# More than a bruise: approach to injuries concerning for abuse

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# Disclosures

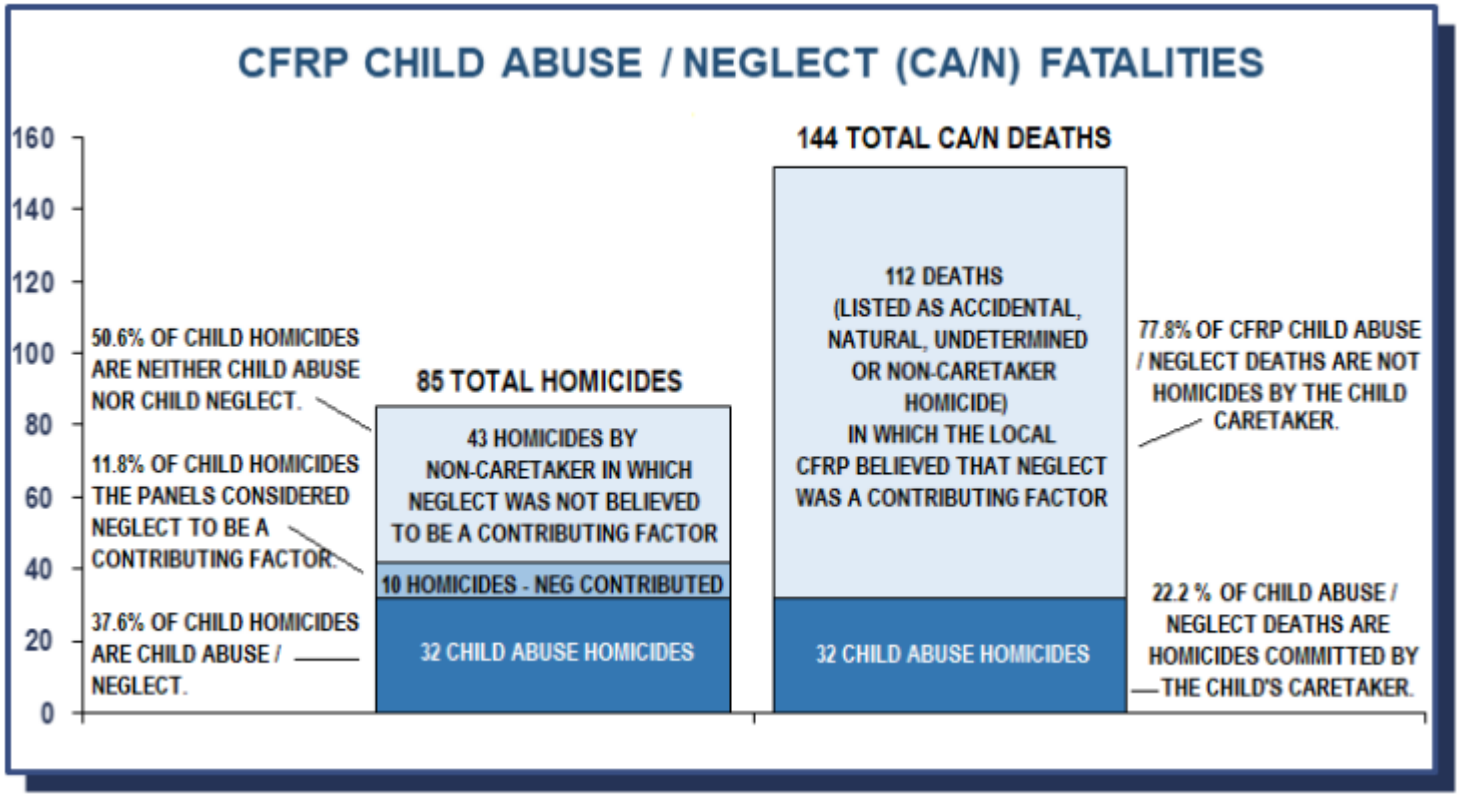
- The presenters have no relevant disclosures

# Objectives

- Identify sentinel injuries in children
- Differentiate between accidental and abusive injuries in children
- Utilize clinical decision making tools to improve assessment and response to injuries suspicious for abuse
- Develop an approach to intervene and respond to concerning childhood injuries

# Missouri CFRP 2020 Report

- 144 Missouri children were victims of fatal child abuse and neglect
- Of those, 42 were reported as homicide by death certificate
- 14 were infants under the age of one year

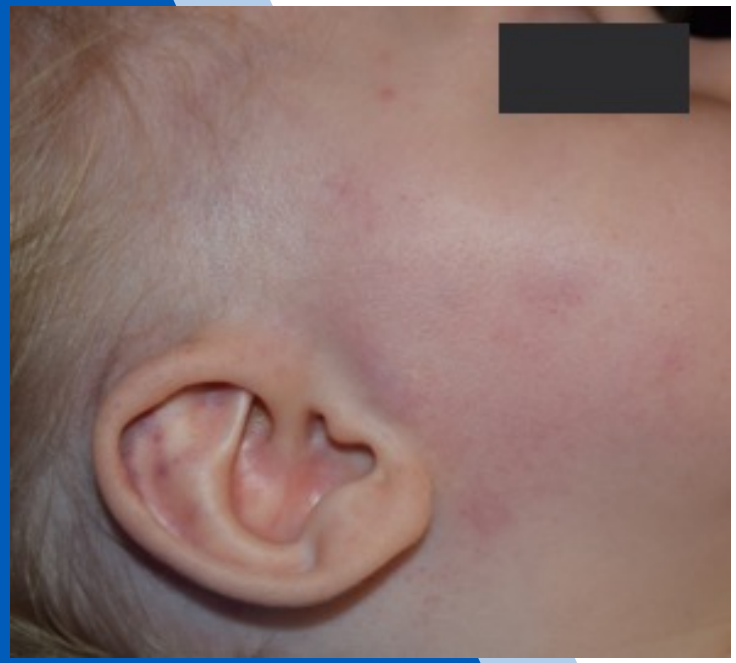



https://dss.mo.gov/re/pdf/cfrar/2020-child-fatality-review-program-annual-report.pdf

# Knowledge Gap

- Minor injuries such as bruises are common in childhood from accidents
- Certain minor injuries may be the first physical sign of abuse and if not recognized, children can suffer further and serious harm
- Physicians and other medical providers should be aware of injury features that raise concern for abuse

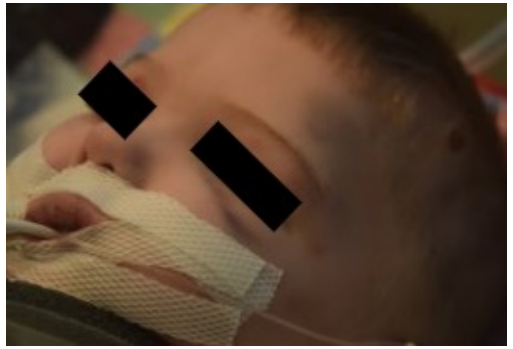
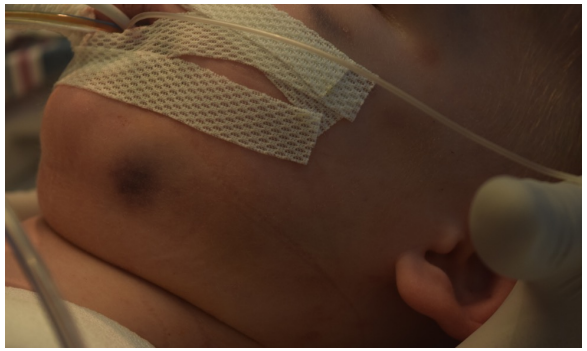
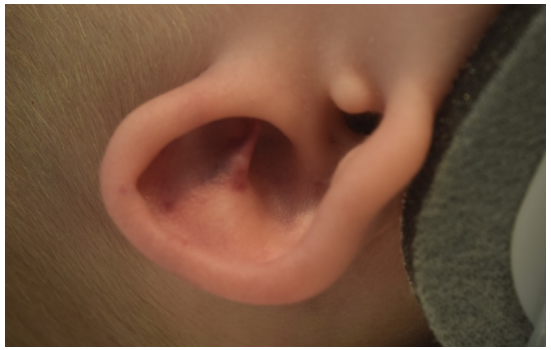
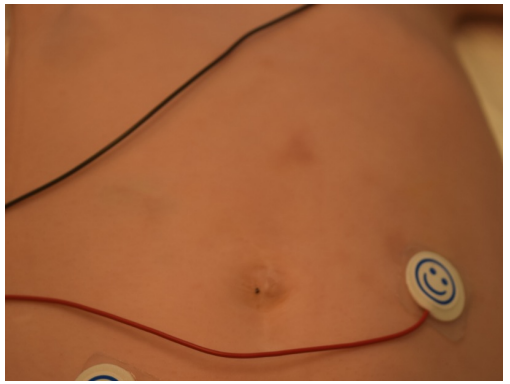
# Case Example 1



- 2.5 yo with facial “swelling”
  - Bruising to both sides of face
  - Inquired about abuse, caregiver denied concerns
  - No reports were made to CPS

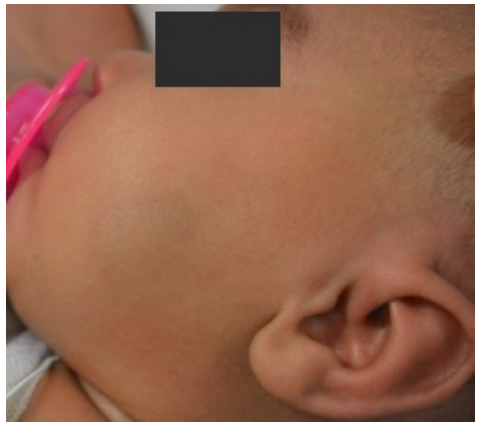
# Case Example 1… Two months later

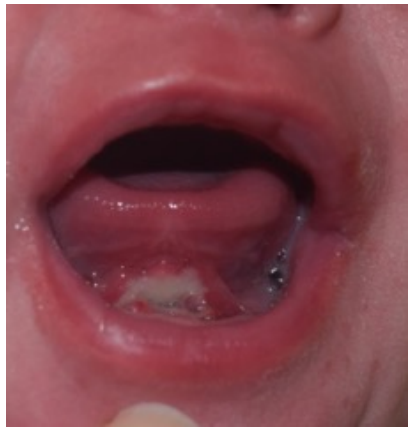
- Cardiac arrest at home
- Severe brain edema, SDH, acute mandible fracture, healing rib fracture, liver and pancreas contusions
- Investigation by CPS/LE – confession of abuse

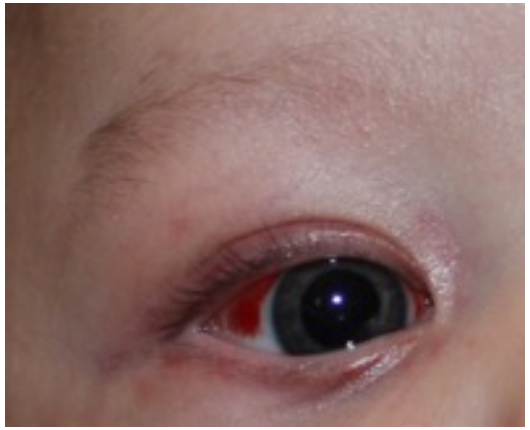





# Sentinel injuries

- Minor, but suspicious injury that precedes more severe abuse; may be the first or only physical indicators of abuse
  - Bruising, oral injury, subconjunctival hemorrhage
  - Opportunity for intervention and prevention of more severe abuse







# Sentinel Injuries in Infants Evaluated for Child Physical Abuse

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**KEY WORDS**
abuse, bruising, infants, maltreatment, screening, abusive head trauma

**WHAT'S KNOWN ON THIS SUBJECT:** Although it is known that relatively minor abusive injuries sometimes precede more severe physical abuse, the prevalence of these previous injuries in infants evaluated for abuse was not known.

