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Evidence-Based Education • Practical Application

CLINICAL CHALLENGES

- What are sentinel injuries and how do they serve as early indicators of current or future child physical abuse?
- What laboratory and imaging studies are indicated for infants presenting with sentinel injuries?
- What measures can be taken to prevent overreporting and underreporting of potential child physical abuse?



Emergency Department Management of Sentinel Injuries in Infants

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Abstract

Sentinel injuries are often found incidentally on infants presenting with medical concerns or minor trauma as the chief complaint. Failure to recognize these findings as a potential indicator of child physical abuse may result in devastating outcomes including disability and death. This issue reviews the most common sentinel injuries including bruises, subconjunctival hemorrhages, oral injuries, and burns. Evidenced-based strategies are provided for evaluation and management of infants presenting to the emergency department with sentinel injuries.

Prior to beginning this activity, see the "CME Information" on page 2.

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Target Audience: This enduring material is designed for emergency medicine physicians, physician assistants, nurse practitioners, and residents.

Goals: Upon completion of this activity, you should be able to: (1) identify areas in practice that require modification to be consistent with current evidence in order to improve competence and performance; (2) develop strategies to accurately diagnose and treat both common and critical ED presentations; and (3) demonstrate informed medical decision-making based on the strongest clinical evidence.

CME Objectives: Upon completion of this activity, you should be able to: (1) identify sentinel injuries and describe their importance as an early indicator of potential child physical abuse; (2) apply evidence-based guidelines to the laboratory and imaging workup of infants presenting with sentinel injuries; and (3) identify barriers and biases that contribute to underreporting and overreporting suspected child physical abuse.

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Case Presentations

CASE 1

A 9-week-old girl presents with constipation and fussiness...

- On examination, she is found to have a subconjunctival hemorrhage. The girl's parents state that this appeared earlier that day due to excessive crying and straining to stool.
- What workup, if any, is warranted at this time?

CASE 2

A 4-month-old boy presents with fever and fussiness...

- The boy's parents say they believe these symptoms are due to teething.
- On examination, he is found to have an upper labial frenulum tear. The parents tell you that it is a self-inflicted injury from a teething toy. His mother says that he has had bleeding from the mouth before.
- How should you further evaluate this patient? Should you consider calling Child Protective Services?

CASE 3

A 7-week-old girl presents with fussiness...

- On physical examination, she is found to have a bruise on her abdomen. Her parents say they believe it is from the mother accidentally rolling onto her while co-sleeping. The girl's parents also say that the infant rolled off the bed onto carpeted flooring, and this may have caused the injury.
- What are the next steps in the management of this infant?

Introduction

Infants aged <1 year present to emergency departments (EDs) at higher rates than any other age group.[1] Infants are a particularly vulnerable population, because they are nonverbal and rely on parents or caregivers as the primary source of history. This may be multiple individuals with varying levels of knowledge of the related event(s). *Sentinel injuries* are seemingly minor visible injuries that are unexplained or inadequately explained; these injuries can be concerning for child physical abuse and are often found incidentally in the ED.[2-4] Common sentinel injuries include bruises, subconjunctival hemorrhages, intraoral injuries, and minor burns. Recognizing these subtle findings is critical, since sentinel injuries may not only represent current child physical abuse, but often precede more severe forms of child physical abuse and may represent the earliest opportunity for clinicians to intervene and protect the child from future harm.[5-8] Notably, 11.5% to 31.2% of infants with later-confirmed severe child abuse or child abuse leading to death had previously been evaluated by clinicians for sentinel injuries.[5-7] This issue of *Pediatric Emergency Medicine Practice* reviews the evaluation of infants with sentinel injuries and provides evidence-based recommendations for the workup and management of these patients.

Critical Appraisal of the Literature

A literature search was performed using PubMed, with the search terms: *sentinel injuries in child abuse*, *bruising in pre-mobile infants*, *subconjunctival hemorrhage in infants*, *oral injuries in infants*, *burns in infants*, *history taking in child abuse*, *laboratory evaluation for suspected child physical abuse*, *imaging in infants of suspected child physical abuse*, *healthcare costs associated with child abuse*, *reporting child abuse*, and *mandated child abuse reporting in medicine*. A similar search was conducted in Ovid MEDLINE®. The literature was largely retrospective chart reviews, systematic reviews, and retrospective secondary analyses. Clinical guidelines and consensus statements from the American Academy of Pediatrics, American College of Radiology, and the United States Centers for Disease Control and Prevention (CDC) were included. Research on child abuse is inherently limited by ethical and practical constraints, resulting in most studies being retrospective in nature.

Etiology and Pathophysiology

For nonambulatory infants, injuries such as bruising and intraoral injuries are uncommon accidental injuries.[9,10] At this developmental stage, infants have limited independent mobility and lack the coordination to generate sufficient force to cause most soft tissue injuries. Consequently, sentinel injuries (bruises, subconjunctival hemorrhages, oral injuries, and burns) should prompt careful evaluation of the reported mechanism of injury and the infant's developmental capabilities.

Bruises

Bruising is recognized as the most common sentinel injury.[2] Bruising is an uncommon finding in infants, particularly those who are not yet pulling to stand or cruising. A multicenter study examining the prevalence of bruising among infants presenting to the

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ED with medical complaints found that only 1.3% of infants aged <12 months and 0.2% of infants aged <5 months had bruising noted on physical examination.[9] In several studies, it was shown that >50% of nonambulatory infants with bruises were ultimately diagnosed with child physical abuse.[11,12] Among infants aged <6 months for whom bruising was identified, 23.3% had identified injuries on skeletal survey, 27.4% had injury on neuroimaging, and 2.7% had abdominal injuries.[11]

