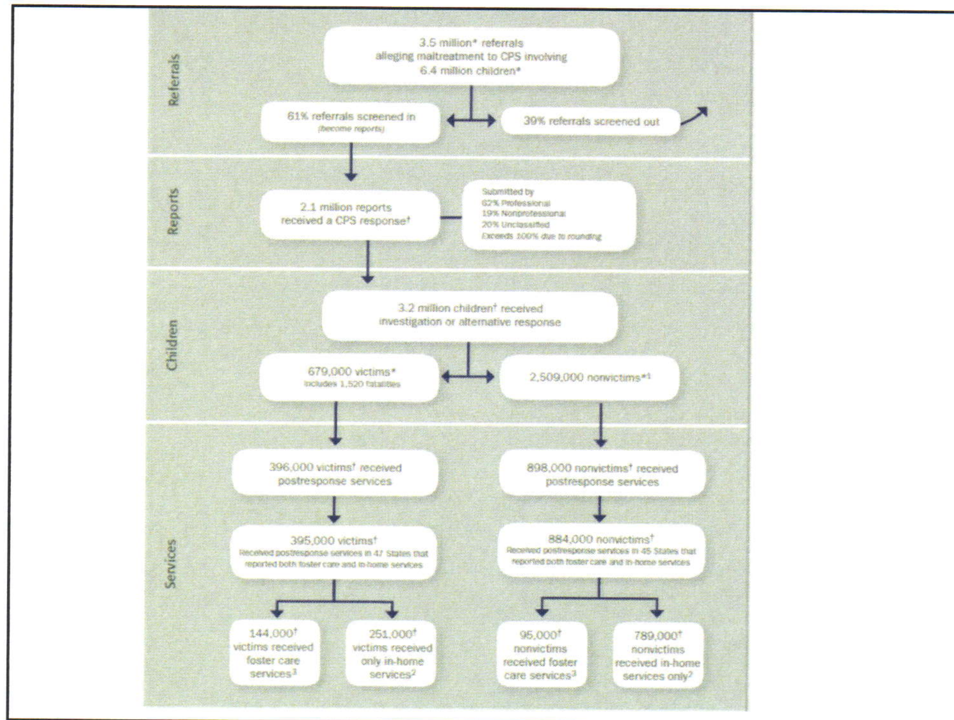
Sentinel Injuries: Recognizing the symptoms of the canary in the coal mine before it's too late