**WHAT THIS STUDY ADDS:** A history of bruising or oral injury in a precruising infant evaluated for abuse should heighten the level of suspicion because these injuries are common in abused infants and rare in infants found not to be abused.

- 27.5% of 200 definitely abused infants had a prior sentinel injury
  - Sentinel injuries included bruising (80%), intraoral injury (11%), and other injury (7%)
- 8% of 100 infants with intermediate concern for abuse had a prior sentinel injury
- 0 of 101 nonabused infants had a previous sentinel injury

- **Medical providers were aware of the sentinel injury in 41.9% of cases**

# Sentinel injuries

A sentinel injury should prompt medical professionals to consider the possibility of physical abuse

# Missed Opportunities to Diagnose Child Physical Abuse

*Elizabeth L. Thorpe, MD,* Noel S. Zuckerbraun, MD, MPH,* Jennifer E. Wolford, DO, MPH,† and Rachel P. Berger, MD, MPH†*

Pediatric Emergency Care. 2014

- 77 children with healing abusive fractures
- 25 (32.5%) subjects had at least 1 prior medical visit where they had signs of trauma (bruising or swelling) and abuse was not recognized

Child Abuse & Neglect 60 (2016) 36–45

Contents lists available at ScienceDirect

Child Abuse & Neglect

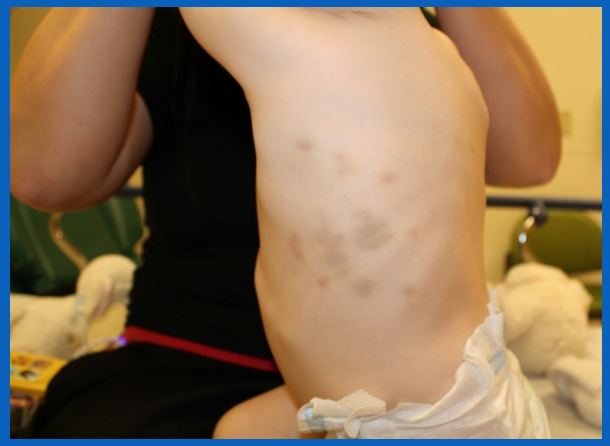
Practice Implications

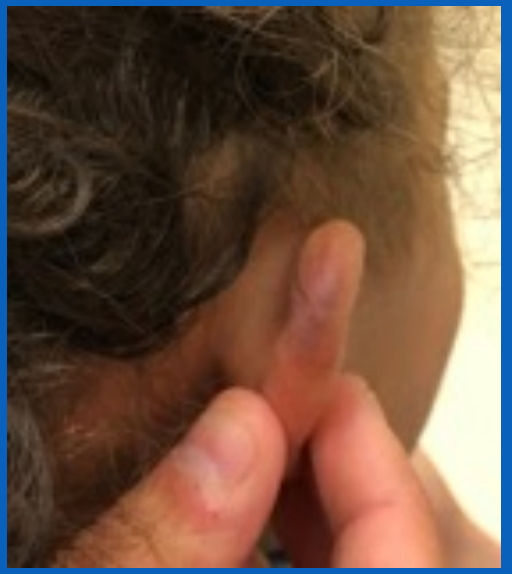
# Prior opportunities to identify abuse in children with abusive head trauma

Megan M. Letson (MD, MEd)[a,b,*], Jennifer N. Cooper (PhD)[a], Katherine J. Deans (MD)[a,b], Philip V. Scribano (DO, MSCE)[c,d], Kathi L. Makoroff (MD, MEd)[e,f], Kenneth W. Feldman (MD)[g,h], Rachel P. Berger (MD, MPH)[i,j]

- 232 children with AHT
- 31% of subjects had a total of 120 prior evaluations by either a medical or CPS professional where findings were concerning for abuse
  - 25% occurred in the medical setting; 6% through CPS involvement
  - Most common medical situations included vomiting or bruising concerns
  - 27% of the prior opportunities occurred within one week prior to diagnosis of AHT

# Bruises: What's concerning?





April 1999

# Bruises in Infants and Toddlers

## Those Who Don't Cruise Rarely Bruise

Naomi F. Sugar, MD; James A. Taylor, MD; Kenneth W. Feldman, MD; et al

- Only 0.6% of 366 children < 6 months had any bruises
- Bruises in infants and children who are not yet beginning to ambulate should lead to consideration of abuse

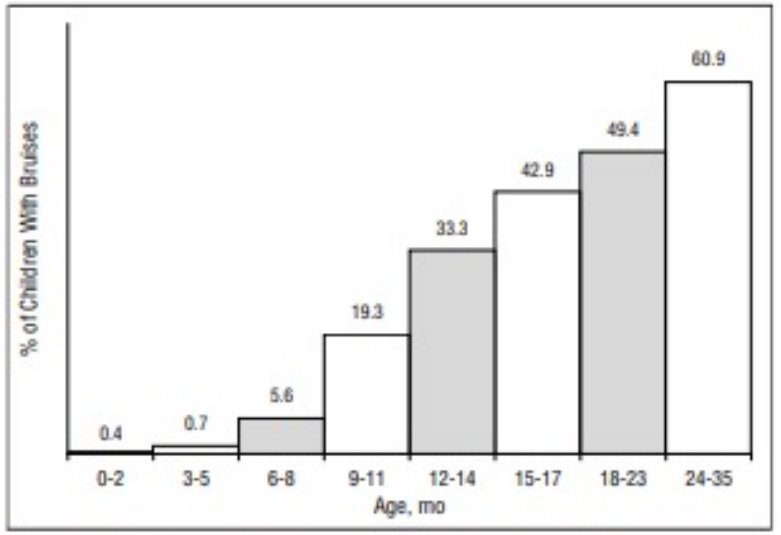



**Figure 1.** *Percentage of children with bruises by age (N = 930).*

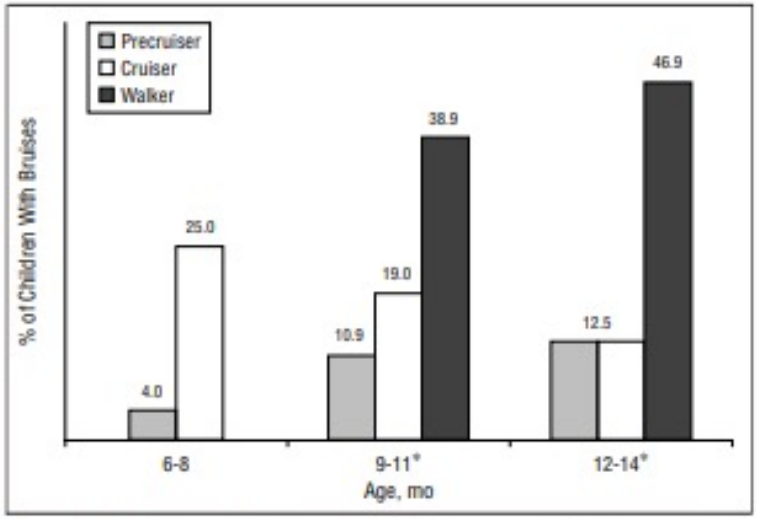



**Figure 2.** *Prevalence of children with bruises by age and developmental stage (N = 930). Precruiser indicates a child who is not walking; cruiser, one who walks with support; walker, one who walks independently; and the asterisk, P<.05.*

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# Patterns of bruising in preschool children—a longitudinal study

Alison M Kemp,[1] Frank Dunstan,[1] Diane Nuttall,[1] M Hamilton,[2] Peter Collins,[2] Sabine Maguire[1]

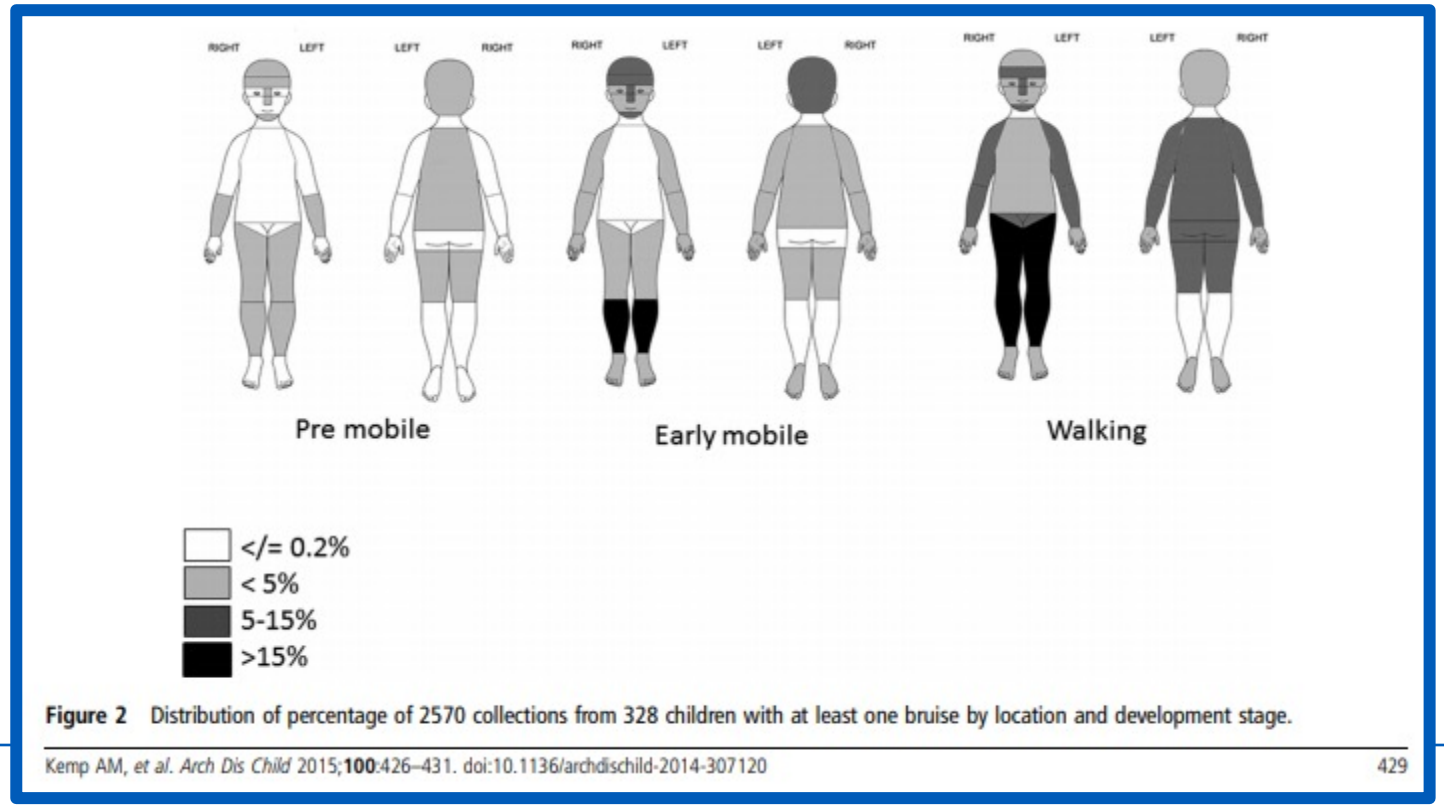



**Figure 2** Distribution of percentage of 2570 collections from 328 children with at least one bruise by location and development stage.

