up

GU bruising after reported almost drop. Was behaving “appropriately”, head CT revealed bilateral SDH’s, also had RH’s.

• Head CT (looking for subdural bleeding, brain swelling)
• Skeletal survey and follow-up skeletal survey in 10-14 days (NOT a babygram!)
• Eye exam (to look for retinal hemorrhages or eye trauma)
• Trauma and bleeding labs to screen for signs of internal injury or bleeding disorder and abdominal CT if abnormal
• MRI of the brain and spinal cord if CT is abnormal (MRI can demonstrate subtle brain injury that CT can miss) or old injury
The work-up

• Babygram vs. Skeletal

- Side-by-side comparison of babygram to single image of complete skeletal survey

The work-up

• Forensic vs. Clinical Significance
  - Most of us have been taught to identify clinically significant injuries
    - Those for which we can affect the medical outcome by providing some sort of treatment or monitoring.
  - In child maltreatment, it is equally as important to identify injuries with forensic significance (ALT>80)—even if not considered “clinically significant”
Forensically Important

- Diagnosed with Flu
- ALT 347
• Briefly

• A medical exam cannot always reveal whether penetration occurred
  – Hymenal tissue is elastic
  – Injuries can heal rapidly
  – Many exams of child whose abusers have confessed to penetration are normal
### Exam Technique

• Visualization of the hymen can be accomplished by:
  – Labial traction
  – Labial separation
  – Prone knee-chest
  – Lateral decubitus
  – Use of swab


### Sexual Abuse

• An internal vaginal examination is contra-indicated in the pre-pubertal patient unless internal bleeding/trauma is present. An internal vaginal examination of a pre-pubertal patient usually requires deep sedation or general anesthesia
Hymenology 101


Hymenology 102

Swab technique

Injuries

Sexual Abuse/Exploitation

- Physical examination is usually normal.
- HIV, gonorrhea and chlamydia are most specific without clear history of vertical transmission. HPV is nonspecific but important to investigate and perform other STI testing.
- The most important piece of evidence in the majority of sexual abuse investigations is the child’s disclosure.
- A forensic interview can be very helpful.

Sexual Abuse Pathway

Symptomatic:
- Dysuria
- Vaginal or rectal pain
- Vaginal or rectal bleeding
- Vaginal or urethral discharge

Acute (event occurred < 96 hours ago)
- yes
  - Proceed with History (See the following sheet for history-taking recommendations)
- no
  - Consult UK Pediatrics Forensics Team to discuss patient management

if no social worker available, be sure to leave pertinent patient information for the ED social worker so that the UK Pediatrics Forensics Team may be contacted the following day

- yes
  - Obtain history from parent or caregiver (without the child present)
  - Obtain non-leading history from child regarding child’s symptoms if sufficient history cannot be obtained from the caregiver
  - Proceed with medical exam guided by history and symptoms
- no

HealthCare
Sexual Abuse Pathway

Child History Taking Recommendations

**Goal is to obtain information that will guide the medical exam and to ensure patient’s safety**

- **Reminder:** If **not acute** consider deferring history taking. History should be focused on medical issues or to explain physical findings/mechanism of injury.
- First: speak to Parents/caregivers **not** in the presence of the child.
- If insufficient information is obtained from parents/caregivers: take history from patient: should ideally be obtained without the parent or caregiver present.
- History should take into consideration child’s level of development.
- Verbatim questions and answers should be documented.
- Record all spontaneous statements.
- Attempt to ask guided open-ended and non-leading questions, for example:
  - Do you know why you are here?
  - Has anything happened to you that you didn't like?
  - Has anything happened that made you feel uncomfortable?
  - Your mom said your “peepee” is hurting. Why do you think it is hurting?

All cases of suspected abuse MUST be reported Child Abuse Hotline 1-877-507-3333 and documentation that the call was made with the case referral number assigned at the time of the report must be documented in the patient’s chart. The ED social worker can make the report on behalf of the physician.

Sexual Abuse Pathway

- **Pt is symptomatic (dysuria, pain, swelling or discharge):**
  - **No**
  - **Yes**
    - **Acute Incident**
      - **Yes**
        - 1) Event occurred within 72 hours and included vaginal or anal penetration
        - 2) Event occurred within 24 hours and included one to genital contact, genital to oral contact.
        - 3) Unclear history: B/E? there is reason to believe that there was contact with the APF’s genital, vaginal, oral, or anal.
        - 4) History indicates there was a struggle that may have left some of APF’s blood or semen on the victim’s clothes or bedding.
      - **No**
        - Proceed with Medical Exam

- **If on physical exam there is anogenital bleeding that is not consistent with accidental trauma and has been within 72 hours:**
  - **Yes**
    - Contact Law Enforcement and perform evidence collection
  - **No**

**SPECULUM EXAM, DIGITAL EXAM AND ABDOMINAL EXAMS ARE NOT INDICATED**

(3) Concern for a vaginal or anal tear or laceration or (j) the volume of vaginal or rectal bleeding is unknown or (k) presence of a foreign body is suspected. If these concerning findings are noted, proceed with a complete medical exam (including consultation of a pediatrics or gynecologist) and most likely with sedation.