Antoinette Laskey, MD, MPH, MBA
Associate Professor of Pediatrics

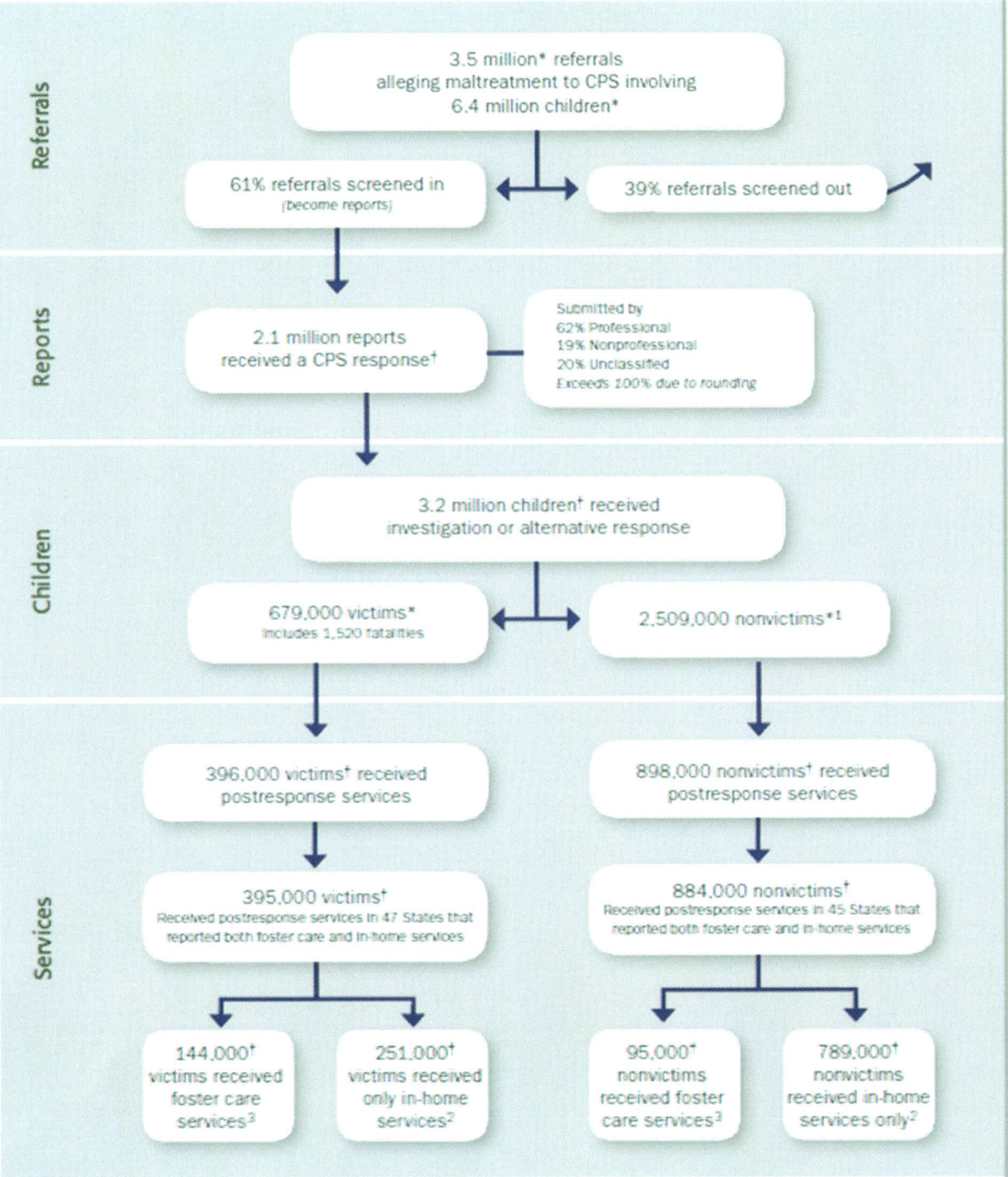
Objectives

- Identify "sentinel injuries" in the context of possible child abuse
- Recognize the necessary evaluation that should happen after a sentinel injury is identified
- Describe the possible outcomes associated with sentinel injuries



Scope of the Problem

- In 2013, 1520 children died as the result of abuse or neglect
- 3.5 million reports were made on 6.4 million children
- 678,932 children were found to be victims of child abuse and neglect
  - Victim rate of 9.1 victims per 1000 children
  - 10 football stadiums FULL


Referrals
3.5 million* referrals alleging maltreatment to CPS involving 6.4 million children*
61% referrals screened in
(become reports)
39% referrals screened out
Reports
2.1 million reports received a CPS response†
Submitted by
62% Professional
19% Nonprofessional
20% Unclassified
Exceeds 100% due to rounding
Children
3.2 million children† received investigation or alternative response
679,000 victims*
includes 1,520 fatalities
2,509,000 nonvictims*1
Services
396,000 victims† received postresponse services
898,000 nonvictims† received postresponse services
395,000 victims†
Received postresponse services in 47 States that reported both foster care and in-home services
884,000 nonvictims†
Received postresponse services in 45 States that reported both foster care and in-home services
144,000† victims received foster care services3
251,000† victims received only in-home services2
95,000† nonvictims received foster care services3
789,000† nonvictims received in-home services only2