Kemp AM, *et al*. *Arch Dis Child* 2015;**100**:426–431. doi:10.1136/archdischild-2014-307120

# Are there patterns of bruising in childhood which are diagnostic or suggestive of abuse? A systematic review

S Maguire, M K Mann, J Sibert, A Kemp

- Bruising in non-independently mobile babies is very uncommon (<1%)
- Bruises in mobile children are small, over bony prominences and front of body
- Commonest sites for bruising in abuse: head/neck (esp face) > buttocks > trunk > arms. Some may be patterned

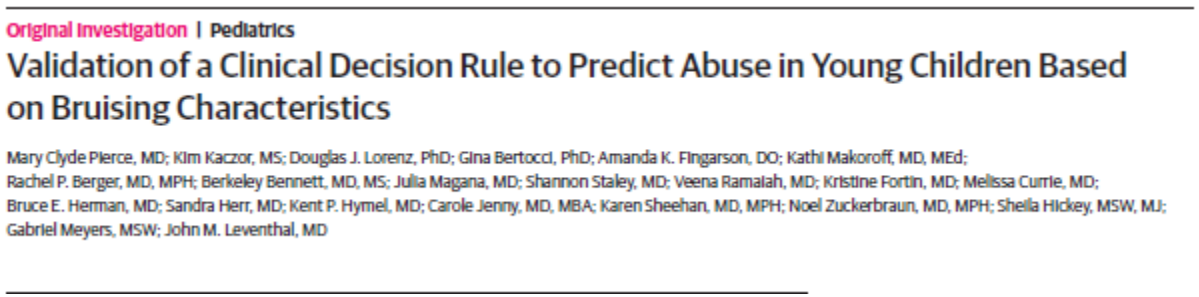
**Implications for practice**

A bruise must never be interpreted in isolation and must always be assessed in the context of medical and social history, developmental stage, explanation given, full clinical examination, and relevant investigations.

**Patterns of bruising that are suggestive of physical child abuse**

- Bruising in children who are not independently mobile
- Bruising in babies
- Bruises that are seen away from bony prominences
- Bruises to the face, back, abdomen, arms, buttocks, ears, and hands
- Multiple bruises in clusters
- Multiple bruises of uniform shape
- Bruises that carry the imprint of implement used or a ligature

# Bruising Clinical Decision Rule (BCDR)



Original Investigation | Pediatrics

Validation of a Clinical Decision Rule to Predict Abuse in Young Children Based on Bruising Characteristics

Mary Clyde Pierce, MD; Kim Kaczor, MS; Douglas J. Lorenz, PhD; Gina Bertocci, PhD; Amanda K. Fingarson, DO; Kathi Makoroff, MD, MEd; Rachel P. Berger, MD, MPH; Berkeley Bennett, MD, MS; Julia Magana, MD; Shannon Staley, MD; Veena Ramaiah, MD; Kristine Fortin, MD; Melissa Currie, MD; Bruce E. Herman, MD; Sandra Herr, MD; Kent P. Hymel, MD; Carole Jenny, MD, MBA; Karen Sheehan, MD, MPH; Noel Zuckerbraun, MD, MPH; Sheila Hickey, MSW, MJ; Gabriel Meyers, MSW; John M. Leventhal, MD

- Affirmative finding for any of the BCDR TEN-4-FACESp components in children younger than 4 years indicated potential risk for abuse and warrant further evaluation
- This tool can help improve the recognition of abuse in young children with bruising

# TEN-4-FACESp

Bruising Clinical Decision Rule for Children < 4 Years of Age

**When is bruising concerning for abuse in children < 4 years of age?**
If bruising in any of the three components (Regions, Infants, Patterns) is present without a reasonable explanation, strongly consider evaluating for child abuse and/or consulting with an expert in child abuse.

## REGIONS

**TEN**

**T**orso | **E**ars | **N**eck

**FACES**

**F**renulum
**A**ngle of Jaw
**C**heeks *(fleshy part)*
**E**yelids
**S**ubconjunctivae

## INFANTS

**4** months and younger

Any bruise, anywhere

## PATTERNS

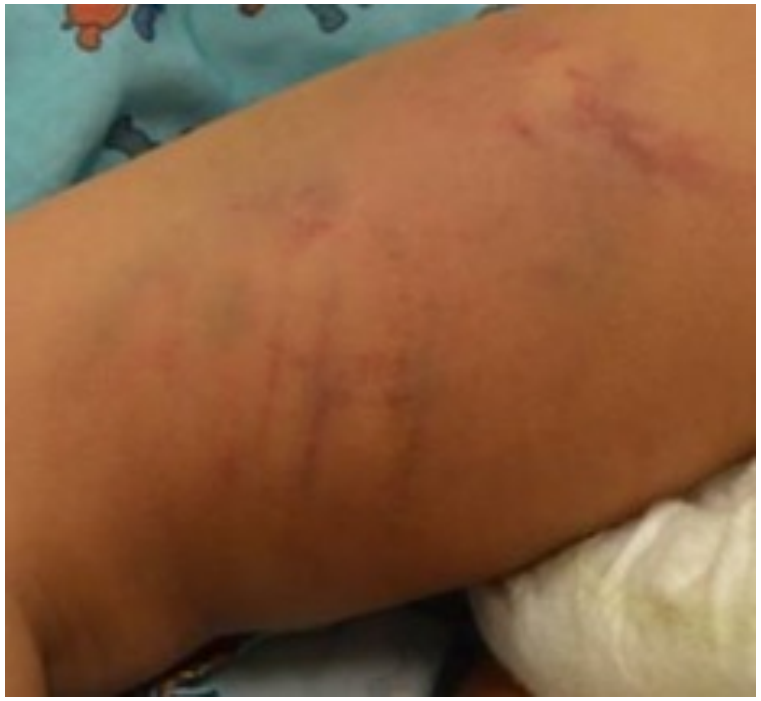
**P**atterned bruising

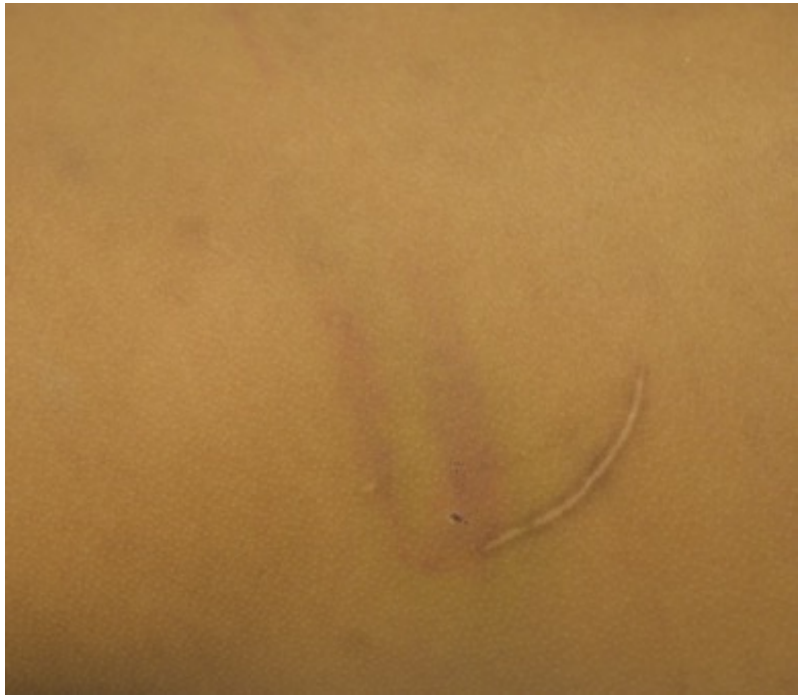
Bruises in specific patterns like slap, grab or loop marks

https://www.luriechildrens.org/en/research/research-areas/health-services-policy-research/teamwork-to-reduce-infant-child-and-adolescent-mortality/resources/ten-4-facesp/