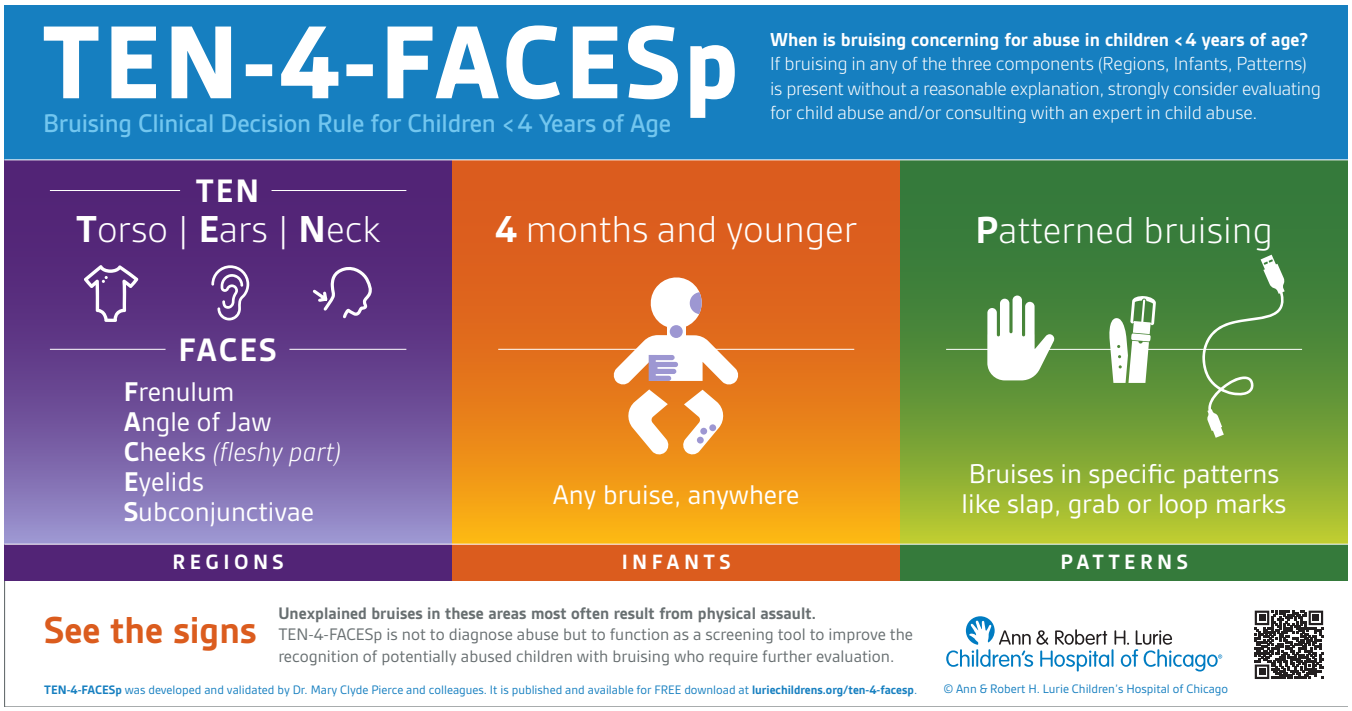
The TEN-4-FACESp clinical screening tool provides an evidence-based framework for assessing bruising patterns concerning for abuse.[13] **(See Figure 1.)** Investigators found that for children aged <4 years, bruising becomes concerning for child physical abuse if it is located on the **t**orso (including the genitals and buttocks), **e**ars, or **n**eck; if the child is aged ≤**4** months; if there are injuries to the **f**renulum, **a**ngle of the jaw, **c**heeks, **e**yelids, or **s**ubconjunctivae; or if the child has **p**atterned bruising (TEN-4-FACESp). Any injury found in this distribution should raise concern for child physical abuse and prompt further evaluation. When used, this tool demonstrates an overall 95.6% sensitivity and 87.1% specificity for detecting abuse.[13] Any bruise on an infant aged ≤4 months is highly concerning for physical abuse; recognition and action in the ED is critical.[13,14] The TEN-4-FACESp tool supports early identification, appropriate diagnostic evaluation, and timely involvement of multidisciplinary and child protection teams for children with bruising. However, a balanced clinical approach is essential, as uncommon medical conditions (eg, bleeding disorders or certain cultural practices) may occasionally present with similar findings.

Subconjunctival Hemorrhages

Subconjunctival hemorrhages are associated with a similar rate of occult injuries as bruising and should be regarded as sentinel injuries that raise concern for possible child physical abuse.[15] In a cross-sectional study of 33,990 pediatric patients presenting for ophthalmologic evaluation, only 0.4% were found to have subconjunctival hemorrhages. Among infants aged 0 to 12 months, the prevalence was even lower at 0.2%, and these cases were attributed to known trauma or ocular surface inflammation.[16] These findings indicate that subconjunctival hemorrhage in children is uncommon (particularly in those aged <1 year) and should prompt careful consideration of nonaccidental trauma when no clear medical or accidental explanation is identified.[16,17] Although more common in adults, subconjunctival hemorrhages resulting from coughing, vomiting, or straining are exceedingly rare in children aged <3 years, and the presence of subconjunctival hemorrhages in this population should heighten clinical concern for child physical abuse.[18]

For neonates, birth-related trauma should be considered as a potential explanation for an observed subconjunctival hemorrhage, which can be present for days to up to 3 weeks following delivery.[19] The

Figure 1. The TEN-4-FACESp Clinical Decision Tool



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subconjunctival hemorrhage will be present immediately following delivery, and any new subconjunctival hemorrhage that was not present at delivery remains concerning for inflicted trauma.

Oral Injuries

Oral injuries represent another form of sentinel injury frequently identified incidentally during routine oral examinations performed for a variety of clinical indications. Abusive injuries to the oral cavity may result from forceful covering of the mouth, insertion of objects, or blunt facial trauma.[20] Forceful insertion of objects such as force-feeding with a bottle or spoon, or forceful insertion of medication syringes are common causes of oral injuries. **(See Figure 2.)** A history of even minor oral bleeding in an infant should prompt careful evaluation for potential intraoral injury.[21] A retrospective secondary analysis of data from a multicenter database showed that 25% of children aged <10 years with oral injuries were found to have positive skeletal surveys, and 38% demonstrated abnormal findings on neuroimaging, indicating a high likelihood of associated occult injuries.[22] The majority of these cases were ultimately assessed as having a significant concern for physical abuse.[22]

Oral injuries frequently occur in the context of accidental trauma. Careful assessment of the child's developmental abilities, together with the caregiver's history, is important. For example, a 12-month-old who is beginning to walk independently may fall face-first into a cabinet corner or step, resulting in a frenulum injury.

Burns

Burns represent another important form of sentinel injury in young children. Scald burns are the most common type of burn injury; however, distinguishing accidental from intentional scalds can be challenging.[23-25] Burns that are more concerning for child physical abuse are those that are uniform in depth, lack splash marks, are in a glove and stocking distribution, spare the flexor surfaces, or otherwise suggest immersion types of burns.[24] Scald burns to the buttocks, perineum, or lower extremities are more commonly abusive injuries; however, these can also be accidental in nature.[23,24] Contact burns are another common type of burn injury and may be either accidental or abusive in nature. Contact burns that are sharply demarcated and/or uniform in depth raise greater concern for inflicted injury. For example, small, circular superficial burns may be concerning for cigarette burns.[25,26] Children aged <2 years are more likely to sustain abusive burns compared with accidental mechanisms.[24] Burns that raise concern for potential child physical abuse lack an adequate explanation, are not compatible with the child's developmental ability, are symmetric or patterned, or present as immersion scald burns.[26-28] Delay in seeking care can also raise concern that a burn is abusive in nature; however, there are several social factors that may contribute to delay in seeking medical attention. A retrospective chart review demonstrated that 14% of patients with abusive burns were found to have positive skeletal surveys, underscoring the potential for associated occult injury.[29] Although children with abusive burns are less likely to have positive skeletal surveys than those with bruises or subconjunctival hemorrhages, the burns themselves have a higher risk for more extensive tissue damage and long-term morbidity.[26]

Chemical burns, contact dermatitis, senna-related burns, phytophotodermatitis, and severe sunburn can all present with physical examination findings concerning for a burn without a specific history from parents regarding how the injury may have occurred. When the cause of the burn is unclear, obtaining a detailed history from the caregiver and attempting to elicit potential exposures to chemicals, laxatives, citrus fruits, or new substances can help distinguish accidental burns from nonaccidental burns.

