

IMPROVING CHILD PHYSICAL ABUSE DETECTION & REDUCING DISPARITIES WITHIN AND BETWEEN HOSPITAL SETTINGS

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EXECUTIVE SUMMARY

Nearly 5,000 children are hospitalized and more than 670 die each year in the United States as a result of abusive injuries.^{1,2} Unfortunately, as many as one-third of young children diagnosed with an abusive injury had prior medical visits during which a provider could have detected their abuse but didn't—representing missed opportunities for intervention and possible protection from further harm.^{3–10}

Child abuse can be especially difficult to identify and diagnose in young, preverbal children, so the American Academy of Pediatrics (AAP) recommends providers perform a skeletal survey to identify occult (hidden) fractures in all children under age 2 with injuries that raise concerns for physical abuse.^{11–13} Little is known, however, about the interpretation and implementation of these recommendations in the hospital setting. A health care provider's decision to screen for occult fractures is likely not dependent solely on the characteristics of a child's injury, but also the clinician's perceptions of the likelihood of abuse occurring in the child's household. This risks creating disparities in care, particularly related to race and socioeconomic status (SES).

In reviews of pediatric and general hospital data from across the U.S., PolicyLab research found uneven use of skeletal surveys to evaluate for additional occult injuries among young injured children. There were significant differences with regards to race and SES, as well as variation across different hospital settings. This raises

concern for potential overevaluation for physical abuse in some youth presenting with lower risk (which can lead to negative outcomes such as unnecessary stress and medical costs) and underevaluation in other children presenting with higher-risk injuries (which could lead to missed cases of abuse). These findings highlight the need to improve our ability to detect and address child abuse for all children, and have led PolicyLab researchers to develop, implement and evaluate patient-specific clinical guidelines for occult injury screening.^{14–16}

This *Evidence to Action* brief reviews the data on disparities in child abuse evaluation in the hospital setting, reports the results of current efforts to address this critical issue, and proposes specific recommendations for health care systems and hospital administrators. We also provide recommendations to policymakers, researchers, and funders of health research to improve the evaluations for child physical abuse, decrease disparities and protect children who have been abused from further harm.



BACKGROUND

Each year, nearly 120,000 children in the U.S. are known by Child Protective Services (CPS) to be victims of physical abuse.² Almost 5,000 of these children are hospitalized and more than 600 die from their injuries.^{1,2} Young children, particularly infants under age 1, have the highest incidence of hospitalizations and deaths due to abusive injuries.^{1,17} Many children who have been abused suffer from severe injuries that can have a lasting impact, such as permanent brain damage.^{1,17,18} Children who recover from their physical injuries may still face long-term health consequences of their abuse, with increased risk of physical and mental health problems, including premature death.^{19–22}

Figure 1

MISSING OPPORTUNITIES CAN LEAD TO FURTHER HARM

The clinical diagnosis of abuse is **missed** in roughly

20–30%

of young children presenting for care of abusive injuries.^{3–10}

As a result, children suffer from

**ongoing abuse,
including fatal abuse.**



Accurate, timely diagnosis of physical abuse is key to preventing repeated and escalating abuse. However, nearly 1 in 3 young children diagnosed with an abusive injury had previous primary care, emergency department, or specialty care visits during which there was a missed opportunity to diagnose abuse and intervene to protect the child from further harm (Figure 1).^{3–10} It can be especially difficult for providers to identify child abuse in young children who cannot yet communicate as the history provided by the caregiver can be unreliable. In addition, young preverbal children can have significant internal injuries that providers could miss on physical examination.

Young victims of physical abuse frequently have undocumented occult, or hidden, injuries, including bone fractures, which are not detected by a physical examination. An important tool used to detect occult fractures is the skeletal survey, a series of x-rays of the entire body.^{11,12} The AAP recommends performing a skeletal survey on all children under age 2 who are suspected victims of physical abuse.^{11,13}

Unfortunately, there are significant disparities and variation around which young injured children are considered to be suspected victims of physical abuse and evaluated with a skeletal survey, often based on race and socioeconomic status. National studies suggest that this is an issue in hospitals and medical practices across the country.²³ These findings prompted us to develop clinical guidelines for the use of skeletal surveys, implement a clinical decision pathway at Children's Hospital of Philadelphia (CHOP) and evaluate it to determine the most successful methods for equitable implementation of the recommended care.



Skeletal Surveys

Child abuse can be difficult to identify and diagnose, especially in young, preverbal children who are unable to tell anyone they are being harmed. Thus, health care providers should perform a thorough evaluation when young children present with injuries that may be from abuse.

The **skeletal survey**, a series of x-rays of the entire body, is a key component of this evaluation. The skeletal survey can reveal **occult fractures**, fractures not otherwise detected based on the medical history taken or the physical examination.^{11,12} Up to 1 in 4 children under age 2 evaluated with a skeletal survey due to a suspicion for abuse are found to have occult fractures, with rates as high as 1 in 3 among those ultimately diagnosed with abuse.^{24–29} Identifying occult fractures can confirm suspicion of abuse and sometimes provide additional information on the timing of the injury.^{11,12} In addition, some fractures identified may require treatment.

Studies have shown that radiation risk from skeletal surveys is low.³⁰ While recognizing that providers and families want to minimize exposure to radiation, this should not be an overriding concern in determining whether to conduct skeletal surveys.