Children's Mercy KANSAS CITY

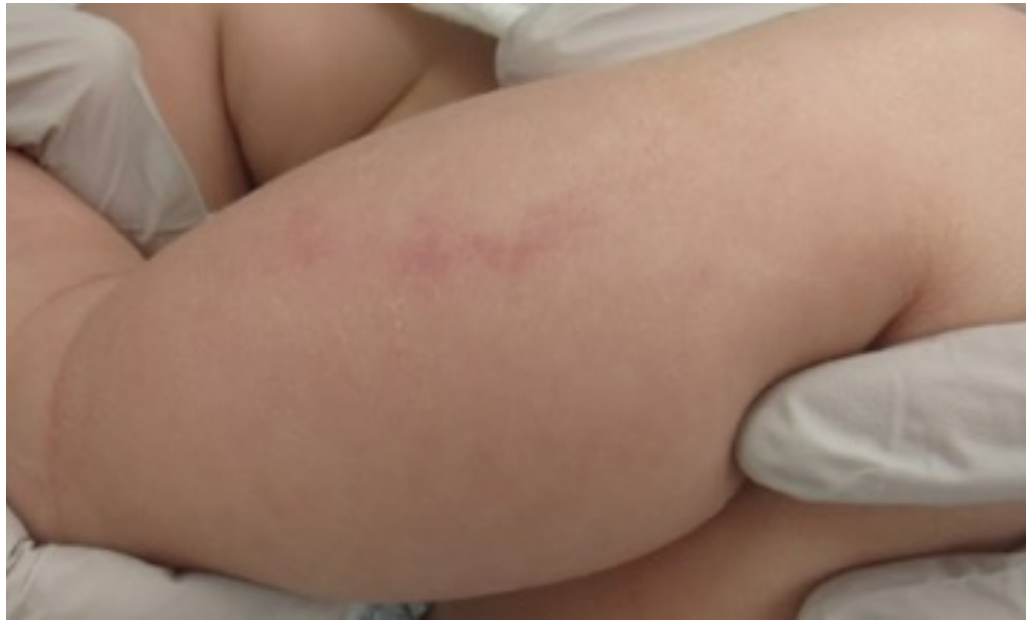
# Patterned Bruising

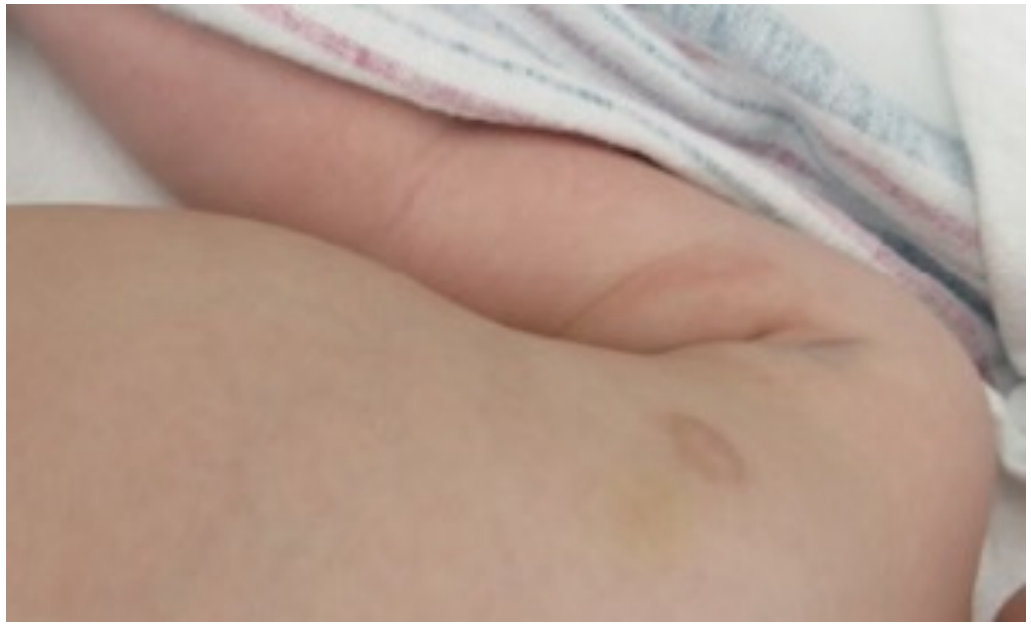


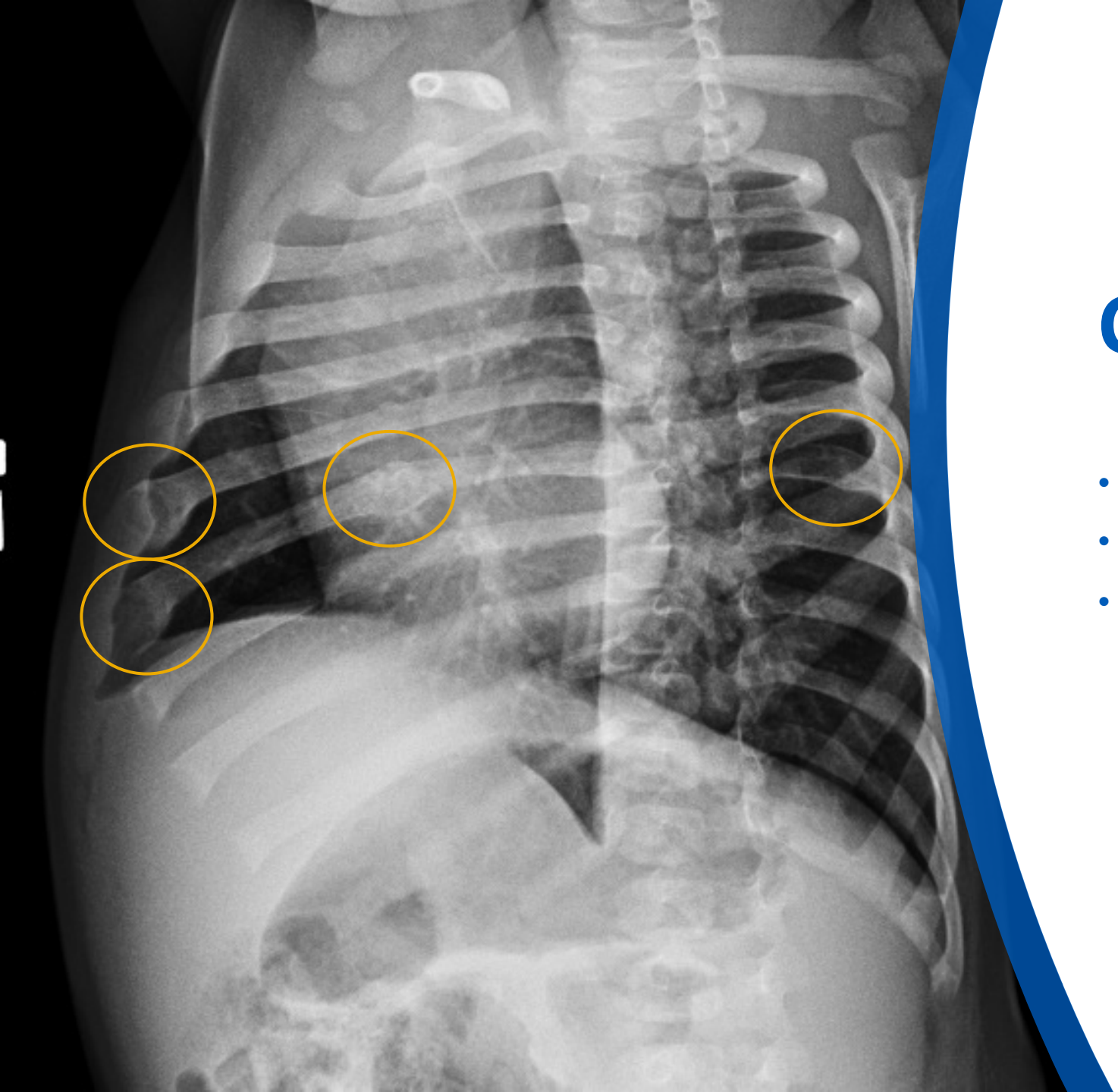


# Case Example 2

- 4 month old seen for WCC
- History for bruises
  - Chest: from dad's medical alert bracelet
  - Leg: think it got stuck in his crib slats







# Case Example 2

- Bruises are concerning
- Reported to CPS
- Referred to ED for occult injury screening

# Medical Evaluation

- Thorough history of injury
- Developmental assessment
- Medical history – bleeding disorders, bone disease etc
- Complete physical exam
- Determine need for further occult injury screening and/or testing for medical conditions

THE JOURNAL OF PEDIATRICS • www.jpeds.com ORIGINAL ARTICLES

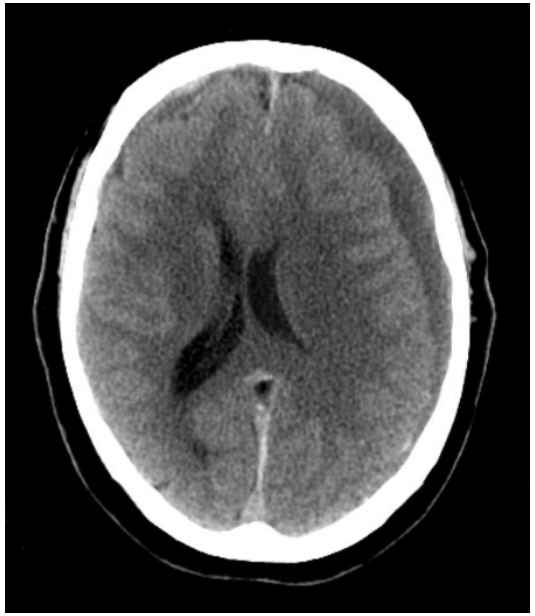
# Additional Injuries in Young Infants with Concern for Abuse and Apparently Isolated Bruises

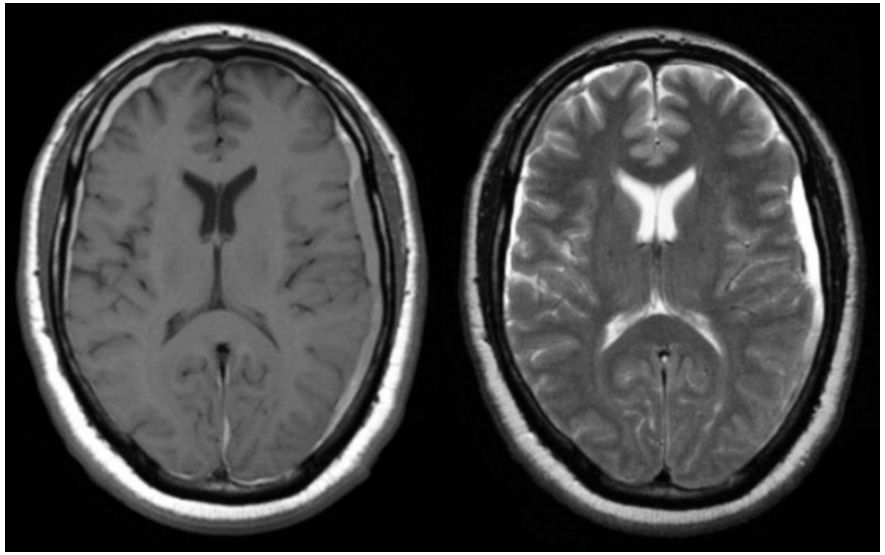
Nancy S. Harper, MD[1], Kenneth W. Feldman, MD[2], Naomi F. Sugar, MD[3,*], James D. Anderst, MD, MSCI[4], and Daniel M. Lindberg, MD[5,6], for the Examining Siblings To Recognize Abuse Investigators[†]

- 146 subjects < 6 months old; 50% had at least one additional serious injury identified upon screening
  - 23.3% had new injury identified by skeletal survey
  - 27.4% had new injury identified by neuroimaging
  - 2.7% had abdominal injury
- 70.5% had testing for bleeding disorders; no bleeding disorders found

# Occult injury screening in suspected victims of physical abuse

- Head CT or MRI
  - Neurologically asymptomatic children < 2 years of age with rib fractures, multiple fractures, facial injury
  - All children < 6 months of age
  - Why? Over 30% have occult head injuries on neuroradiology (Rubin et al. Pediatrics 2003)