See following sheet re: ESI testing following physical exam
Sexual Abuse

- Treatment and tests (briefly)
  - Hospital/clinic personnel must discuss and offer options for post-coital emergency contraception with the female adolescent patient when indicated
    - When used within 72 hours, the risk of pregnancy after a single act of unprotected intercourse is reduced from 8% to 1%.
  - When indicated, hospital/clinic personnel must discuss and offer prophylactic treatment for sexually transmitted infections including gonorrhea, Chlamydia, trichomonas, syphilis, HIV and hepatitis.
    - For latest treatment updates, refer to www.cdc.gov
    - Prophylactic treatment for gonorrhea, Chlamydia and trichomonas is usually not indicated for the pre-pubertal child but the treating physician / health care provider should consider obtaining cultures and tests for sexually transmitted infections.
    - HIV PEP is most effective if given as soon as possible after the sexual assault and is not effective if given after 72 hours

Clinical photography-a few words

- document more visual evidence than thousands of words could
- preserve visual evidence better than diagrams or our memories...especially for court
- of victims capture far more detail than injury diagrams
- tell a story in way that drawings and words cannot
- EARLY PHOTOGRAPHS OF INJURIES ARE CRUCIAL FOR INJURY ASSESSMENT.
Clinical photography-a few words

• Pictures tell a story:
• 2 year old boy brought to ED by grandfather with diffuse head and facial bruising and swelling.

Clinical photography

photos courtesy of UL Kosair Charities Division of Pediatric Forensic Medicine
**Terminology**

- **Near Fatality:**
  - “Near fatality” is a term used in child protective services. It is NOT a medical term and it triggers a different type of investigation.
  - Child Abuse Prevention & Treatment Act Section 106.B.4 defines near fatality as “an act that, as certified by a physician, places the child in serious or critical condition”.
  - Questions asked
    - Is abuse or neglect by a caregiver suspected (must be answered yes to be considered for a near fatality investigation).
    - Is the child or has the child been in serious or critical condition as a result of suspected abuse or neglect (if answered yes, the case is automatically a near fatality)
      - Have live saving measures be performed (Narcan, CPR, intubated, etc)

**The HOW**

- State Child Protection Hot Line number: 1-877-KYSAFE1
- Email: https://prd.chfs.ky.gov/ReportAbuse

[Map of DCBS Service Regions]
**Few more things...**

- Certain things may be forensically important that are not necessarily clinically important.
- We do not want clean urine if possible (unnecessary trauma and we are screening for blood).
- We will order MRI instead of CT if injury known to occur several days prior.
- For Sexual Assault exams—if have abnormal finding, need to document in 2 positions.
- If <72-96 hours, consider kit
- Make sure follow-up: for SA needs referral from CPS or CACU for CAC consult.
- Please send home with HIV prophylaxis if feel that treatment is necessary.
- Don’t forget the mimics of child abuse—there are many!
- **Always feel free to call us!**

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**The HOW**

- University of Kentucky Pediatric Forensic Medicine: (859)218-6727 or (859) 257-5522 and ask for clinician on call. For other questions, email at ukpedfor@uky.edu
- University of Louisville Kosair Charities Pediatric Forensic Medicine: (502) 629-3099 or (502)629-6000 and ask for clinician on call.
PFM team

- We help interpret the medical findings in child maltreatment investigations
- Anyone can call us and ask for guidance
- We also do formal consults for medical providers, CPS, police

PFM Team

- 1 Fellow trained and Board Certified Child Abuse Pediatrician (Dr. Howard)
- 1 Board Certified Child Abuse Pediatrician (Dr. Sugarman) and medical director at the CAC.
- 1 part time pediatrician with special interest in Child Abuse Pediatrics (Dr. Pittenger)
- 2 Nurse Practitioners (Kara Scott, DNP, Kristin Meerkreebs, FNP)
### PFM Team

- Nursing team
- Three RN’s
  - Lauren Besednjak (Northern Bluegrass Region and nurse manager)
  - Carla Hay (Cumberland Region and outreach coordinator)
  - Stephanie Smith (Southern Bluegrass Region)
- Social Worker
  - Wallace Bellis, MSW

More to come...

---

### The END

- QUESTIONS?
References


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