WHAT OUR RESEARCH SHOWS US

PolicyLab researchers examined data from 1997 to 2013 on the use of skeletal surveys to evaluate for suspected physical abuse in young injured children seen at CHOP and pediatric and general hospitals across the country. We not only confirmed the presence of racial and socioeconomic disparities in care, but we also identified tremendous variation in skeletal survey use across hospitals, despite the AAP recommendation to perform a skeletal survey on all suspected victims of child physical abuse.

≠ THERE ARE SIGNIFICANT RACE- AND SOCIOECONOMIC STATUS-BASED DISPARITIES IN SCREENING FOR CHILD ABUSE AT PEDIATRIC HOSPITALS

👤 THERE IS SIGNIFICANT VARIABILITY IN THE USE OF SKELETAL SURVEYS AT CHILDREN'S HOSPITALS

H THERE IS EVEN GREATER VARIABILITY IN THE USE OF SKELETAL SURVEYS AT GENERAL HOSPITALS

📊 CLINICAL DECISION SUPPORT TOOLS ARE BENEFICIAL

🔄 CONTINUOUS QUALITY IMPROVEMENT IS NEEDED



Strengths and Limitations of AAP Recommendations on the Use of Skeletal Surveys

The AAP recommends performing a skeletal survey on all children under age 2 who are suspected victims of physical abuse.^{11,13} The AAP provides practitioners with guidance on histories, physical exam findings and injuries that may suggest abuse.

AAP indications for obtaining a skeletal survey include:³¹

- All children under 2 years with obvious abusive injuries
- All children under 2 years with any suspicious injury, including:
 - Bruises or other skin injuries in nonambulatory infants
 - Oral injuries in nonambulatory infants
 - Injuries not consistent with the history provided
 - Infants with unexplained, unexpected sudden death (consult with medical examiner/coroner first)
 - Infants and young toddlers with unexplained intracranial injuries, including hemorrhage and hypoxic-ischemic injury
 - Infants and siblings under 2 years who are household contacts of a child who has been abused
 - Twins of infants and toddlers who have been abused

Some of these recommendations are very specific and actionable. However, there is still not consensus among medical providers and experts regarding all of the injury presentations that are suspicious for abuse and should prompt a skeletal survey.³² In addition, some of these indications, such as "suspicious injury" or "injuries not consistent with the history provided," are less clearly defined and may be difficult for providers to interpret.

Determinations of suspected abuse and the use of skeletal surveys may thus differ based on the clinician's impressions of the family, medical training, experience treating young injured patients, knowledge of the relative risks and benefits of skeletal surveys, and other factors. Hospital-level factors including type (pediatric or community) and availability of skeletal survey may also influence decision-making.

Some indications from the AAP guide, such as "suspicious injury" or "injuries not consistent with the history provided," are less clearly defined and may be difficult for providers to interpret.

≠ THERE ARE SIGNIFICANT RACE- AND SOCIOECONOMIC STATUS-BASED DISPARITIES IN SCREENING FOR CHILD ABUSE AT PEDIATRIC HOSPITALS

We started by reviewing the medical records of infants under age 1 who were treated at CHOP between 1997 and 2006 for skull fractures unrelated to a motor vehicle accident and not associated with significant brain injury. The majority of skull fractures without associated brain injury in infants are attributed to accidental falls, but they can also result from abuse. We found that providers evaluated 50% of infants with a lower SES (as represented by Medicaid insurance) for suspected abuse using skeletal survey, but only 34% of infants with higher SES (as represented by private insurance).³³

To determine whether similar disparities in evaluation existed for young children with serious injuries that are associated with a higher likelihood of abuse at other institutions across the country, we then analyzed administrative data from 39 pediatric hospitals.³⁴ We chose to focus on infants diagnosed with non-motor vehicle crash-related traumatic brain injury, as this is a group of infants that research has previously shown

to be at high risk for occult fractures from abuse.^{25,34,35} Our findings are noted in Figure 2 below.

These findings, which are consistent with other research studies that used rich clinical data, imply that infants with injuries associated with a high likelihood of abuse are not sufficiently screened for child abuse, especially those infants who are White and have a higher SES.³⁶⁻³⁸ Although poverty has been shown to be the greatest risk factor for abuse, and poverty rates are higher among Black children, research has shown that provider biases based on race and SES do contribute to overdiagnosis in Black children and children with lower SES, and missed diagnoses in children with higher SES.^{3,39} Underevaluation of children with high-risk injuries may contribute to missed cases of abuse and risk for further harm to the child, and overevaluation of children with low-risk injuries may contribute to unnecessary radiation exposure, cost, time, stress on the child and family, and over-reporting to child protective services.

Figure 2

INFANTS WITH INJURIES ASSOCIATED WITH A HIGH LIKELIHOOD OF ABUSE ARE NOT SCREENED CONSISTENTLY

Providers evaluated

72%

of these infants with a skeletal survey.

Infants with a lower SES were more likely to be evaluated

with skeletal survey (SES represented by insurance status).