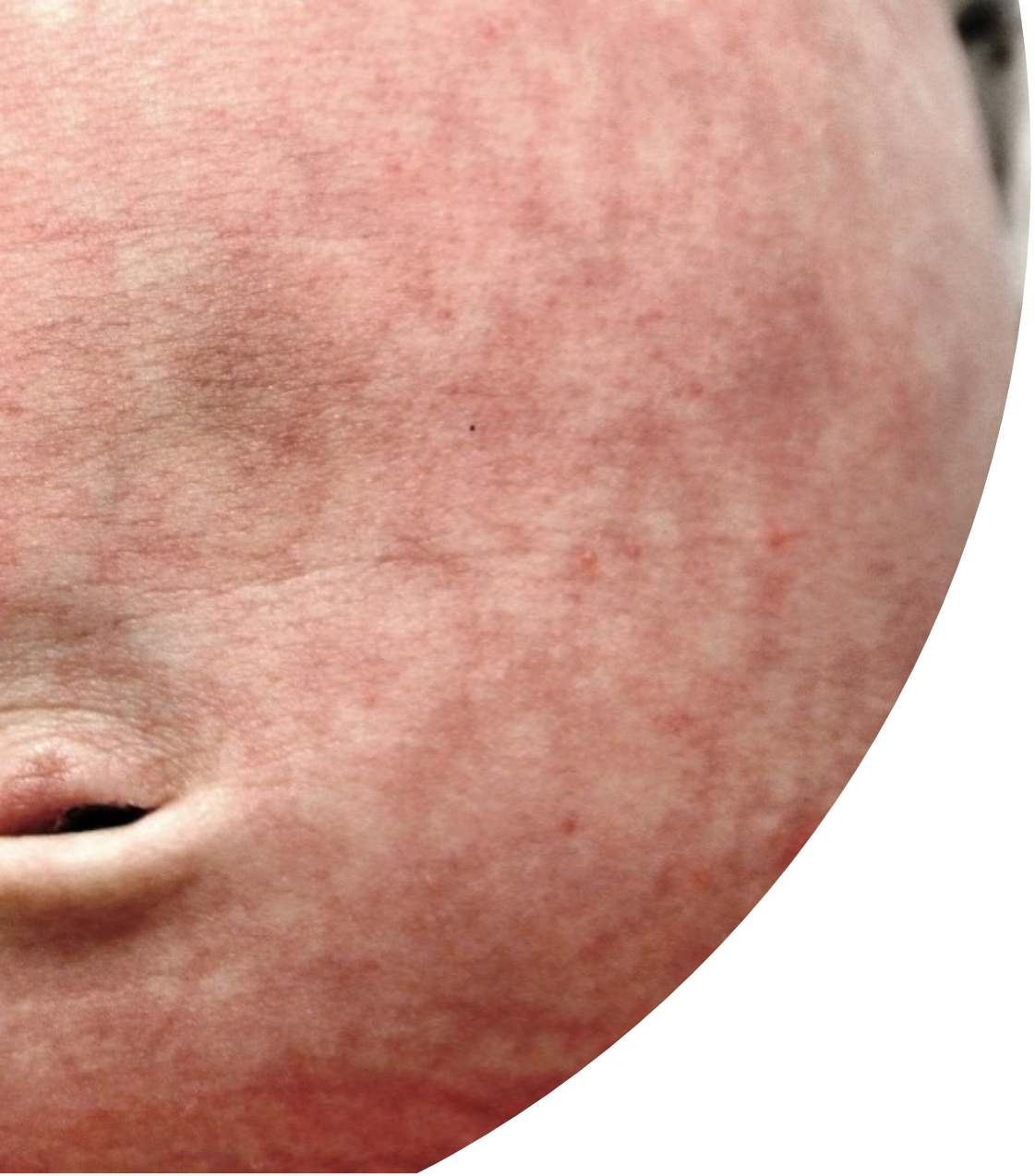
# Occult injury screening in suspected victims of physical abuse

- Skeletal Survey
  - All children < 2 years of age with suspected physical abuse (AAP, Section of Radiology. Pediatrics. 2000)
  - Children 2-5 years old handled individually based on specific clinical indicators of abuse

COMPLETE SKELETAL SURVEY TABLE

| APPENDICULAR SKELETON |
|---|
| Right and left humerus (AP) |
| Right and left ulna & radius (AP) |
| Right and left hand (PA) |
| Right and left femur (AP) |
| Right and left tibia & fibula (AP) |
| Right and left foot (AP) |

| AXIAL SKELETON |
|---|
| Thorax (AP, lateral, right and left obliques), to include sternum, ribs [51,52], and thoracic and upper lumbar spine |
| Abdomen/pelvis, to include the thoracolumbar spine and sacrum (AP) |
| Lumbosacral spine (lateral) |
| Skull (frontal and lateral), to include cervical spine (if not completely visualized on lateral skull)* |



# Occult injury screening in suspected victims of physical abuse

- Occult abdominal injury screening with AST, ALT, lipase
  - Children < 5 years of age with suspected physical abuse
  - If AST or ALT > 80, or lipase > 100, obtain an abdominal CT
    - Occult abdominal injuries identified in 3.2% of children meeting these criteria (Lindberg et al. Pediatrics 2009)

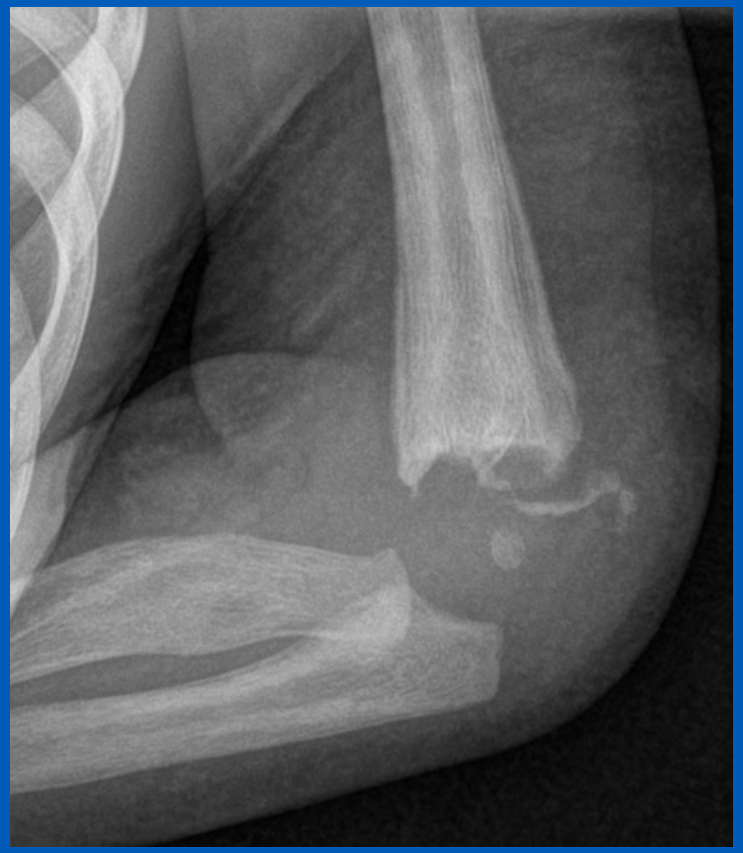
# Sibling Evaluations

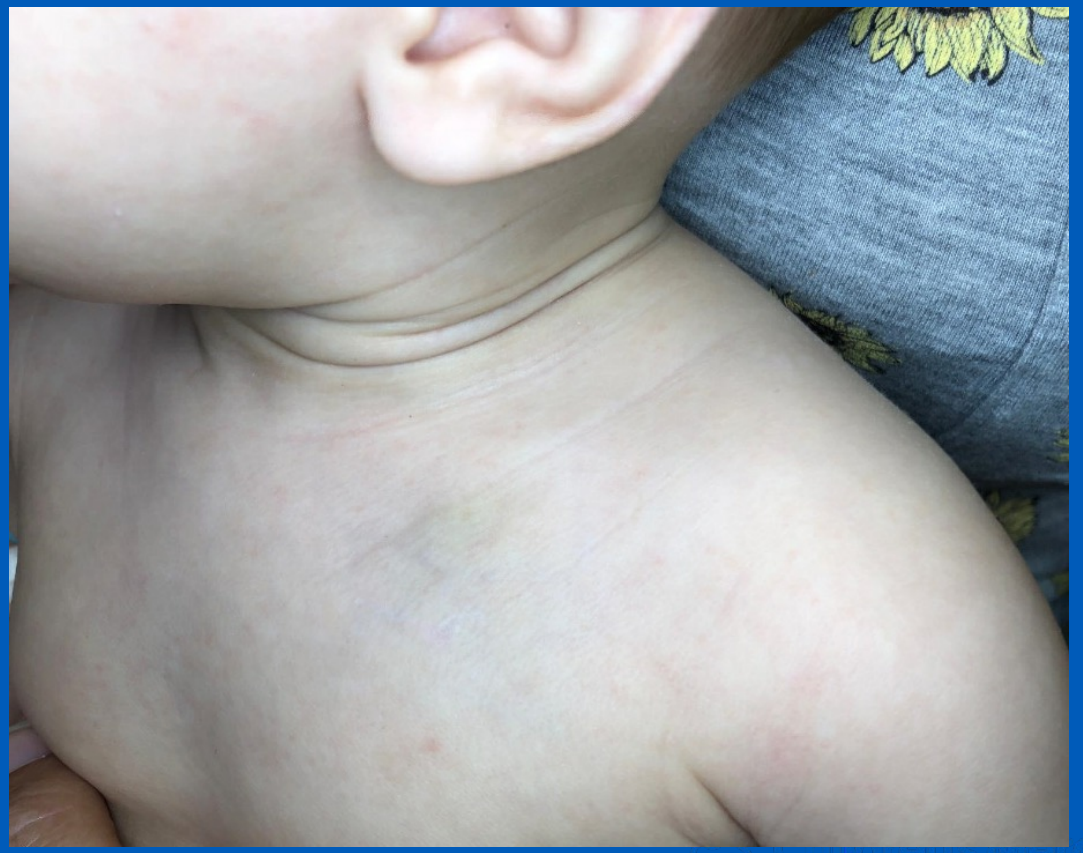
- When one child is abused, other children in the home are also at risk
  - More than 10% of siblings have occult fractures
  - Twins at increased risk of abusive fracture
- Recommend sibling exams:
  - Any child less than 5 years old
  - Children less than 2 years also need a skeletal survey
  - Children with visible injuries or who disclose abuse

Lindberg et al. Prevalence of Abusive Injuries in Siblings and Household Contacts of Physically Abused Children. *Pediatrics*. 2012.