Scope of the Problem

- The US has one of the worst rates of child abuse in the industrialized world
  - 4-7 children die every day due to child maltreatment

Mandated Reporting

- Any person who has **reason to believe** that a child has been subjected to abuse or neglect is required to report
- It is important to remember that mandated reporting is like a screening test
  - It isn't meant to be the final answer as to whether someone is or isn't a victim

Triggers for Abuse

- Crying in infants
- Unrealistic developmental expectations
  - Attributing motives to infants
    - "The baby wasn't eating just to irritate me"
    - "The baby refused to go to sleep"
    - "The baby peed on me on purpose"

What is a sentinel injury?

- Relatively "minor" injuries identified in a child
- Found typically in a pre-cruising infant
- These injuries may not be serious alone but are warnings of worsening abuse
- Sentinel injuries may be missed or downplayed by medical providers
  - This results in missed opportunities to protect children

What is a sentinel injury?

- Visible or detectable to a caregiver
- Sentinel injuries may be missed or downplayed by medical providers
  - This results in missed opportunities to protect children

What is NOT a sentinel injury?

- Injuries that a caregiver cannot detect
  - Rib fractures
  - Metaphyseal fractures
  - Head injuries with subtle symptoms
    - Vomiting
    - Irritability
    - Sleepiness

Who Might See a Sentinel Injury?

- A parent
- An unrelated caregiver (babysitter)
- A medical person
- Another family member

Sentinel Injuries

- Of 200 definitely abused infants, 27.5% had a previous sentinel injury compared to NONE of the 101 non-abused infants evaluated
- 66% of these sentinel injuries were in infants <3m of age
- 95% were at or before 7m
  - Sheets, et al, 2013

Sentinel Injuries

- A medical provider was aware of the injury in 42% of the cases

Types of Injuries

- Bruises in infants
- Intraoral injury
- Ear injury
- Subconjunctival hemorrhage

Cutaneous Injuries

- Bruises or contusions: damage to blood vessels resulting in leakage of blood into tissue
- Petechia (1) or petechiae (multiple): 1-2mm red-purple spots due to broken capillaries; resolve rapidly

Cutaneous Injuries

- Bruises are the most common presenting injury in abused children
- May not ever be brought to medical attention due to the perception that it is a minor injury—even in infants
- If a medical provider sees the injury, they may underestimate its importance and not document it or the history provided for it

Timing the Injury

- Bruises CANNOT be dated clinically
  - Evolution of bruise varies based on body fat, UV exposure, depth and extent of injury, skin complexion
- Guessing at an age is not helpful and may be misleading

Bruises: What is Normal?

- Depends on the developmental age of the child
- Depends on the trauma history offered
- Therefore, take a thorough history
- Document what you see and hear

Bruising by Age

- "Those who don't cruise, rarely bruise"
- Study of almost 1000 children <36m of age
    - 20% had bruises on exam

Bruising by Age

- By age, however, their developmental status was key
    - 0.6% <6m
    - 1.7% <9m
    - 2.2% in non-cruisers (not up on 2 feet)
    - 17.8% cruisers
    - 51.9% walkers
        - Sugar, et al, 1999

Bruising by Location

- Patients <48m old admitted to an intensive care unit because of trauma were evaluated for bruising
- Abuse patients were more likely to have bruising of the
  - Torso
  - Ear
  - Neck
  - Anywhere if they were less than 4m old

Bruising by Location

- The decision rule is called TEN-4
- Bruising over "soft parts"
  - Cheek
  - Ears
  - Neck
  - Buttock
  - Abdomen
  - Hand

Additional Injuries

- One large study found that among infants <6m with apparently isolated bruises
  - 23% had a fracture found on skeletal survey
  - 27% had a head injury found on CT or MRI
  - 3% had an abdominal injury
  - 50% had at least one additional serious injury
    - Harper, et al, 2014