SES was more likely to influence screening rates

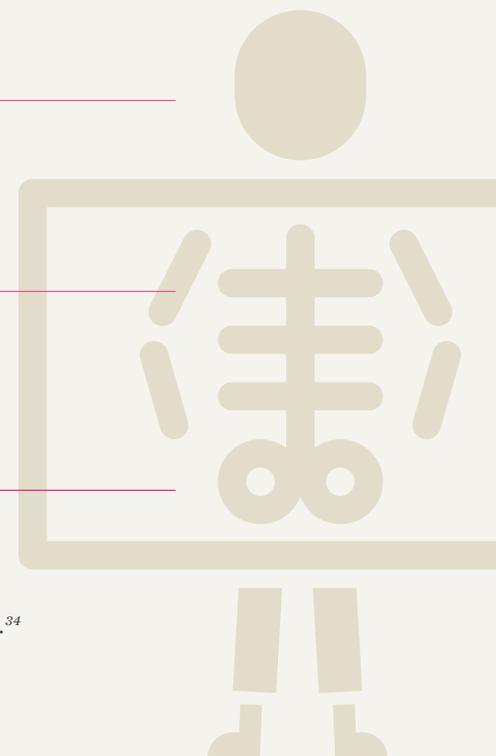
among White infants than Black infants.

In other words, racial/ethnic minority families, in general, are more likely to be screened for abuse regardless of SES.

Among those evaluated with skeletal survey,

37% were diagnosed with abuse,

which shows that a high percentage of children evaluated are determined to be victims of abuse.³⁴





THERE IS SIGNIFICANT VARIABILITY IN THE USE OF SKELETAL SURVEYS AT CHILDREN'S HOSPITALS

To understand how skeletal survey practices vary across children's hospitals, we analyzed data from 43 nonprofit pediatric care hospitals on infants with a diagnosis of physical abuse and infants with non-motor vehicle crash-related femur fractures or traumatic brain injury. We focused on these two injuries as they are associated with a high likelihood of abuse in infants.^{40,41} We found great variation in skeletal survey use for all three diagnoses (Table 1).

Pediatric hospitals with a comprehensive child abuse program—in which there is centralized management to provide assessment and diagnostic services for all forms of maltreatment and to connect with community agencies involved in child protection—were more likely to perform skeletal surveys than other pediatric hospitals.

Table 1

RATES OF SKELETAL SURVEY USE IN SUSPECTED CHILD ABUSE ACROSS CHILDREN'S AND GENERAL HOSPITALS

	 CHILDREN'S HOSPITALS ^A		 GENERAL HOSPITALS ^B	
	Average Rate	Range	Average Rate	Range
Infants <2 years with physical abuse diagnosis	83%	55–93%	48%	15–100%
Infants <1 year diagnosed with traumatic brain injury	68%	44–86%	51%	26–98%
Infants <1 year diagnosed with femur fractures	77%	44–94%	53%	26–77%

^AThe analysis included data from 43 children's hospitals between 1999 and 2009.

^BFor infants <2 years with a diagnosis of physical abuse, data is drawn from 112 hospitals. For infants <1 year with diagnosed traumatic brain injury, data is drawn from 49 hospitals. For infants <1 year with diagnosed femur fractures, data is drawn from 43 hospitals. The analysis included data from 2009–2013.

Figure 3

SKELETAL SURVEY PERFORMANCE VARIES WIDELY ACROSS HOSPITALS, BUT IS HIGHER AT CHILDREN'S HOSPITALS

The percentage of infants with high-risk injuries who undergo an evaluation for suspected abuse varies dramatically across hospitals.

We found that at some pediatric hospitals, **nearly 100%** of infants with high-risk injuries undergo an evaluation, but at other pediatric hospitals, **less than 50%** undergo an evaluation.⁴⁰

Injured infants presenting to non-pediatric hospitals are **less likely** than infants presenting to pediatric hospitals to undergo evaluation for abuse.⁴¹



H THERE IS EVEN GREATER VARIABILITY IN THE USE OF SKELETAL SURVEYS AT GENERAL HOSPITALS

We next investigated how skeletal survey practices vary across general hospitals, drawing on data from participating academic medical centers, community-based hospitals and large multihospital systems. The majority of these hospitals (97%) did not primarily serve a pediatric population. We again analyzed data on infants with a diagnosis of physical abuse, or with a diagnosis of a high-risk injury (non-motor vehicle crash-related femur fractures or traumatic brain injury).^{40,41} We found even greater variation in skeletal survey use than we had in the study of pediatric hospitals (Table 1; Figure 3).

Teaching hospitals and hospitals with higher volumes of young injured children were more likely to evaluate victims of abuse using skeletal survey than were nonteaching hospitals and hospitals with lower volumes of young injured children, respectively. In addition to showing greater variability in skeletal survey use than pediatric hospitals, general hospitals also had lower average rates of skeletal survey use for these diagnoses compared to children's hospitals.

These findings demonstrate a significant lack of standardization in child abuse screening across U.S. hospitals, particularly among general hospitals with less experience providing care for children. This raises concern that providers are missing opportunities to diagnose abuse and protect children from ongoing harm.

These findings demonstrate a significant lack of standardization in child abuse screening across U.S. hospitals, particularly among general hospitals with less experience providing care for children.

CLINICAL DECISION SUPPORT TOOLS ARE BENEFICIAL

It can be difficult for providers to identify which young injured children have suspicious injuries and should undergo a skeletal survey as part of a child abuse evaluation. Evidence-based implementation methods, such as clinical decision support tools, may be necessary. Clinical decision support tools provide clinicians with the knowledge and patient-specific information—intelligently filtered and presented at appropriate times—to enhance health care.⁴² They include clinical pathways, suggested order sets, clinical decision rules, and alerts and reminders.