# Case #3

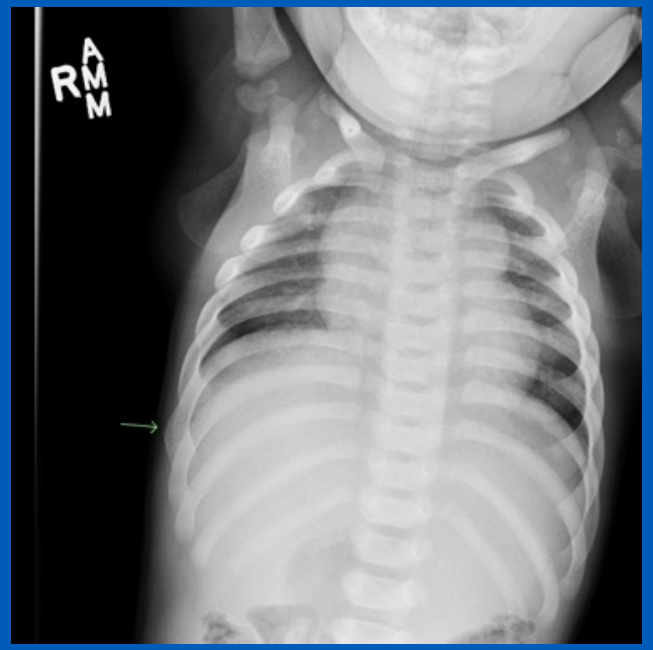
6 mos old seen for WCC

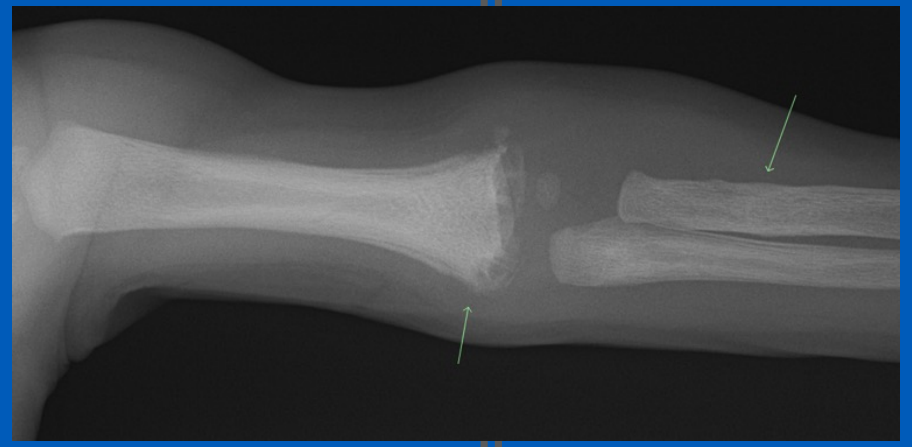


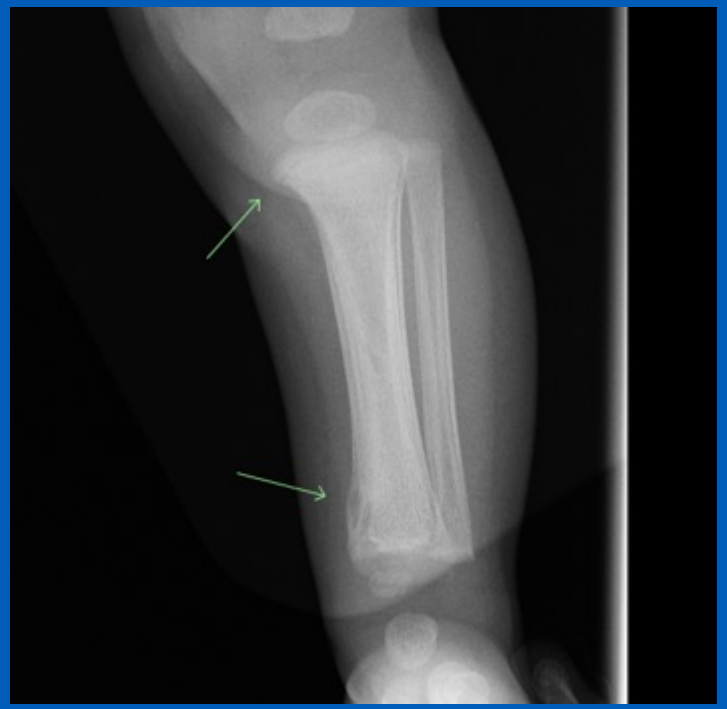


# Case #3

6 mos old seen for WCC





# Testing for Abuse in Children With Sentinel Injuries

Daniel M. Lindberg, MD[a,b], Brenda Beaty, MPH[c], Elizabeth Juarez-Colunga, PhD[c,d], Joanne N. Wood, MD, MSHP[e], Desmond K. Runyan, MD, DrPH[a]

- Increased and more consistent occult injury screening may aid in abuse identification

**TABLE 3** Rates of Abuse Diagnosis and Testing for Children With Putative Sentinel Injuries

| Candidate Injury | % With Abuse Diagnosis, Mean (Range) | % With Skeletal Survey, Mean (Range) | % With Neuroimaging, Mean (Range) | % With Hepatic Transaminases, Mean (Range) |
|---|---|---|---|---|
| Age <6 mo | | | | |
| Bruise(s) | 8.3 (1.1–21.3) | 20.0 (5.4–30.8) | 44.0 (19.9–60.1) | 14.9 (2.5–24.0) |
| Burn(s) | 3.5 (0–6.9) | 13.1 (0–23.3) | 15.7 (4.8–29.4) | 15.9 (0–44.1) |
| Oropharyngeal injury | 17.0 (0–41.7) | 31.9 (11.1–62.5) | 39.3 (11.1–62.5)[a] | 26.1 (7.1–40.0) |
| Age <12 mo | | | | |
| Femur/humerus fracture | 18.9 (7.1–51.4) | 59.8 (40.9–82.0) | 63.8 (43.3–84.7) | 35.2 (9.8–71.2) |
| Radius/ulna/tibia/fibula fracture | 19.2 (3.5–49.3) | 42.8 (25.0–78.9) | 45.1 (25.5–78.9) | 25.7 (6.0–64.8) |
| Isolated skull fracture | 4.3 (0.3–11.8) | 40.6 (21.5–74.3) | 79.6 (66.6–95.4) | 19.8 (1.3–47.8) |
| Intracranial hemorrhage | 26.3 (10.7–42.9) | 59.0 (42.3–81.6) | 89.3 (75.8–96.9) | 49.6 (15.9–71.4) |
| Age <24 mo | | | | |
| Rib fracture(s) | 56.1 (11.5–71.6) | 81.5 (69.2–94.9) | 90.6 (78.2–98.6) | 73.1 (11.5–87.7) |
| Abdominal trauma | 24.5 (0–47.4) | 31.9 (18.2–57.9) | 58.7 (36.4–75.7) | 74.3 (35.8–91.8) |
| Genital injury | 12.3 (0–21.4) | 18.5 (0–40.0) | 20.0 (0–45.0) | 16.5 (39.5–89.5) |
| Subconjunctival hemorrhage | 8.6 (0–22.0) | 14.3 (5.9–36.6) | 19.7 (10.9–38.2) | 14.7 (0–35.4) |

Rates are percentages after excluding visits noted to be transfers from another institution.

[a] Ranges for SS and neuroimaging are identical because the 2 institutions with the highest and lowest rates of testing in this group obtained neuroimaging in all children who received SS.

# Importance of Proper Screening

## Identifying Predictors of Physical Abuse Evaluation of Injured Infants

*Opportunities to Improve Recognition*

*Emily A. Eismann, MS,* Robert Allan Shapiro, MD,*† Kathi L. Makoroff, MD, MEd,*† Jack Theuerling, BA,* Nicole Stephenson, BS,* Elena M. Duma, MD,†‡ Emily T. Fain, MD,‡§ Theresa M. Frey, MD,‡ Lauren C. Riney, DO,‡ and Jonathan D. Thackeray, MD¶‖*

- 53% of infants with visible injury underwent skeletal survey
- 58% of infants presenting with bruising, burns, and/or intraoral injury underwent a skeletal survey

- 19% of infants were found to have occult fracture and 38% of infants had intracranial hemorrhage
- When testing completed, occult fractures and intracranial hemorrhage are commonly found

**Screening for occult injury helps detect additional injuries that may not be obvious by looking at the child**

# Mandated Reporting

- All health care providers are mandated reporters of ***suspected*** cases of abuse and neglect
- How to Report
  - Call the local CD office
  - MO: **1-800-392-3738**
  - Online at **https://dss.mo.gov** **-->** Click link to report child abuse and neglect

# PCP Reporting Decision Making

ARTICLES | SEPTEMBER 01 2008

## From Suspicion of Physical Child Abuse to Reporting: Primary Care Clinician Decision-Making

Emalee G. Flaherty, MD; Robert D. Sege, MD, PhD; John Griffith, PhD; Lori Lyn Price, MS; Richard Wasserman, MD, MPH; Eric Slora, PhD; Niramol Dhepyasuwan, Med; Donna Harris, MA; David Norton, MD; Mary Lu Angelilli, MD; Dianna Abney, MD; Helen J. Binns, MD, MPH

- Clinicians did not report 27% of injuries they considered to be likely or very likely due to abuse and 76% possibly due to abuse to CPS
- Black children and children unfamiliar to the clinician were more likely to be reported
- Multiple reasons for not reporting

# Reminder

- The evaluation of abuse is based on tangible data
- Social risks or the absence of risks are not part of the medical diagnosis of abuse
- Use of evidenced based medicine and screening tools may help mitigate bias
- Lack of hotlines may impact the quality of information and services/interventions available for the child

# Child Protective Services

Missouri Department of Social Services
CHILDREN'S DIVISION

- Ensure safety of the child
  - Strive to maintain integrity of the family
  - Resources and support to family
  - Safety plans: voluntary plan created by CPS with the family.
  - Cannot take custody, but may refer to court

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# Law Enforcement


- Investigate if a crime occurred
  - Can take emergency police protective custody

# Communication

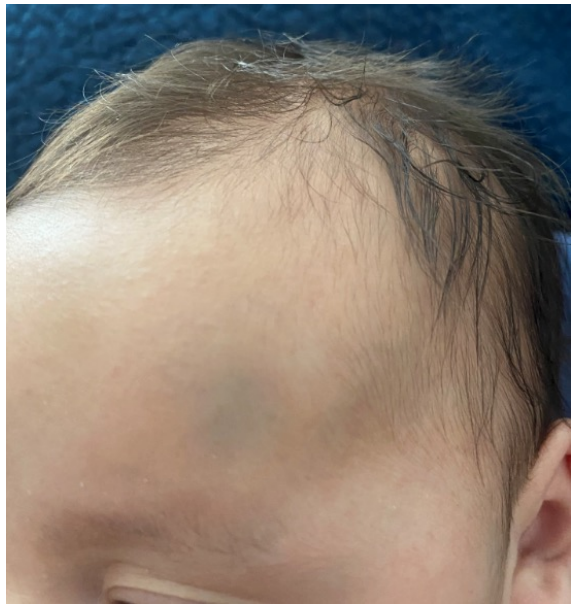
- With the family:
  - Share why you are concerned; be honest and non-judgmental
  - Explain your obligations by law (eg mandated reporting)
  - Hear parents' feelings
  - Be aware of your own emotions
  - Partner with the parent – mutual desire for child's safety and health
  - Don't: downplay your concern or theirs; say what will or won't happen next; become defensive
- **Ensure the families reasons for seeking care or child's other medical needs are still addressed**