Figure 2. A Torn Frenulum



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■ Differential Diagnosis

Injuries in infants may result from either accidental or nonaccidental mechanisms, and the presence or absence of a plausible history as well as developmental consistency are often key factors in determining whether the injury was accidental. For neonates, birth-related trauma should be considered as a potential explanation for observed findings. Similarly, birthmarks such as congenital dermal melanocytosis or nevus simplex can be mistaken for acute injury. History from caregivers as to when the lesion was first noticed can guide the level of concern. Bleeding disorders, coagulopathies, metabolic diseases, and

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genetic disorders should be included in the differential diagnosis, although these conditions are rare.[30,31] Evaluation of these rarer conditions should be guided by a child abuse pediatrician, if available. If no child abuse pediatrician is available, geneticists, pediatric hematologists, or general pediatricians can provide insight for further evaluation.

Prehospital Care

Sentinel injuries are often first identified in the primary care setting and may be subsequently referred to the ED for further evaluation.[12] Effective communication between primary care and ED clinicians is essential. Timely sharing of information regarding prior concerns or documented injuries may help prevent missed opportunities for early recognition and intervention in cases of potential abuse. When prompted, caregivers may provide photographs of prior injuries or recall a history of previous injuries.

Sentinel injuries are clinically minor in nature, so emergency medical services (EMS) involvement is uncommon. However, in cases in which EMS is called, their observations can offer valuable contextual information regarding the home environment, including potential concerns relating to intimate partner violence or illicit drug use or manufacturing in the home. EMS staff are mandated reporters and should report any concerns to Child Protective Services.

Emergency Department Evaluation

Sentinel injuries are frequently identified incidentally; infants presenting to the ED with sentinel injuries may exhibit a wide range of chief complaints. A thorough history and physical examination are essential to guide the level of concern and determine the need for further diagnostic evaluation.

Nonambulatory infants, typically aged <6 months, are at the highest risk for abuse. Developmental ability varies substantially between 6 and 12 months, and an infant's developmental stage plays a critical role in assessing the plausibility of reported injury mechanisms.

History

Obtaining a thorough and objective history from parents or caregivers is a critical component of evaluating potential sentinel injuries. The history should be obtained using a neutral, nonaccusatory tone asking open-ended questions when feasible. Any injury found incidentally on physical examination should be discussed. The reported mechanism, timing, and progression of any injury and how the caregiver knows the reported mechanism occurred (eg, if it was visually witnessed by the caregiver, heard by the caregiver, or based on presumptive history) should be elicited and documented. Witnesses to the event are helpful to report for corroboration if Child Protective Services or law enforcement become involved in the case. Inconsistencies in the history, vague explanations, or large differences between caregivers' histories, as well as discrepancies between the reported history and the infant's developmental abilities, should heighten concern for possible child physical abuse.

A review of prior medical encounters, within the institution or seen on electronic medical records, can provide valuable context, helping identify patterns of repeated visits or injuries that may suggest ongoing maltreatment. Frequent ED utilization has been associated with higher rates of abuse.[32-34] A retrospective chart review of 26 infants admitted for abusive head trauma found the majority of parents had previously contacted a medical provider due to concerns of excessive crying prior to the admission.[35] Similarly, a significant association was observed between previous medical visits for infant distress and subsequent encounters for child physical abuse.[36]

While maintaining objectivity during history-taking is essential, caregiver attitudes and descriptions of the child can also provide insight. Infants who were described negatively by parents or whose parents demonstrated an unrealistic developmental expectation have been shown to have a higher incidence of abuse than infants who were described positively by their caregivers.[37] While this aspect of the history may be helpful, it should not be used exclusively to determine risk for abuse.

Accurate and objective documentation of the history provided by caregivers is essential, particularly if Child Protective Services or law enforcement become involved. Noting who was present during the history-taking, whether a language interpreter was offered or utilized, and using quotation marks when directly citing the caregiver enhances clarity and the reliability of the documentation.

Physical Examination

A comprehensive skin examination should be completed for all infants presenting to the ED as part of routine screening for possible child physical abuse. Although a full examination may initially seem invasive, studies have shown that parents generally support a complete head-to-toe assessment for children aged <2 years as a screening tool for abuse.[38] Because sentinel injuries may appear subtle or minor **(see Figure 3 and Figure 4, page 7)**, a meticulous and systematic examination is essential. While detailed written documentation is important, photographic documentation of all identified injuries provides an objective record and serves as a vital component in any subsequent child abuse investigation.[39] In addition, photographs can assist in differentiating true injuries from birthmarks or other benign lesions, providing further clarity and objectivity in the evaluation.

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Diagnostic Studies

There is currently significant variability in the evaluation of children for whom physical abuse is suspected.[40] Although several efforts have been made to develop consensus statements based on expert opinion, establishing standardized protocols has been challenging.[41] Some individual hospital systems have successfully implemented institutional protocols to improve consistency in the assessment of children with suspected physical abuse and in an effort to decrease implicit bias in these evaluations.[42,43] Despite variability in evaluation practices, imaging and laboratory studies remain essential components in the assessment of children with sentinel injuries, as occult injuries are frequently identified in this population.[44-46] **See Table 1** for a summary of recommended laboratory and imaging studies for infants aged <1 year with an injury concerning for physical abuse.

While the initial injuries may appear minor and prompt hesitation to pursue an extensive workup, evidence suggests that up to half of infants aged <6 months who present with a sentinel injury have underlying occult fractures or intracranial injury.[44-47] This reinforces the importance of maintaining a low threshold for a comprehensive evaluation when assessing infants with seemingly minor injuries.

Laboratory Studies

Initial laboratory evaluation in the ED can be tailored to the specific injury type identified. However, all infants presenting with any type of sentinel injury should be screened for occult abdominal trauma using serum aspartate aminotransferase (AST), alanine aminotransferase (ALT), amylase, and lipase levels,

Figure 3. Ear Bruising



Pinna bruising suggestive of physical abuse. The presence of petechiae is a concerning feature.