Petechiae

- Result from a variety of mechanisms
  - Slaps
  - Suffocation/Smothering
  - Twisting
- Rapidly resolve so early photodocumentation and repeat documentation is necessary

Hand/Foot Squeeze

- Usually an injury seen only in infants
- May be missed due to the infant's tendency to keep their hands tightly fisted
- May be associated with difficult to detect metacarpal and metatarsal fractures
- Does not result from routine handling

Oral Injuries

- Frena/Frenula/Frenum: piece of tissue attaching the lip to the gum (top and bottom) and the tongue to the floor of the mouth
- May be injured accidentally in a mobile child
  - Running with something in the mouth
  - "Face plant" with a drag
  - Falling on the face

Oral Injuries

- If torn in an infant, very frequently associated with inflicted trauma
  - Shoving something (pacifier, bottle, medicine dropper) in the mouth
  - May be seen with suffocation/smothering
- Bleeds "a lot" due to blood mixing with saliva
- Heals rapidly
- May look like an isolated spot of thrush when healing

Ear Injuries

- Ears tend to be in protected location and are not commonly injured in falls
- Injuries often from being hit or pinched/pulled
- Often painful
- Can be permanently disfiguring depending on severity
- Accidents can happen but wouldn't be "unknown"

Eye Injuries

- Conjunctiva is the thin tissue overlying the eyeball
- Bleeding underneath the conjunctiva is called subconjunctival hemorrhage

Eye Injuries

- Subconjunctival hemorrhages have many causes
- Infants DO NOT sustain subconjunctival hemorrhages from
  - Constipation
  - Coughing (unless they have pertussis)
  - Vomiting
  - Crying

Eye Injuries

- Subconjunctival hemorrhages in infants are often associated with
  - Smothering
  - Suffocation
  - Strangulation
  - Direct injury to the eye

Nursemaid's Elbow

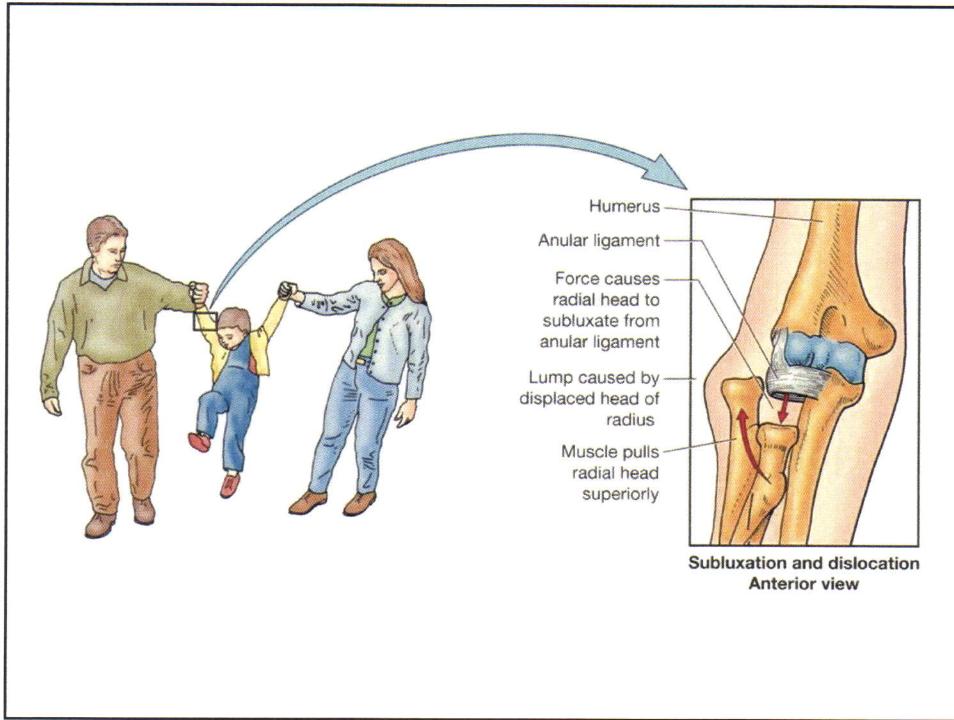
- AKA "Pulled Elbow" or radial head subluxation
- Typically occurs between 1-4 years of age
- Often accidental in walking children
  - Caregiver tries to prevent a fall by jerking the child up by the arm