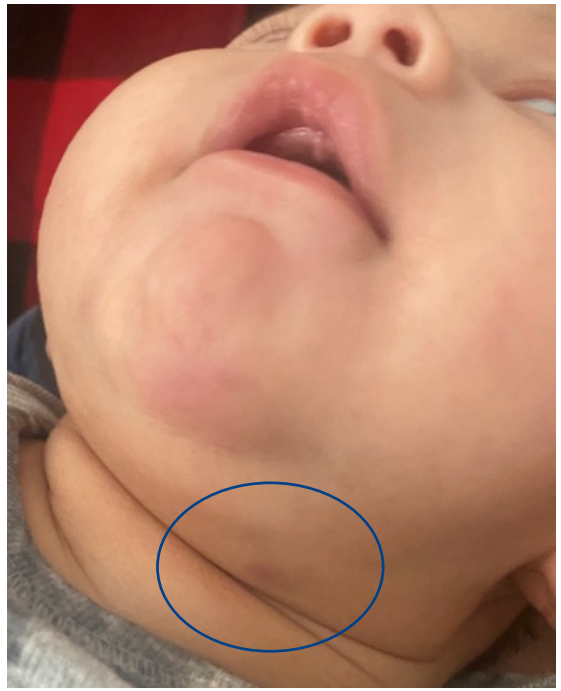
# Communication

- With CPS/LE
  - Explain the child's current injuries and why you are concerned
  - Avoid medical jargon
  - Share what you have been told about how the injury occurred
  - Don't over or understate certainty about abuse
  - Let them know if the child needs further medical tests or follow up

# Case Example 4

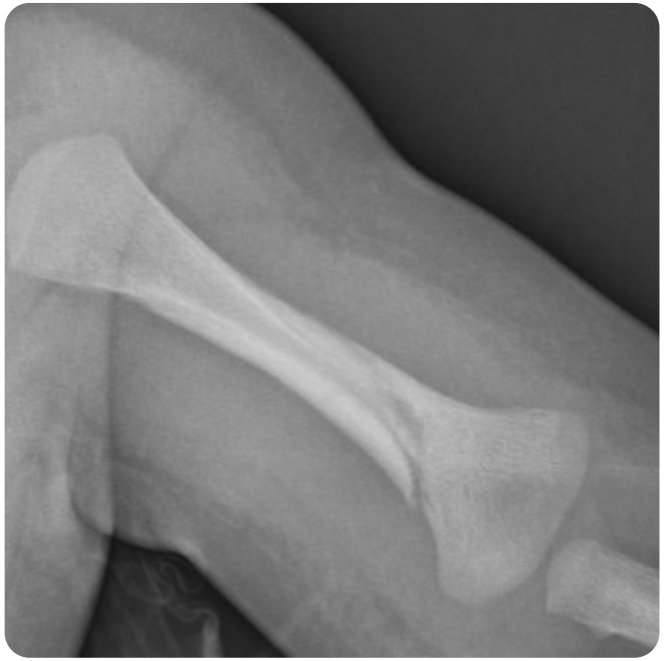
- 3 month old with vomiting and facial bruising
- Head CT and skeletal survey completed – no additional injury
- Discharged home

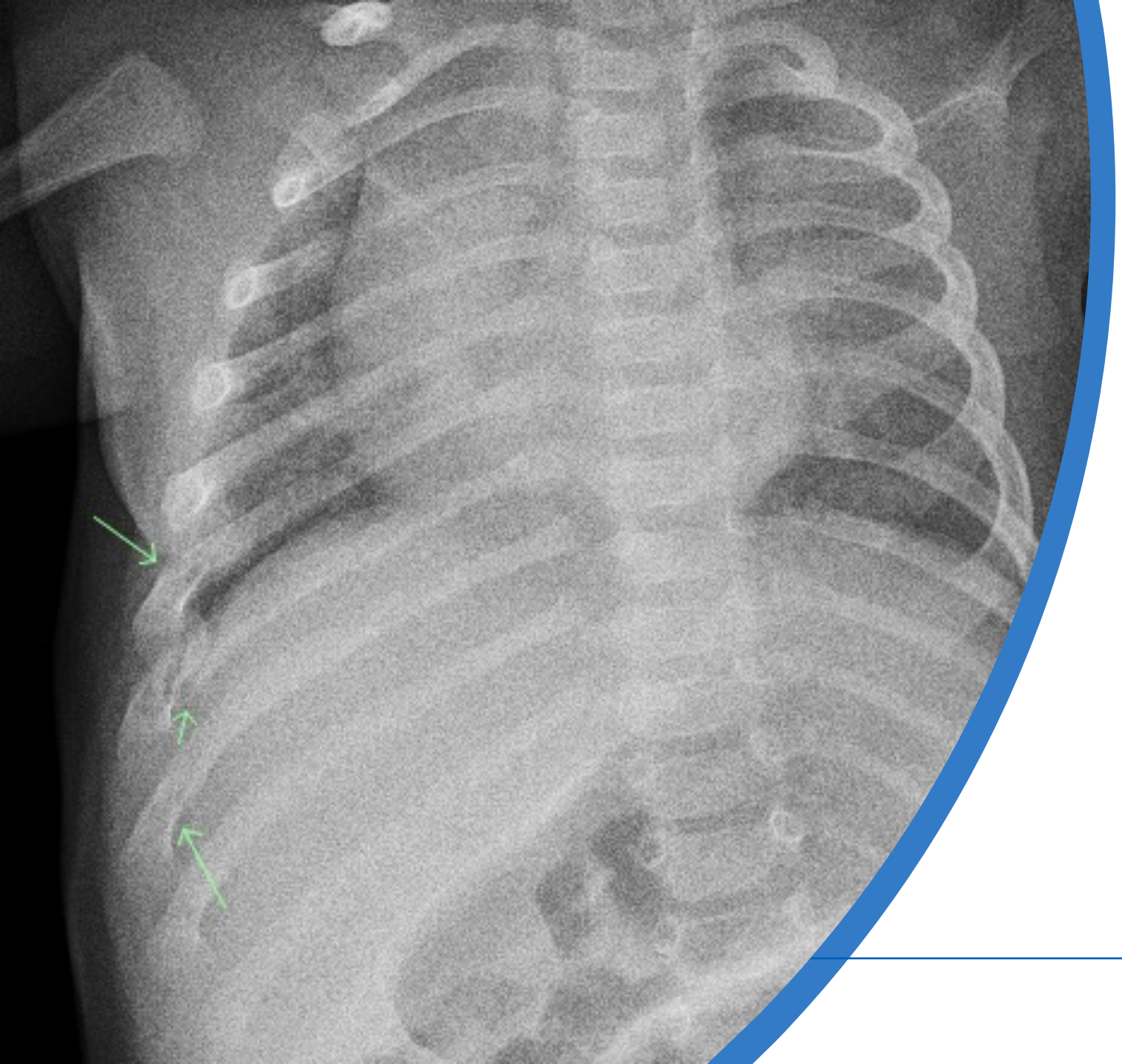




# Case 4 continued

- 11 days later seen in another ED for arm pain
- Report was made to CPS for suspicious injury, but was discharged home without a safety plan
- Referred to Orthopedics





# Case 4 continued

Orthopedics team recognized that further occult injury screening was needed

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# Case 4: Opportunities for Improvement

- Normal occult injury screening does not “rule out” abuse or negate concerning bruises
- May have been mislead by initial history
- Earlier involvement of CPS
- Communication with CPS regarding injury suspicion and safety concerns
- Lack of occult injury screening at the time second injury (fracture) identified

# What can providers do?

- Be alert for injuries in young children that are not typical for their development or in concerning locations
- When evaluating infants and toddlers for nonspecific symptoms such as vomiting, irritability, seizures or apnea consider head trauma in the differential diagnosis
- Perform a thorough head-to-toe physical examination and be alert for signs of trauma

# What can providers do?

- Be familiar with occult injury screening indications and use evidence-based approaches to identify and screen at risk children
- Use appropriate occult injury imaging protocols
- If an injury is concerning for abuse, report to CPS for investigation
- Know your resources – Child Abuse Pediatricians are available for consultation!

# Tools & Resources

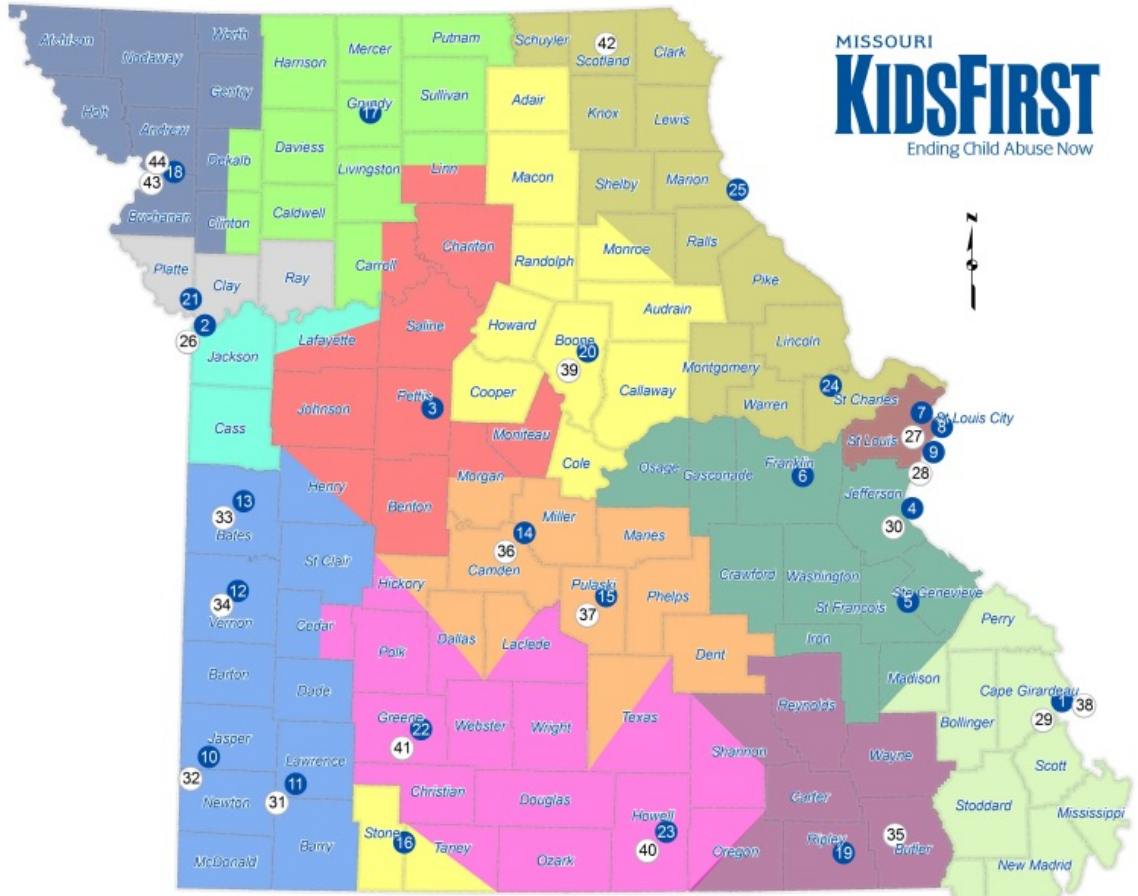



# Child Abuse Pediatricians

# SAFE-CARE Network

- State-funded program that develops and maintains a coordinated medical response to child abuse and neglect in Missouri
- Education on injury mechanics, sentinel injuries and other medical aspects of abuse/neglect
- Ensure access to quality care by trained SAFE-CARE providers at a CAC or community clinic