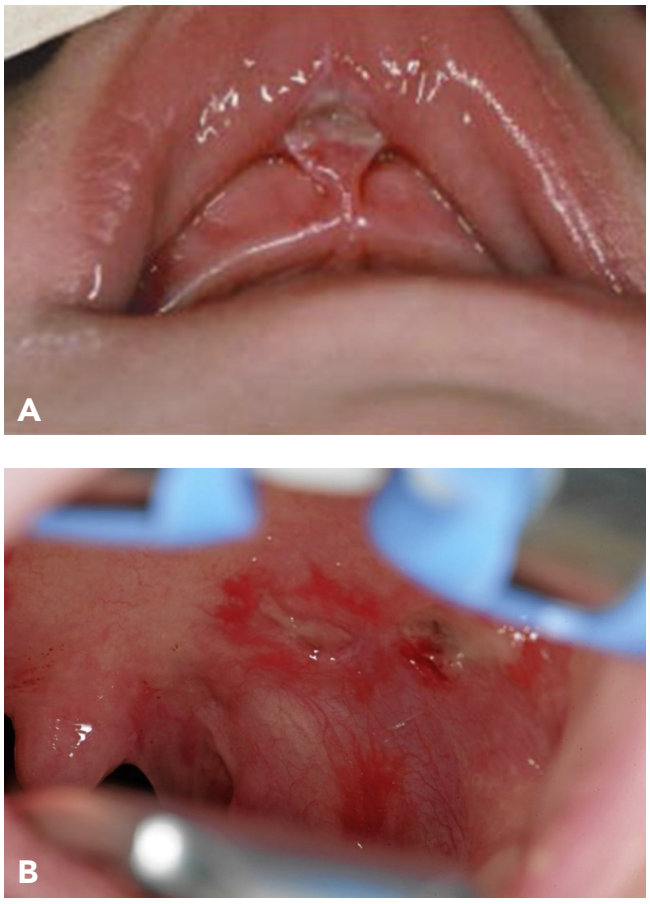
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Table 1. Diagnostic Studies for Assessment of Occult Injuries in Infants With an Injury Concerning for Physical Abuse

Laboratory Studies	Imaging Studies
• Liver enzymes (aspartate aminotransferase, alanine aminotransferase) • Pancreatic enzymes • Complete blood cell count[a] • Coagulation studies[a] • Urinalysis[a] • Urine drug screen[a]	• Skeletal survey • Noncontrast head computed tomography[b] • Abdominal and pelvis computed tomography[c]

[a]See discussion in the "Laboratory Studies" section; may not be indicated or necessary for all patients.
[b]Recommended for all children aged <6 months; strongly consider for children aged 6 to 12 months.
[c]Recommended if a relevant abnormality of abdominal laboratory studies is found.

Figure 4. Infant Oral Injuries Suggestive of Abuse



A. A torn frenulum with the presence of slough, suggesting the injury is recent.
B. Lacerations to the soft palate caused by forced insertion of an object into the mouth. Note the presence of slough.

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with abnormal thresholds defined as AST >80 U/L, ALT >70 U/L, amylase >90 U/L, and lipase >50 U/L.[48,49] Urinalysis may also be performed to assess for hematuria as a potential indicator of renal or urinary tract injury. Recent studies suggest that urinalysis has limited additional utility, as patients with hematuria consistent with abdominal injury also demonstrated elevated liver or pancreatic enzyme levels.[50,51]

For infants presenting with bruising or found to have an intracranial hemorrhage, complete blood cell count, prothrombin time, activated partial thromboplastin time, von Willebrand factor antigen, von Willebrand factor activity, factor VIII level, and factor IX level should be obtained to evaluate for a bleeding disorder as the etiology for bruising.[31] For infants with intracranial hemorrhage with neurologic compromise, D-dimer and fibrinogen should also be obtained.[31]

Laboratory screening for illicit substances may be considered, particularly when there is concern for caregiver substance use, as this places the infant at increased risk for physical abuse and/or neglect.[52,53]

Imaging Studies

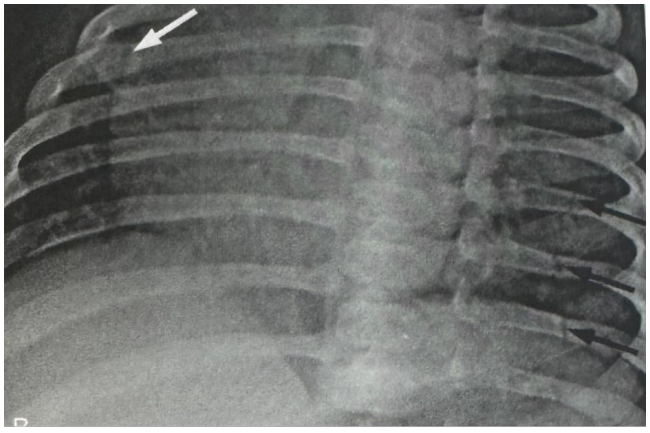
When there is a concern for physical abuse, a skeletal survey should be performed for all children aged <2 years.[54,55] Specifically, infants presenting with sentinel injuries should be screened with a skeletal survey, since occult fractures are common.[44-46] **(See Figure 5.)** A skeletal survey should include frontal and lateral views of the skull; lateral views of the cervical and thoracolumbar spine; single views of the long bones, hands, feet, chest, and abdomen; and oblique views of the ribs.[56] A "babygram" is not sufficient for screening for occult fractures, due to its limited sensitivity for subtle or early injuries.

Noncontrast head computed tomography (CT) should be completed for all infants aged <6 months with suspected physical abuse, since there is a high incidence of occult intracranial injury.[5,11,57-59] **(See Figure 6.)** For infants aged 6 to 12 months, noncontrast head CT should be strongly considered, particularly for those with facial bruising or intraoral injuries, as these patients are at higher risk for underlying intracranial injury.[5,11,22] The Pediatric Emergency Care Applied Research Network (PECARN) rules are less sensitive in child physical abuse cases and should not be used when determining the need for head CT.[60]

Management Considerations

Sentinel injuries are inherently minor and often do not require treatment. Medical management should focus on identifying and treating occult injuries and ensuring the child's safety.