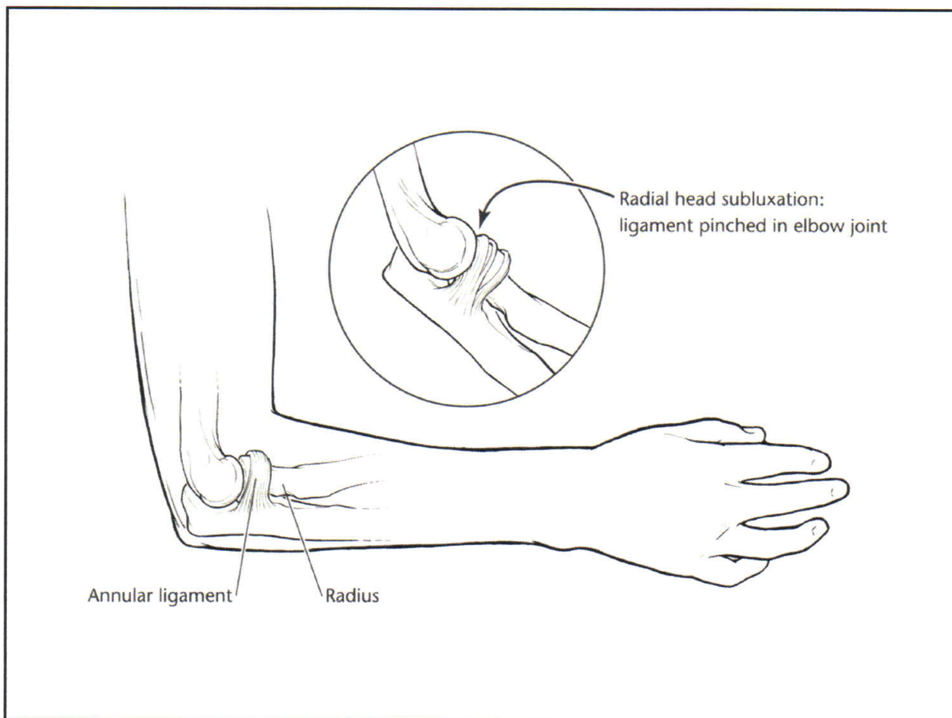
Nursemaid's Elbow

- Results in a partial separation of the joint allowing a portion of the ligament to become trapped
- Can result in a total dislocation of the joint
- May recur due to increased laxity of the joint after the first event

Nursemaid's Elbow

- Symptoms:
  - Pain on manipulation of arm
  - Child will hold arm straight at their side and won't reach for things


Humerus
Anular ligament
Force causes radial head to subluxate from anular ligament
Lump caused by displaced head of radius
Muscle pulls radial head superiorly
Subluxation and dislocation
Anterior view


Radial head subluxation: ligament pinched in elbow joint
Annular ligament
Radius

Nursemaid's Elbow

- Causes in infants
  - Forcefully lifting a baby by their arm (excessive force, not routine care)
  - Sudden jerking of a baby's arm
  - Dropping and catching (history is often at presentation)