# Missouri's Network of Child Advocacy Centers and SAFE-CARE Providers




## CAC Sites

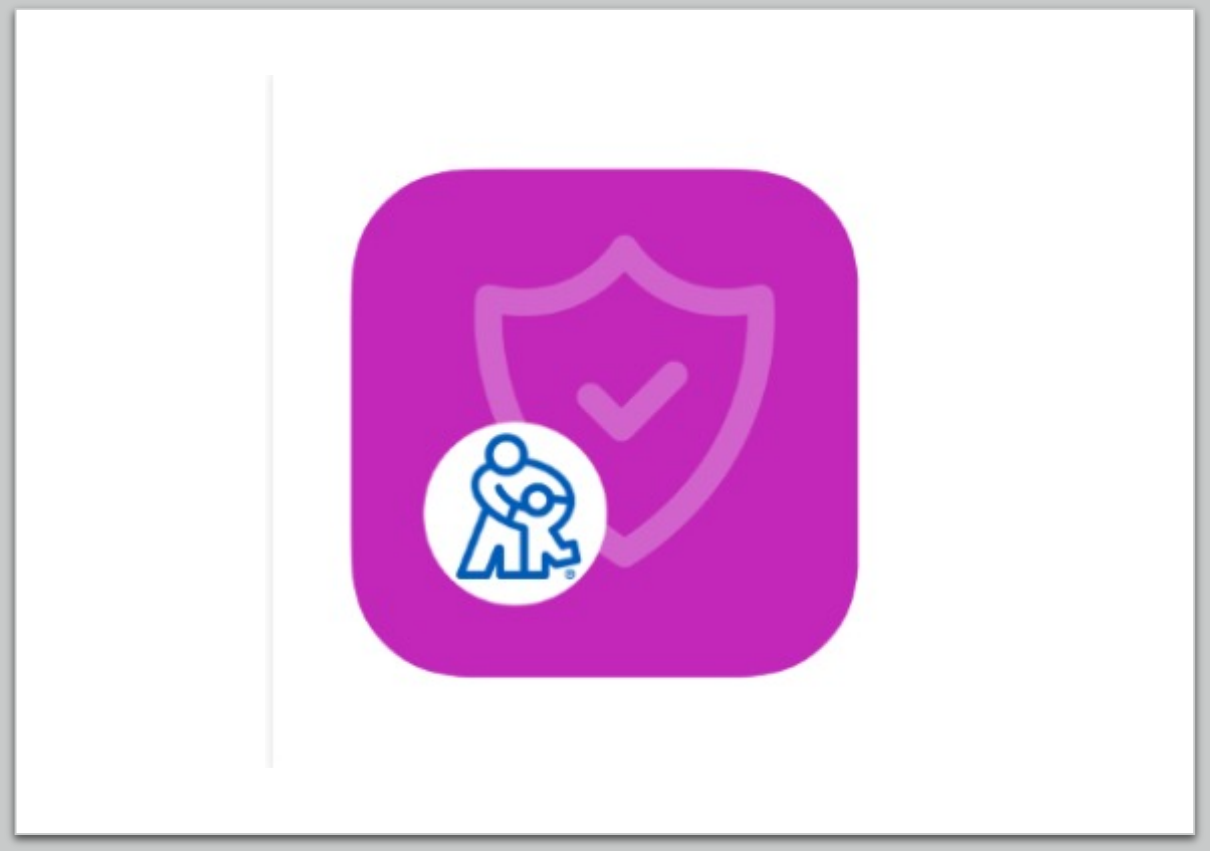
1 CAC SEMO-NASV, Cape Girardeau
2 CAC Child Protection Center, Kansas City
3 CAC Child Safe of Central Missouri, Sedalia
4 CAC Children's Advocacy Center of East Central Missouri, Festus
5 CAC Children's Advocacy Center of East Central Missouri, Farmington
6 CAC Children's Advocacy Center of East Central Missouri, Union
7 CAC Children's Advocacy Services of Greater St. Louis, UMSL Campus
8 CAC Children's Advocacy Services of Greater St. Louis, West Pine
9 CAC Children's Advocacy Services of Greater St. Louis, Kirkwood
10 CAC Children's Center of Southwest Missouri, Joplin
11 CAC Children's Center of Southwest Missouri, Pierce City
12 CAC Children's Center of Southwest Missouri, Nevada
13 CAC Children's Center of Southwest Missouri, Butler
14 CAC Kids Harbor, Osage Beach
15 CAC Kids Harbor, Too, St. Robert
15 CAC Lakes Area Child Advocacy Center, Branson West

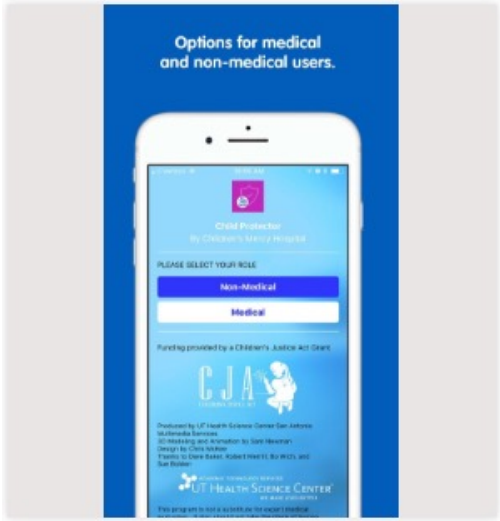
## Safe-Care Providers

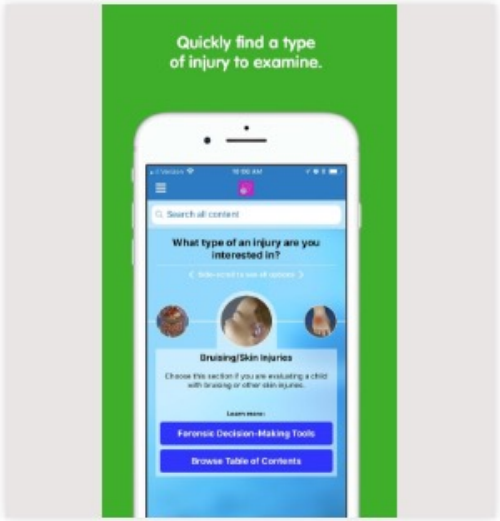
26 SCP Children's Mercy Hospital, Kansas City, Dr. Jim Anderst and 8 additional providers
27 SCP St Louis Children's Hospital, St. Louis, Dr. Adrienne Atzemis and 6 additional providers
28 SCP Cardinal Glennon Children's Hospital, St. Louis, Dr. Tim Kutz and 4 additional providers
29 SCP SEMO-NASV, Cape Girardeau, Lori Blankenship
30 SCP Children's Center of East Central Missouri, Festus
31 SCP Children's Center of Southwest Missouri, Pierce City, Cathy Ingalls
32 SCP Children's Center of Southwest Missouri, Joplin, Susan Pumphrey and Anastasia Beezley
33 SCP The Children's Center of Southwest Missouri, Butler, Misty Tourtillot
34 SCP The Children's Center of Southwest Missouri, Nevada, Misty Tourtillot
35 SCP Poplar Bluff Pediatric Associates, Poplar Bluff, Dr. Claudia Preuschoff
36 SCP Kids Harbor, Osage Beach
37 SCP Kids Harbor, Too, St. Robert
38 SCP EBO MD, Cape Girardeau, Lisa Baker
39 SCP Rainbow House, Columbia, Dr. Holly Monroe
40 SCP The Child Advocacy Center South Central, West Plains, Celeste Williams

COMMUNITY ASSET BUILDERS, LLC

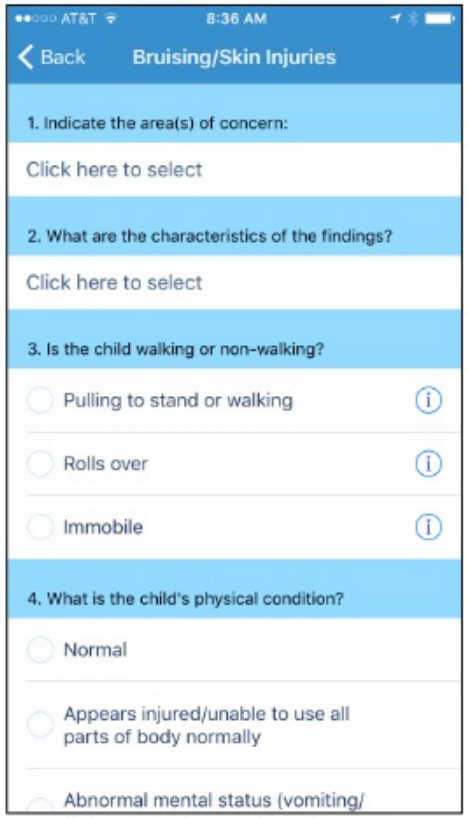
# Child Protector App

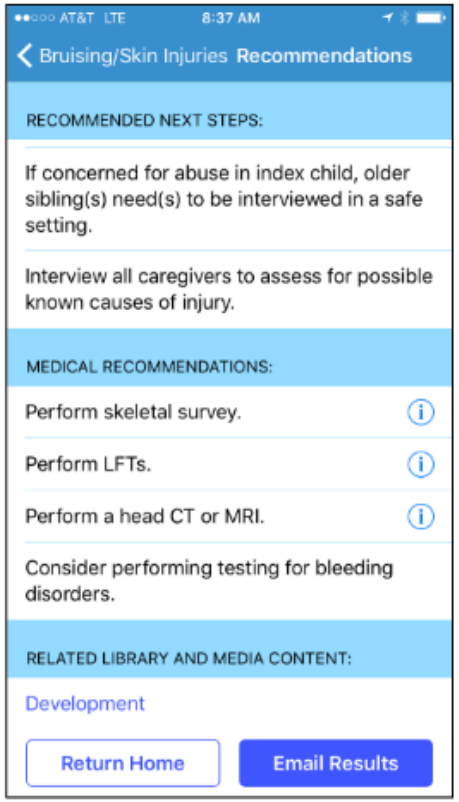




# Child Protector: Decision Trees & Recommendations

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# Summary

- Sentinel injuries may be the first sign of physical abuse
- Missing signs of abuse can put a child at risk for significant harm
- Reporting ***suspected*** cases may prevent further injury and death
- Understand recommendations for occult injury screening
- When in doubt, reach out!

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# Thank you!

- Questions/comments?
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