Figure 5. Multiple Acute and Healing Rib Fractures on X-Ray



A 3-month-old with a facial bruise was found to have multiple rib fractures, both acute (black arrows) and healing (white arrow).
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Figure 6. Parenchymal Hemorrhage on Head Computed Tomography



A 5-week-old infant presented to the emergency department with "breathing problems" and lethargy. The patient was found to have a bruise on the abdomen. Head computed tomography was completed and showed a parenchymal hemorrhage (arrow).
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Reporting

In the United States, all clinicians are mandated reporters to Child Protective Services and/or law enforcement, and they are legally required to report any suspected child abuse.[61] Familiarity with the specific reporting laws in the state in which you practice is essential, since requirements and procedures vary regionally. (See the World Population Review website for more information on reporting laws by state, available at: https://worldpopulationreview.com/state-rankings/mandatory-reporting-laws-by-state)

Despite this legal obligation, not all suspected cases of child abuse are reported.[62] Multiple barriers to reporting have been identified. Clinicians may be uncertain whether a case is truly abuse, have concern regarding personal anonymity and confidentiality, or experience confusion regarding the reporting process.[63,64] In addition, lack of feedback or follow-up from Child Protective Services can discourage reporting.[64] While these barriers are understandable, conducting a thorough evaluation of infants with sentinel injuries, including timely involvement of Child Protective Services and/or law enforcement for concerns of abuse or neglect, is critical.[65] Reporting is warranted when there is reasonable suspicion for abuse and/or neglect; definitive proof is not required.

Injuries that are considered severe, such as intracranial hemorrhage or fractures, are more likely to be reported to Child Protective Services.[62] When initial injuries such as bruises, subconjunctival hemorrhages, oral injuries, or burns are concerning for child physical abuse and subsequent laboratory and imaging evaluations are negative for occult injury, the initial injury itself remains concerning and must still be reported to Child Protective Services or law enforcement.

Cost

Although a comprehensive evaluation for suspected abuse may seem costly and resource-intensive, the economic burden of child maltreatment is substantial. Based on CDC incidence data from 2015, the estimated lifetime cost per victim of nonfatal child abuse is between $210,012 and $830,928, and the cost associated with fatal cases was estimated to be between $1.3 million and $16.6 million.[66] The discrepancy is driven by the application of value per statistical life methodology, which includes the economic impact of lost future productivity in fatal cases. The total economic burden of child maltreatment in the United States in 2015 was estimated to exceed $2 trillion.[66] Although this represents the most recent national estimate, the present-day economic burden is likely considerably higher due to inflation and rising healthcare costs since 2015.

These estimates do not account for the long-term personal and societal costs associated with child abuse, including reduced economic productivity, mental health sequelae, and increased healthcare utilization among adults with a history of childhood maltreatment.[67,68] Recognizing the economic and public health impact highlights the importance of early identification and intervention, even when initial injuries appear minor.

Special Populations

Children with developmental delays and disabilities are significantly more likely to be victims of abuse.[69-71] Developmental ability should be assessed in the history and physical examination, since workup should be completed to match the developmental age of the patient.[10] For example, a 4-year-old nonverbal child who is bed-bound and cannot sit unsupported or roll in either direction should be evaluated similarly to an nonambulatory infant, since that is their developmental age. If this 4-year-old presented with a forehead bruise, with no reasonable or developmentally plausible history of trauma to explain this finding, it would be concerning for child physical abuse and would warrant laboratory and imaging workup for potential occult injuries.



5 Things That Will Change Your Practice

1. Any bruising on a nonambulatory infant, found incidentally or as part of the chief complaint, with no clear and corroborated explanation is concerning for child physical abuse.
2. Always perform a full skin and intraoral examination on nonambulatory infants who present to the ED, regardless of the presenting chief complaint.
3. Document all physical examination findings and provide an unbiased account of the caregiver's history in both the medical record and in communication with Child Protective Services and/or law enforcement.
4. Any child aged <2 years with injuries concerning for child physical abuse should undergo an occult injury evaluation including laboratory and imaging studies.
5. Injuries concerning for child physical abuse should be reported to Child Protective Services and/or law enforcement, even if laboratory and imaging studies for occult injuries return negative.

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Case Conclusions

CASE 1

For the 9-week-old girl who presented with constipation and fussiness and was found to have a subconjunctival hemorrhage...

Since the subconjunctival hemorrhage was deemed minor and assumed to be caused from straining to stool, no laboratory or imaging workup was performed in the ED. A Child Protective Services referral was not placed, and the infant was discharged home to the parents. Three weeks later, the infant presented via emergency medical services in full arrest. She was found to have acute-on-chronic subdural hemorrhages, retinal hemorrhages, and rib fractures at various stages of healing. The patient was transferred to a children's hospital where she eventually progressed to brain death.

CASE 2

For the 4-month-old infant who presented with fever and fussiness and was found to have a frenulum tear...

The boy had a full laboratory and imaging evaluation in the ED for concern for child physical abuse. He was found to have 3 posterior rib fractures, a distal femur classic metaphyseal lesion, and a parietal skull fracture on skeletal survey. Head CT showed the parietal skull fracture with no intracranial abnormalities. Laboratory workup was unremarkable. Child Protective Services was contacted, and the patient was discharged to his grandparents.

CASE 3

For the 7-week-old who presented with fussiness and was found to have a bruise on her abdomen...

A skeletal survey was completed and was negative. Head CT was completed and was within normal limits for the patient's age. Laboratory evaluation, including coagulation studies, AST, ALT, lipase, amylase, and urinalysis, were unremarkable. Since the infant was immobile and the abdomen was an atypical area to sustain accidental bruising, you called a referral in to Child Protective Services and informed them that the bruise on the abdomen was concerning for child physical abuse. Child Protective Services responded to the ED to develop a safety plan with the parents prior to discharge.

Controversies and Cutting Edge

Overreporting and underreporting child abuse to Child Protective Services remains a challenge in the ED and primary care settings. Studies have shown that children from Black or Hispanic families are disproportionately reported to Child Protective Services, even when presenting with injuries similar to those of White children.[72-76] Similarly, children from higher socioeconomic backgrounds are reported to Child Protective Services significantly less than children from lower socioeconomic backgrounds.[76,77] These disparities reflect structural inequities within the healthcare system and highlight the need for a uniform evaluation protocol for children presenting with suspected child physical abuse.[78,79]

Disposition

When managing infants with sentinel injuries, consultation with a child abuse pediatrician or child protection medical team, when available, is strongly recommended to guide disposition and follow-up plans.[80,81] For infants who have negative laboratory and imaging workup for occult injuries, discharge home may be appropriate only if a safe discharge plan can be established with the support of Child Protective Services. Although the workup may be negative, the presence of a sentinel injury itself is concerning for physical abuse, and returning an infant to the same environment without appropriate interventions is associated with a risk for additional injuries.[5-8] Collaboration with Child Protective Services to ensure a safe discharge plan is essential.