Evaluation of a Sentinel Injury

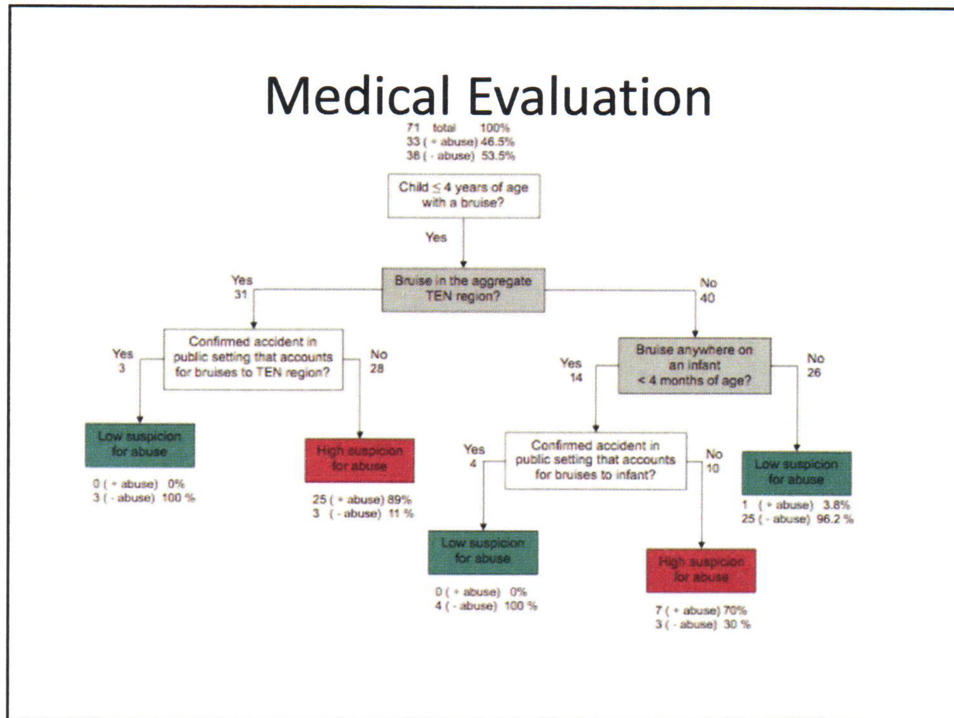
- Trauma history
  - Detailed report of events
  - Accidental injuries often have the trauma history as part of the presentation, not a complete "I don't know what happened"
  - Detailed documentation of who gives the history and who cares for the child

Medical Evaluation

- A complete physical exam is an absolute MUST
  - Complete, head to toe including diaper area skin exam
  - Frenula
  - Hands and feet
  - Eyes
  - Ears