Research from other institutions demonstrates the value of clinical pathways. At the Cincinnati Children’s Hospital Medical Center, after implementation of a screening algorithm for infants under age 1 with a head injury, the use of skeletal surveys among White infants increased, and African American and White infants became equally likely to receive skeletal surveys.³⁶ Dell Children’s Medical Center of Central Texas introduced a clinical pathway for all infants under age 1 with non-motor vehicle crash-related fractures in the emergency department.³⁷ After implementation of the clinical pathway, overall use of skeletal surveys increased from 60% to 85%, and disparities in the use of skeletal surveys between publicly insured and privately insured infants disappeared. However, disparities between these groups in the final determination of child abuse remained.

Given the promise of clinical pathways for skeletal survey use in child abuse screening, at CHOP, we worked to address the need for additional consensus and guidance regarding skeletal survey use. We collaborated with experts from around the country to develop concrete recommendations on which specific fracture scenarios should raise suspicion for abuse and prompt ordering of a skeletal survey. Our goal was to develop patient-specific clinical guidelines that providers can use to determine which young children with injuries like intracranial hemorrhage (bleeding in or around the brain), fractures and bruising they should evaluate with skeletal survey.^{14–16}

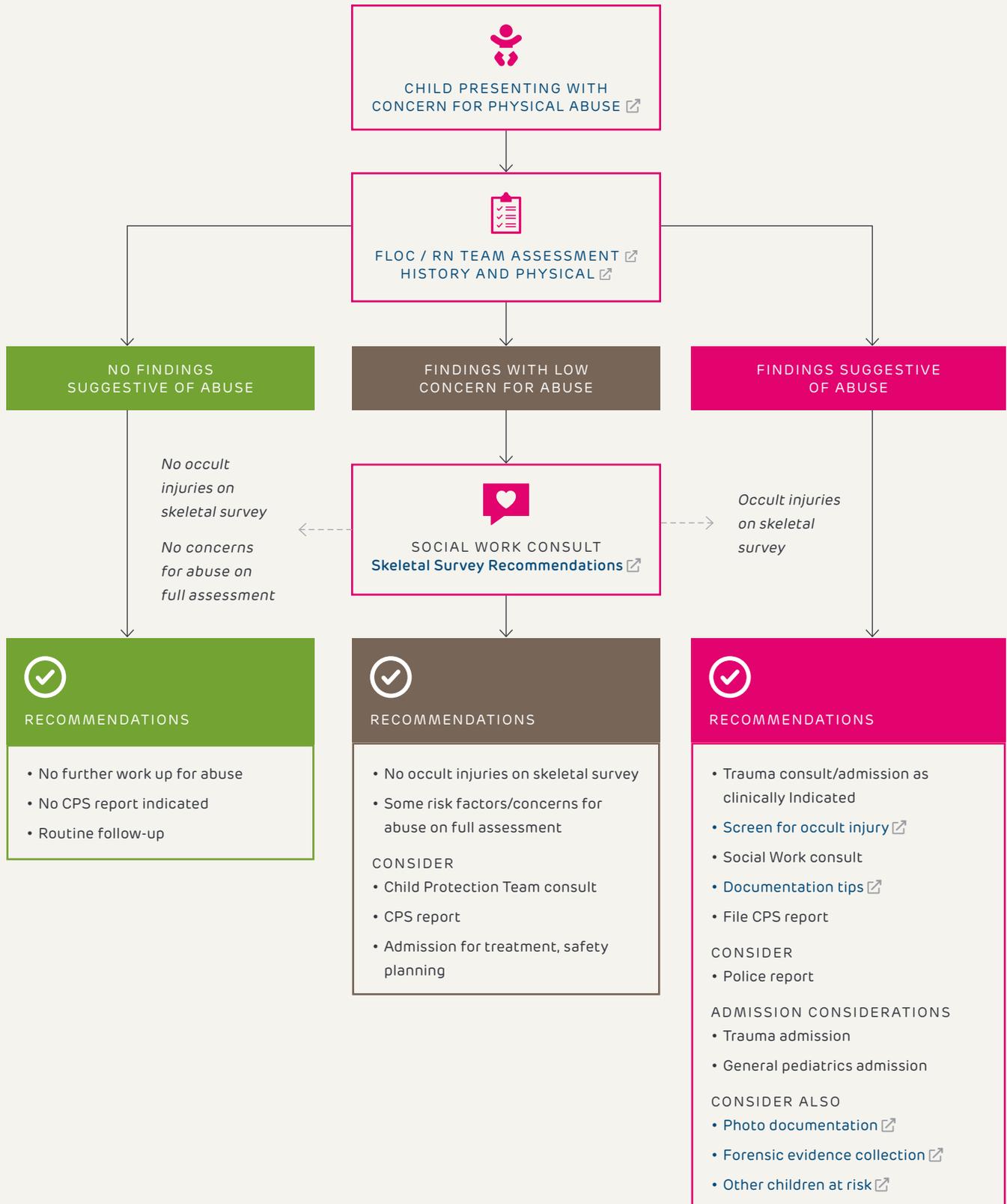
We convened panels of medical experts and reviewed the existing literature to develop detailed, scenario-based guidelines. Recognizing that providers’ understanding of specific injury mechanisms and their ability to determine whether a reported mechanism is consistent with a specific injury may vary, we incorporated reported mechanism of injury and specific type of injury into the scenario-based guidelines. The resulting guidelines have the potential to decrease provider subjectivity and bias and improve the appropriate use of skeletal survey to identify child abuse victims. The resulting guidelines have been incorporated into clinical pathways at CHOP to help reduce variation in care (Figure 4).