A repeat skeletal survey should be obtained 10 to 14 days after the initial skeletal survey, since acute fractures can be missed on initial imaging.[82-85] The yield of follow-up skeletal surveys has been shown to vary considerably, with newly identified findings reported in 8.5% to 21.5% of cases.[82,83,85] When a child abuse pediatrician or child protection medical team is involved, they can assist in arranging follow-up imaging and coordination with Child Protective Services. In settings in which child abuse pediatricians or child protection medical teams are unavailable, transfer to a children's hospital for a higher level of care should be considered.

For infants with occult injuries, disposition will depend largely on the severity of the injury/injuries. Early and ongoing communication with Child Protective Services, along with consultation from child abuse pediatricians, is key to ensure appropriate management and discharge planning.

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Risk Management Pitfalls for Emergency Department Management of Infants With Sentinel Injuries

1. **"An 11-month-old was brought in for right arm pain and was found to have bruises on the right forehead and right arm after being left unsupervised for 5 to 10 minutes on the living room floor. While he was in the ED, he was not moving much; he would not sit unsupported and did not crawl or roll around the gurney. I assumed it was because he was in pain."** It is important to elicit details regarding the child's developmental abilities. While some children are ambulatory at this age, this injury would be concerning in an 11-month-old infant who is significantly delayed and cannot roll or sit unsupported. Injuries in such children would be concerning for physical abuse, since those who do not cruise rarely bruise.

2. **"The 5-week-old boy came in for vomiting. I thought a focused physical examination was enough, so I didn't do a full skin evaluation."** Every infant presenting to the ED should have a full physical examination, since these patients are unable to communicate what may be occurring.

3. **"The 9-week-old infant had a few bruises on her shins, but I didn't think it was a big deal. Kids get bruises all the time."** Any bruise on a nonambulatory infant (typically those aged ≤4 months) is concerning for child physical abuse and warrants a thorough evaluation.

4. **"The mother brought her 6-month-old son in with a scald burn. The mother also had burns to her body and bruising to her face and neck. I thought the history of hot water falling onto the mother and infant was a plausible explanation, so I didn't ask further questions."** Signs of intimate partner violence such as bruising, injuries to the caretaker and infant, or not allowing another caretaker to speak or be alone with the clinician should be addressed in the ED, since they are risk factors for child physical abuse.

5. **"I called Child Protective Services, and they indicated that they would respond immediately to the ED to see the 5-week-old with a facial bruise. The bruise was really small, and we needed the bed space, so I discharged the child to the parents and thought Child Protective Services could follow up at the home instead."** This is not a safe discharge plan. Waiting for Child Protective Services or law enforcement to respond to the bedside when they are requesting to do so will increase the length of stay, but it is important in developing a safe discharge plan.

6. **"The 7-week-old infant had a subconjunctival hemorrhage. The parents were so nice and cooperative, and the injury was so minor, I didn't think it was necessary to do the rest of the workup or call Child Protective Services."** Any infant with a concerning injury should have a full workup and Child Protective Services referral. Bias toward the parents' race, demeanor, or socioeconomic status should not play a role in this decision.

7. **"Child Protective Services was here and wanted to discuss a case that I called in 3 weeks ago. I couldn't remember the details, and there was minimal information in the documentation."** Child Protective Services and law enforcement are likely to request medical documentation following an ED visit for concern for child physical abuse, along with an interview of the clinician. Accurate and complete documentation of the history provided by the caregivers, physical examination findings, and pertinent negatives and positives are the gold standard for good medical practice and are important to investigative agencies, should they become involved. Photographic documentation is also helpful when dealing with visible injuries.

8. **"The family comes in often with their 4-month-old. I thought the mother was just anxious, so I just got a brief history and did a focused physical examination."** Frequent ED visits are common in children who are eventually diagnosed with physical abuse. Thorough physical examination of all infants presenting to the ED is critical to not miss injuries.

9. **"The 10-week-old baby had a bruise to the abdomen. I obtained a skeletal survey, head CT, and laboratory evaluation. They were all negative. There was no need to call Child Protective Services for just a bruise."** The initial injury was concerning for physical abuse, and therefore, reportable to Child Protective Services and/or law enforcement.

10. **"Last time I called Child Protective Services for an infant with a subconjunctival hemorrhage they did nothing about it, so I'm not going to call this time."** Clinicians are mandated reporters and are responsible for reporting all injuries concerning for child physical abuse to Child Protective Services and/or law enforcement, regardless of previous responses.

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Summary

Sentinel injuries are seemingly minor injuries that may serve as a warning sign for child physical abuse. Injuries accompanied by vague or implausible explanations require a comprehensive laboratory and imaging evaluation along with referral to Child Protective Services and/or law enforcement. Failure to recognize and appropriately address sentinel injuries can result in missed opportunities for early intervention of child physical abuse and potentially devastating outcomes.

Time- and Cost-Effective Strategies

- When available, early consultation with a child abuse pediatrician or child protection medical team to guide management and potential transfer to a children's hospital can decrease repeated laboratory and imaging studies and streamline the care of an infant.
- Evaluation and identification of sentinel injuries and appropriate intervention can prevent escalating abuse and the costs associated with more severe and fatal forms of child maltreatment.

References

Evidence-based medicine requires a critical appraisal of the literature based upon study methodology and number of subjects. Not all references are equally robust. The findings of a large, prospective, randomized, and blinded trial should carry more weight than a case report.

To help the reader judge the strength of each reference, pertinent information about the study will be included in bold type following the reference, where available. In addition, the most informative references cited in this paper, as determined by the authors, are noted by an asterisk (*) next to the number of the reference.

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CME Questions

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1. **Using the TEN-4-FACESp clinical decision rule, which bruise found incidentally on physical examination is the most concerning for suspected child physical abuse?**
   a. A single bruise on the shin of a 10-month-old infant who is cruising around the gurney
   b. A bruise on the fatty aspect of the cheek of a 3-month-old infant who is unable to roll
   c. A bruise on the knee of a 14-month-old infant who is just learning to walk
   d. A bruise on the forehead of a toddler who is running around the examination room

2. **Which of the following statements regarding subconjunctival hemorrhages in infants is TRUE?**
   a. They are common benign findings in infants aged <1 year.
   b. They can be caused by coughing, crying, or straining in infants.
   c. They are rare in infants and may be sentinel injuries.
   d. They do not require further evaluation.

3. **Which of the following histories is the most concerning in a child presenting with an upper labial frenulum tear?**
   a. A 2-year-old boy who tripped while running, falling onto concrete
   b. A 5-month-old who hit her mouth with a bottle while trying to feed
   c. A 10-month-old who pulled to stand and fell, striking her face on a coffee table
   d. A 10-day-old infant who presented with bleeding following a frenotomy

4. **A 7-month-old boy presents with bilateral lower extremity scald burns with a clear line of demarcation. The mother states that the child pulled a pot of hot water over his legs. The patient is medically stable for discharge. What is the next best step?**
   a. Discharge home with instructions to follow up with the child's pediatrician in 3 to 4 days.
   b. Discharge home with instructions to follow up with burn surgery in 2 to 3 days.
   c. Obtain a skeletal survey and call Child Protective Services only if there is an identified fracture.
   d. Initiate a full workup for child physical abuse (laboratory studies, skeletal survey, and head computed tomography [CT]), and call in a Child Protective Services and/or law enforcement report.