Medical Evaluation

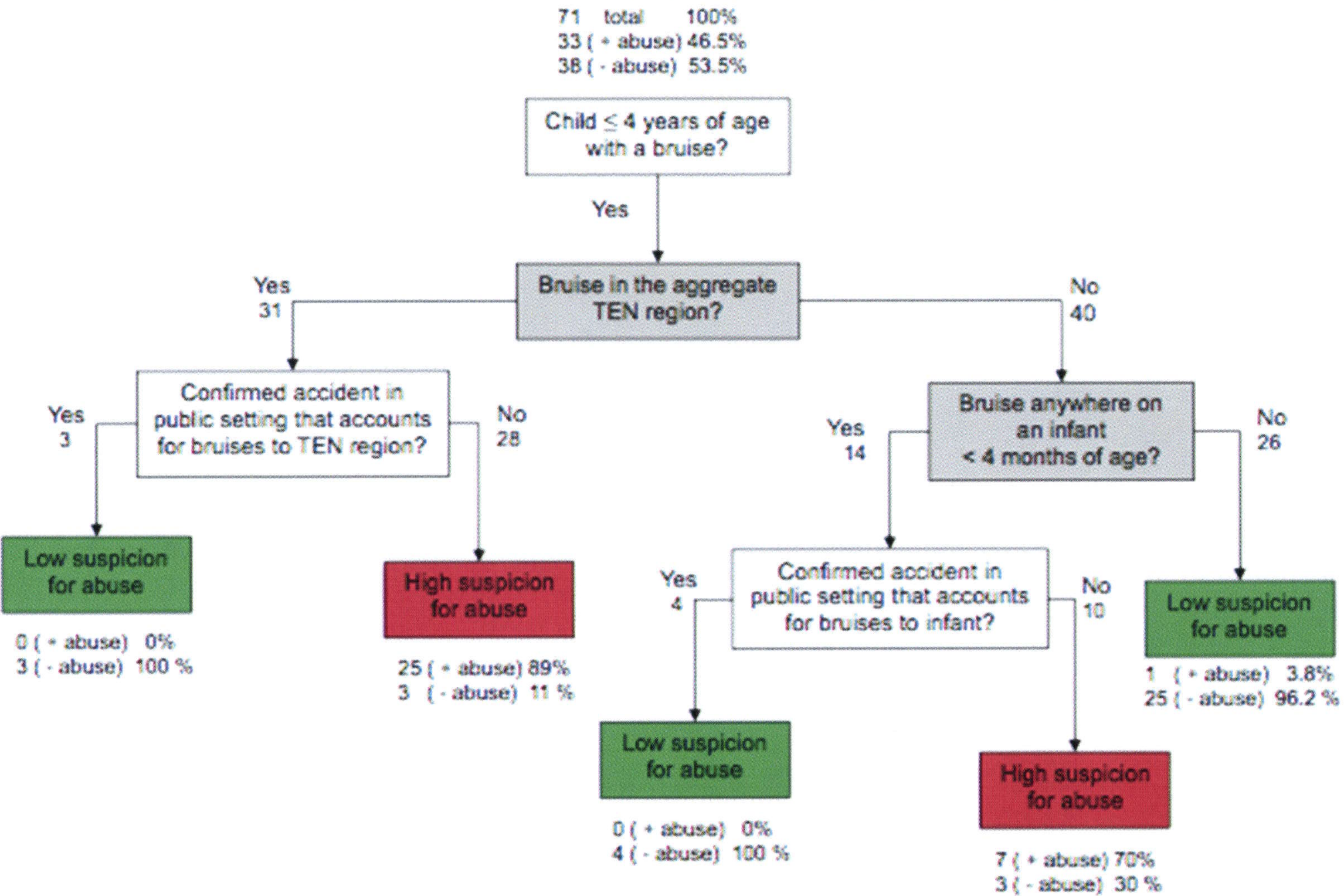
- Head CT if child is less than <6m or has neuro symptoms
- Skeletal survey if less than 2y
- Repeat skeletal survey in 2 weeks
- Lab studies for abdominal injuries



Documentation

- Documentation of everything
  - History
  - Physical
  - Labs
  - Radiology studies

Medical Evaluation



Documentation

- Pictures are crucial
  - Many of these injuries evolve or resolve rapidly
  - It is difficult or impossible for us to interpret verbal or written descriptions of injuries
  - Make the photo count! Don't send blurry or out of context pictures
  - Use a size standard

Drawing Conclusions

- Even if there are absolutely NO other findings besides the sentinel injury, the sentinel injury in and of itself is our warning
- Failing to heed the warning:
  - "Return of this child to the hands of the caregiver who caused these injuries may result in further injury or death"

Protecting Children

- If there is "only" a sentinel injury, the family may actually benefit from help before things escalate
- Maintaining engagement is important
- Recognizing what the trigger was is critical
- Developing respite plans with families can be helpful

Summary

- Sentinel injuries in infants include
  - Bruising
  - Petechiae
  - Oral injuries
  - Eye injuries
  - Ear injuries
  - Nursemaid's elbow

Summary

- Sentinel injuries can be challenging to recognize as abuse because they don't seem "that serious"
- Research has shown that they are very serious for what they portend: the potential for further abuse and possibly death

Questions?

- Antoinette.Laskey@imail.org
- Safe and Healthy Families Intake
  - 801-662-3606