CHOP guidelines have the potential to decrease provider subjectivity and bias and improve the appropriate use of skeletal survey to identify child abuse victims.

Figure 4

SCHEMATIC OF EMERGENCY DEPARTMENT CLINICAL PATHWAY FOR EVALUATION/TREATMENT OF CHILDREN WITH CONCERN FOR PHYSICAL ABUSE

Summary of clinical pathway. For full pathway, visit: <https://www.chop.edu/clinical-pathway/abuse-physical-clinical-pathway>



CONTINUOUS QUALITY IMPROVEMENT IS NEEDED

In order to gain a broader understanding of the use and effectiveness of child abuse clinical decision support tools at children's hospitals around the country, we surveyed 41 children's hospitals regarding the presence of child abuse pathways and analyzed skeletal survey use at those same hospitals. This 2016 study revealed that:

- 9% of the children's hospitals did not have a single clinical pathway related to the evaluation and care of victims of child abuse.
- The presence of a child abuse pathway at a hospital was associated with higher rates of skeletal survey performance for high-risk infants.
- Differences in skeletal survey performance between infants with public versus private insurance were not ameliorated by the presence of a pathway.⁴³

While these findings again indicate the utility of clinical pathways, they also indicate that pathways alone may not be sufficient to improve practice and reduce disparities. This aligns with evidence from other fields.⁴⁴

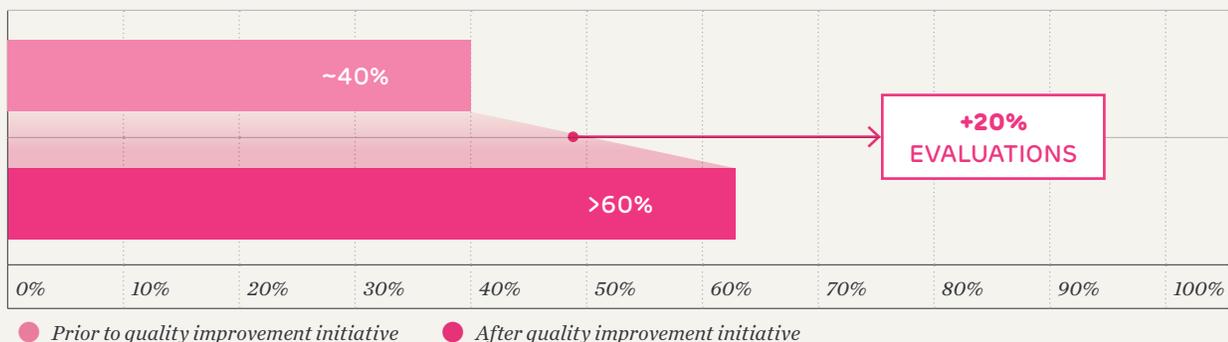
Similarly, CHOP implemented its *clinical pathway* related to evaluation for abuse in children with extremity fractures in late 2013. However, subsequent evaluation of infants with extremity fractures revealed that rates of skeletal survey use in this high-risk population remained low (around 40%) after implementation of the pathway. To address the shortcomings of this initial intervention, we convened a quality improvement team to enhance the clinical decision support tools and increase awareness and education among providers about the clinical pathway. We then re-evaluated skeletal survey use to detect child abuse in the targeted population and found it had surpassed 60% with implementation of the quality improvement interventions (Figure 5).

Pathway implementation must be accompanied by evaluation and continuous quality improvement with a focus on disparities.

Figure 5

QUALITY IMPROVEMENT INITIATIVES CAN INCREASE PERFORMANCE OF ABUSE EVALUATIONS AMONG YOUNG CHILDREN WITH EXTREMITY FRACTURES

With implementation of quality improvement interventions, rates of child abuse evaluations increased from about 40% to more than 60% in CHOP's emergency department.⁴⁵





WHAT CAN BE DONE

Based on our research findings and those of other experts in this field, we have identified recommendations for hospital administrators, funders, and policymakers that, when layered with other interventions, can help eliminate disparities in care and protect all at-risk children from potential further harm.

-  **RECOMMENDATIONS FOR HOSPITALS**
-  **RECOMMENDATIONS FOR FUNDERS**
-  **RECOMMENDATIONS FOR POLICYMAKERS**

H RECOMMENDATIONS FOR HOSPITALS

Replicate and implement successful clinical decision support tools including evidence-based clinical guidelines, clinical pathways and clinical alerts

Hospitals should use evidence-based methods to implement patient-specific clinical guidelines for child abuse evaluation, including but not limited to screening for high-risk injuries and using occult injury detection tools such as skeletal survey.^{45,46} In addition to the guidelines created by PolicyLab researchers, the AAP published valuable recommendations on identifying and evaluating children with injuries that raise concerns of physical abuse.¹³⁻¹⁶ Hospitals should integrate these guidelines into existing work flow. Incorporation of these recommendations into patient-specific, user-friendly clinical pathways may increase the appropriate use of skeletal surveys and decrease disparities and variation in their use. In addition, electronic alerts embedded within the electronic health record have demonstrated promise in prompting providers to utilize clinical decision support tools.⁴⁷

Benchmarking (the process of comparing a practice's performance with an established standard) has contributed to improved outcomes for treatment of other pediatric conditions.⁴⁸ However, benchmarks are not currently widely used for child abuse detection. As individual hospitals work toward improving quality, benchmarks should be developed that can be applied across hospitals and encourage more routine use of injury detection tools by providers.