5. **When documenting suspected child physical abuse, which of the following would allow for the best communication between the medical and legal teams?**
   a. Describing the injury using objective language and providing caregivers' history using quotes
   b. Using subjective descriptors for the physical examination such as "appears abusive"
   c. Avoiding the mention of any caregiver history, to prevent bias
   d. Summarizing the findings without many details or a photograph of the injury

6. **A 5-week-old infant presents for fussiness. On examination, you identify 3 round bruises on the right thigh. What imaging is indicated?**
   a. Right femur x-ray
   b. Right pelvis, femur, tibia fibula, and foot x-ray
   c. Skeletal survey
   d. Skeletal survey and noncontrast head CT

7. **You are seeing a 10-week-old boy with a subconjunctival hemorrhage. Following a complete laboratory and imaging workup, there are no occult injuries found. What is the best next step?**
   a. Discharge with instructions to follow up with the child's pediatrician in 2 to 3 days.
   b. Discharge with instructions to return for a repeat skeletal survey in 10 to 14 days.
   c. Place a referral to Child Protective Services and/or law enforcement to arrange a safe discharge plan.
   d. No further action is needed, since no injuries were found on laboratory or imaging studies.

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8. **A 3-year-old bed-bound, tracheostomy- and gastrostomy-dependent boy presents for increased secretions. On examination, you find bruising to the bilateral upper extremities. What workup, if any, is required for suspected child physical abuse?**
   a. No workup is required, since bruising is a common finding in this patient population, and therefore, not concerning for child physical abuse.
   b. No workup is required, since the child is aged >2 years.
   c. Only laboratory workup is required. Imaging is not indicated, since the child is aged >2 years.
   d. Laboratory workup and a skeletal survey are required, since the child is developmentally delayed and unlikely to have unexplained bruising.

9. **Which of the following is an effective strategy to reduce racial and socioeconomic bias in the medical evaluation of children with sentinel injuries?**
   a. Rely on clinical intuition when deciding whether to report.
   b. Implement standardized, evidence-based occult injury guidelines.
   c. Limit reporting to only severe injuries.
   d. Delegate the decision to report to another member of the care team.

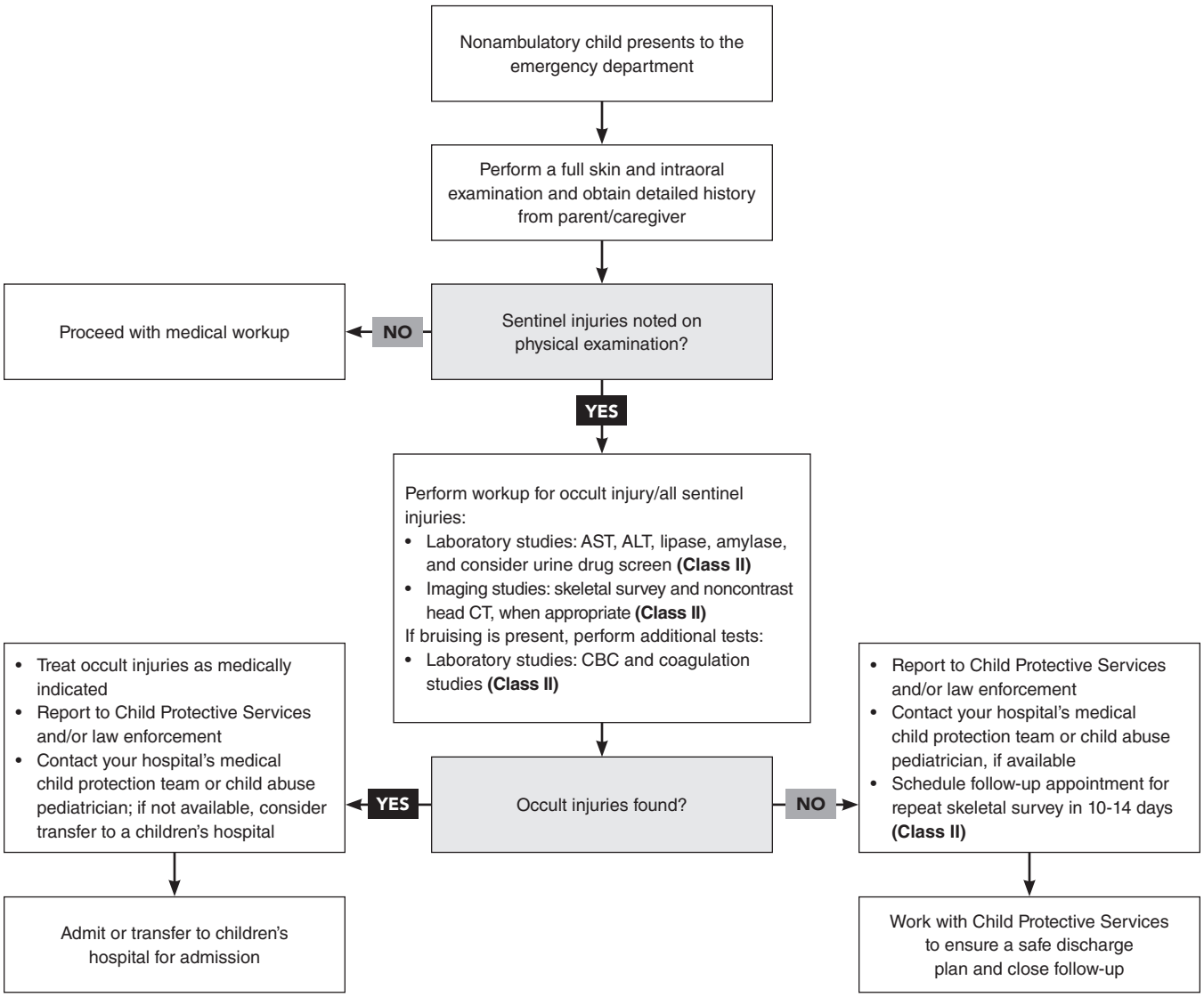
10. **What is the recommended timeline for a follow-up skeletal survey in infants evaluated for abuse?**
   a. Within 24 hours of the initial survey
   b. 3 to 5 days following the initial survey
   c. 10 to 14 days following the initial survey
   d. 21 to 30 days following the initial survey



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Clinical Pathway for Emergency Department Management of Infants With Sentinel Injuries

Click or scan for interactive pathway



Abbreviations: ALT, alanine aminotransferase; AST, aspartate aminotransferase; CBC, complete blood cell count; CT, computed tomography.