Conduct continuous evaluation and quality improvement of child abuse evaluation guidelines

Evaluation and continuous quality improvement (CQI) of guidelines for child abuse evaluation is crucial for ensuring they achieve their intended outcomes. This ongoing monitoring includes evaluating whether clinicians are following the guidelines, whether use of the guidelines improves identification of child abuse victims, and whether there are unintended consequences of the guidelines, such as substantial increases in unnecessary skeletal survey use, neglect of a population not specified in the guidelines or increased costs. CQI enables administrators to make necessary adjustments to the guideline content and implementation methods.

Different fields of medicine have demonstrated that other quality improvement methods, such as designating a change champion, employing audits through regular review of medical records, and offering regular provider feedback, can improve the success of condition-specific guidelines.⁴⁹ These methods have yet to be evaluated for child abuse detection guidelines, but could have a similar positive impact on standardizing the practice across an institution.

One potential way to facilitate CQI is by partnering with research networks and large administrative database systems to create meaningful, standardized measures of quality in the evaluation and care of suspected victims of child abuse. In addition, interactive training of clinicians on where to find the guidelines and when and how to use them—through tools such as workshops or practical sessions—coupled with evaluation processes have demonstrated success in the adoption of clinical guidelines.⁴⁹⁻⁵¹ Continuous quality improvement is also vital to ensuring that guidelines have a lasting positive impact.⁵²



The Child Abuse Pediatrics Network (CAPNET)

The recent establishment of CAPNET, a multicenter, federally funded research network dedicated to improving the care of children who have potentially been abused, presents a unique opportunity for creating and implementing quality measures across participating centers.^{53,54} Another potential opportunity for collaboration is the Pediatric Hospital Information System (PHIS) comparative pediatric database, which is maintained by the Children's Hospital Association and includes clinical and resource utilization data for more than 49 children's hospitals.⁵⁵ Participating hospitals can compare their own outcomes to those of other hospitals across the country. Benchmarking utilizing PHIS data has driven improvement in other areas of pediatric care such as asthma.⁴⁸



RECOMMENDATIONS FOR FUNDERS

Support additional research dedicated to improving child abuse prevention, screening, interventions and treatment

We need further research dedicated to preventing child abuse and improving outcomes for victims. In particular, there is a need for multicenter studies evaluating the effectiveness of screening tools designed to promote timely and accurate recognition of abuse. While we have demonstrated success in improving child abuse evaluation practices in one children's hospital among infants with a specific type of injury, we have yet to determine the generalizability of these findings to other centers and populations of at-risk children.

There is a scarcity of funding to support these avenues of research, particularly when considering the high cost to society and the number of children who could benefit from it.⁵⁶ For instance, while an estimated 12.5% of U.S. children will experience child abuse or neglect in their lifetime, in fiscal year 2019, only about 0.1% of National Institutes of Health (NIH) funding for medical research, about \$43 million, was apportioned to child abuse and neglect research.^{57,58}

We need more resources from hospitals, governments at all levels, foundations, and philanthropic funding sources to pursue this research to improve upon best practices and support the implementation of such interventions in every hospital across the country.



RECOMMENDATIONS FOR POLICYMAKERS

Actively engage in the issue of child abuse prevention and detection, and explore ways to support equitable access to high-quality care to protect all at-risk children

Policymakers in some states, including Pennsylvania and New York, have already recognized the prevalence of child abuse and need for better detection and prevention, and they have enacted laws requiring clinicians to receive child abuse recognition training.^{59,60} The efficacy of these trainings, however, has not been assessed. Policymakers and relevant stakeholders such as licensing and accreditation bodies should build on these requirements by incorporating best practices and information about effective clinical pathways established by evidence-based research into these required trainings. Additionally, policymakers should mandate that these trainings be evaluated, and dedicate resources to quality improvement efforts to ensure the programs have the intended impact on physician knowledge, physician practice and outcomes for children. Some states have also established centralized systems for child abuse education and detection in partnership with health systems, medical providers and other stakeholders.⁶¹

We know that the national recommendations for detection of child abuse victims are not regularly followed. As new research emerges and more evidence-based best practices are established, federal lawmakers should mandate policies for detecting and intervening in cases of child abuse to ensure that every child—regardless of race, gender, socioeconomic status or geographic location—has the same level of care and protection to prevent the harms of physical abuse and neglect.

While not the focus of this *Evidence to Action* brief, primary prevention is essential to keep children from becoming victims of abuse in the first place. Additional resources should also be made available to support the development and implementation of primary prevention.