Class of Evidence Definitions

Each action in the clinical pathways section of *Pediatric Emergency Medicine Practice* receives a score based on the following definitions.

Class I
- Always acceptable, safe
- Definitely useful
- Proven in both efficacy and effectiveness

Level of Evidence:
- One or more large prospective studies are present (with rare exceptions)
- High-quality meta-analyses
- Study results consistently positive and compelling

Class II
- Safe, acceptable
- Probably useful

Level of Evidence:
- Generally higher levels of evidence
- Nonrandomized or retrospective studies: historic, cohort, or case control studies
- Less robust randomized controlled trials
- Results consistently positive

Class III
- May be acceptable
- Possibly useful
- Considered optional or alternative treatments

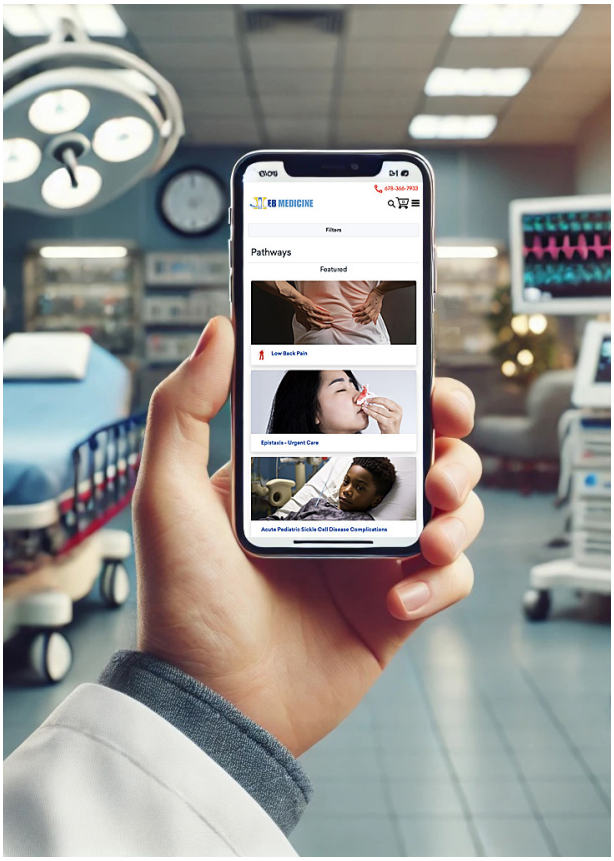
Level of Evidence:
- Generally lower or intermediate levels of evidence
- Case series, animal studies, consensus panels
- Occasionally positive results

Indeterminate
- Continuing area of research
- No recommendations until further research

Level of Evidence:
- Evidence not available
- Higher studies in progress
- Results inconsistent, contradictory
- Results not compelling

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.
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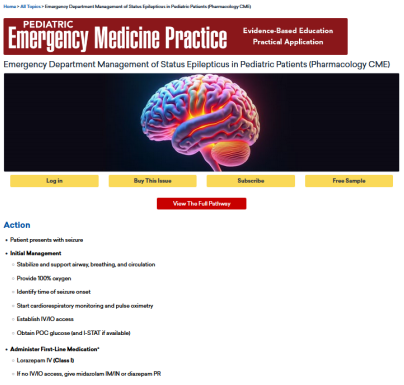
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QUICK READ

Points & Pearls

MAY 2026 | VOLUME 23 | ISSUE 5

Emergency Department Management of Sentinel Injuries in Infants

Points

- Nonambulatory infants have limited independent mobility and lack the coordination to generate sufficient force to cause most soft tissue injuries.
- Sentinel injuries in nonambulatory infants should prompt careful evaluation of the reported mechanism of injury and the infant's developmental capabilities.
- Caregivers' explanations for injuries should be assessed for developmental plausibility, since mechanisms that are inconsistent with an infant's developmental abilities should raise concern for child physical abuse.
- Children with developmental delays or disabilities should be evaluated based on their developmental age rather than chronological age, since injuries inconsistent with their abilities may indicate potential child physical abuse.
- Documentation of the caregivers' history, including timing, reported mechanism, and whether the event was witnessed or inferred, is critical for medical and legal evaluation.
- Screening for social risk factors, including intimate partner violence and illicit drug use or manufacturing in the home, may provide important context of exposure in the evaluation of suspected abuse.
- Review of electronic medical records may expose previous injuries or patterns concerning for child physical abuse.
- A complete physical examination of all infants presenting to the emergency department is essential for identifying sentinel injuries.
- Even when injuries appear concerning, alternative explanations such as bleeding disorders, dermatologic conditions, or cultural practices should be considered.
- The TEN-4-FACESp clinical decision rule can help identify bruising patterns concerning for abuse.[13] **(See Figure 1.)**
- Noncontrast head computed tomography should be considered for infants presenting with sentinel injuries, particularly those with facial or intraoral injuries, since occult intracranial injuries may be present.[11,22,57-59]

Pearls

- Sentinel injuries may represent the earliest warning signs of child physical abuse. These injuries can precede more severe forms of abuse, and recognition may provide a critical opportunity for clinicians, Child Protective Services, and/or law enforcement to intervene before escalation.
- Injuries in nonambulatory infants should raise concern for potential abuse. Bruising, subconjunctival hemorrhages, oral injuries, and burns are uncommon in nonambulatory infants and should prompt careful history, physical examination, and further evaluation when indicated.
- Occult injuries are frequently identified in infants undergoing evaluation for a sentinel injury. Fractures, intracranial hemorrhage, or intra-abdominal trauma may be present despite minimal external findings. Appropriate imaging and laboratory evaluation are essential to detect these injuries.[44-46] **(See Table 1.)**

- Uniform protocols should guide reporting of suspected child physical abuse, as race and socioeconomic factors can influence overreporting or underreporting.[78,79]
- Early involvement of child abuse pediatricians, medical child protection teams, or social workers can facilitate efficient evaluation, documentation, and coordination with Child Protective Services and/or law enforcement.[80,81]
- Discharge planning should include coordination with Child Protective Services and/or law enforcement, as well as communication with outpatient clinicians to ensure appropriate follow-up care.
- When the initial evaluation for occult injury is negative but concern regarding the sentinel injury remains, close follow-up and reassessment are important, since some injuries or patterns of abuse may evolve over time.
- Repeat skeletal surveys obtained 10 to 14 days after the initial study can reveal fractures that were initially not visible.[82-85]

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