CONCLUSION

Timely and accurate diagnosis of abusive injuries is a critical step in ensuring victims of abuse receive appropriate medical care and are protected from further harm. Appropriate use of occult injury evaluation tools, such as skeletal survey, can improve identification of child abuse victims. However, skeletal surveys are not performed uniformly among young children with injuries that are highly suspicious for abuse. Findings from PolicyLab and other institutions suggest that implementation of injury-specific clinical guidelines using clinical decision support tools may improve appropriate use of skeletal survey, reduce disparities in care and increase detection of occult injuries that are indicative of abuse.

Institutions should couple implementation of guidelines with evaluation and CQI to determine whether they are having the intended impact. Evaluation and CQI efforts identify and address disparities in care based on race and SES. This high standard of care and protection should not depend on where a child lives. Increased research funding to support the universal and standardized implementation and evaluation of evidence-based interventions can help expand the reach of best practices to providers and health care systems across the country. Taken together, these efforts to improve detection of abuse will increase our ability to protect children who have been abused from further harm.

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REFERENCES

1. Leventhal JM, Gaither JR. Incidence of serious injuries due to physical abuse in the United States: 1997 to 2009. *Pediatrics*. 2012;130(5):e847–852.
2. U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. *Child Maltreatment 2019*. Washington, D.C. 2021.
3. Jenny C, Hymel KP, Ritzen A, Reinert SE, Hay TC. Analysis of missed cases of abusive head trauma. *JAMA*. 1999;281(7):621–626.
4. Oral R, Yagmur F, Nashelsky M, Turkmen M, Kirby P. Fatal abusive head trauma cases: consequence of medical staff missing milder forms of physical abuse. *Pediatr Emerg Care*. 2008;24(12):816–821.
5. Ravichandiran N, Schuh S, Bejuk M, et al. Delayed identification of pediatric abuse-related fractures. *Pediatrics*. 2010;125(1):60–66.
6. Sheets LK, Leach ME, Koszewski IJ, Lessmeier AM, Nugent M, Simpson P. Sentinel injuries in infants evaluated for child physical abuse. *Pediatrics*. 2013;131(4):701–707.
7. Thorpe EL, Zuckerbraun NS, Wolford JE, Berger RP. Missed opportunities to diagnose child physical abuse. *Pediatr Emerg Care*. 2014;30(11):771–776.
8. Oral R, Blum KL, Johnson C. Fractures in young children: are physicians in the emergency department and orthopedic clinics adequately screening for possible abuse? *Pediatr Emerg Care*. 2003;19(3):148–153.
9. Pierce MC, Kaczor K, Acker D, Carle M, Webb T, Brenze AJ. Bruising Missed as a Prognostic Indicator of Future Fatal and Near-Fatal Physical Child Abuse. *Pediatric Academic Societies* 2008.
10. Letson MM, Cooper JN, Deans KJ, et al. Prior opportunities to identify abuse in children with abusive head trauma. *Child Abuse Negl*. 2016;60:36–45.
11. American Academy of Pediatrics. Diagnostic imaging of child abuse. *Pediatrics*. 2009;123(5):1430–1435.
12. American College of Radiology. ACR-SPR practice parameter for the performance and interpretation of skeletal surveys in children. 2016; <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Skeletal-Survey.pdf>
13. Christian CW and the American Academy of Pediatrics Committee on Child Abuse and Neglect. The evaluation of suspected child physical abuse. *Pediatrics*. 2015;135(5):e1337–1354.
14. Wood JN, Fakeye O, Feudtner C, Mondestin V, Localio R, Rubin DM. Development of guidelines for skeletal survey in young children with fractures. *Pediatrics*. 2014;134(1):45–53.
15. Wood JN, Fakeye O, Mondestin V, Rubin DM, Localio R, Feudtner C. Development of hospital-based guidelines for skeletal survey in young children with bruises. *Pediatrics*. 2015;135(2):e312–320.
16. Paine CW, Scribano PV, Localio R, Wood JN. Development of guidelines for skeletal survey in young children with intracranial hemorrhage. *Pediatrics*. 2016;137(4).
17. Leventhal JM, Martin KD, Gaither JR. Using U.S. data to estimate the incidence of serious physical abuse in children. *Pediatrics*. 2012;129(3):458–64.
18. Parks S, Sugerman D, Xu L, Coronado V. Characteristics of non-fatal abusive head trauma among children in the USA, 2003–2008: application of the CDC operational case definition to national hospital inpatient data. *Injury Prevention*. 2012;18(6):392–8.

19. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med.* 1998;14(4):245–258.
20. Chartier MJ, Walker JR, Naimark B. Separate and cumulative effects of adverse childhood experiences in predicting adult health and health care utilization. *Child Abuse Negl.* 2010;34(6):454–464.
21. Middlebrooks JS, Audage NC. The Effects of Childhood Stress on Health Across the Lifespan. In: Centers for Disease Control and Prevention; National Center for Injury Prevention and Control, ed. Atlanta, GA 2008.
22. Flaherty EG, Thompson R, Litrownik AJ, et al. Effect of early childhood adversity on child health. *Arch Pediatr Adolesc Med.* 2006;160(12):1232–1238.
23. Lane W, Dubowitz H. What factors affect the identification and reporting of child abuse-related fractures? *Clin Orthop Relat Res.* 2007;461:219–225.
24. Barber I, Perez-Rossello JM, Wilson CR, Silvera MV, Kleinman PK. Prevalence and relevance of pediatric spinal fractures in suspected child abuse. *Pediatr Radiol.* 2013;43(11):1507–1515.
25. Duffy SO, Squires J, Fromkin JB, Berger RP. Use of skeletal surveys to evaluate for physical abuse: Analysis of 703 consecutive skeletal surveys. *Pediatrics.* 2011;127(1):e47–52.
26. Hansen KK, Campbell KA. How useful are skeletal surveys in the second year of life? *Child Abuse Negl.* 2009;33(5):278–281.
27. Karmazyn B, Lewis ME, Jennings SG, Hibbard RA, Hicks RA. The prevalence of uncommon fractures on skeletal surveys performed to evaluate for suspected abuse in 930 children: Should practice guidelines change? *Am J Roentgenol.* 2011;197(1):W159–163.
28. Lindberg DM, Berger RP, Reynolds MS, Alwan RM, Harper NS. Yield of skeletal survey by age in children referred to abuse specialists. *J Pediatr.* 2014;164(6):1268–1273 e1261.
29. Day F, Clegg S, McPhillips M, Mok J. A retrospective case series of skeletal surveys in children with suspected non-accidental injury. *J Clin Forensic Med.* 2006;13(2):55–59.
30. Berger RP, A. P. S. G. M. S. Effective radiation dose in a skeletal survey performed for suspected child abuse. *The Journal of Pediatrics.* 2016;171:310–312.
31. Kellogg ND, American Academy of Pediatrics Committee on Child Abuse and Neglect. Evaluation of suspected child physical abuse. *Pediatrics.* 2007;119(6):1232–1241.
32. Deye KP, Berger RP, Lindberg DM, Ex SI. Occult abusive injuries in infants with apparently isolated skull fractures. *J Trauma Acute Care Surg.* 2013;74(6):1553–1558.
33. Wood JN, Christian CW, Adams CM, Rubin DM. Skeletal surveys in infants with isolated skull fractures. *Pediatrics.* 2009;123(2):e247–252.
34. Wood JN, Hall M, Schilling S, Keren R, Mitra N, Rubin DM. Disparities in the evaluation and diagnosis of abuse among infants with traumatic brain injury. *Pediatrics.* 2010;126(3):408–414.
35. Barber I, Perez-Rossello JM, Wilson CR, Kleinman PK. The yield of high-detail radiographic skeletal surveys in suspected infant abuse. *Pediatr Radiol.* 2015;45(1):69–80.
36. Rangel EL, Cook BS, Bennett BL, Shebesta K, Ying J, Falcone RA. Eliminating disparity in evaluation for abuse in infants with head injury: use of a screening guideline. *J Pediatr Surg.* 2009;44(6):1229–1234; discussion 1234–1235.
37. Higginbotham N, Lawson K, Gettig K, et al. Utility of a child abuse screening guideline in an urban pediatric emergency department. *J Trauma Acute Care Surg.* 2014;76(3):871–877.
38. Laskey AL, Stump TE, Perkins SM, Zimet GD, Sherman SJ, Downs SM. Influence of race and socioeconomic status on the diagnosis of child abuse: a randomized study. *J Pediatr.* 2012;160(6):1003–1008 e1001.
39. Lane WG, Rubin DM, Monteith R, Christian CW. Racial differences in the evaluation of pediatric fractures for physical abuse. *JAMA.* 2002;288(13):1603–1609.
40. Wood JN, Feudtner C, Medina SP, Luan X, Localio R, Rubin DM. Variation in occult injury screening for children with suspected abuse in selected US children's hospitals. *Pediatrics.* 2012;130(5):853–860.
41. Wood JN, French B, Song L, Feudtner C. Evaluation for occult fractures in injured children. *Pediatrics.* 2015;136(2).
42. HealthIT.gov. What is Clinical Decision Support (CDS)? <https://www.healthit.gov/policy-researchers-implementers/clinical-decision-support-cds>. Content last reviewed on April 10, 2018.
43. Stavas N, Paine C, Song L, Shults J, Wood J. Impact of child abuse clinical pathways on skeletal survey performance in high-risk infants. *Acad Pediatr.* 2020;20(1):39–45.
44. Grol R. Successes and failures in the implementation of evidence-based guidelines for clinical practice. *Med Care.* 2001;39(8 Suppl 2):II46–54.
45. Deutsch SA, Henry MK, Lin W, et al. Quality improvement initiative to improve abuse screening among infants with extremity fractures. *Pediatr Emerg Care.* 2019;35(9):643–650.
46. Crumm CE, Brown ECB, Thomas-Smith S, Yu DTY, Metz JB, Feldman KW. Evaluation of an emergency department high-risk bruising screening protocol. *Pediatrics.* 2021;147(4).
47. McGinn T, Feldstein DA, Barata I, et al. Dissemination of child abuse clinical decision support: Moving beyond a single electronic health record. *Int J Med Inform.* 2021;147:104349.
48. *Building Benchmarks for Pediatric Care: Patients Hospitalized for Asthma, Bronchiolitis and Pneumonia.* Children's Hospital Association; July 8 2016.
49. Prior M, Guerin M, Grimmer-Somers K. The effectiveness of clinical guideline implementation strategies—a synthesis of systematic review findings. *J Eval Clin Pract.* 2008;14(5):888–897.
50. Sidebotham PD, Pearce AV. Audit of child protection procedures in accident and emergency department to identify children at risk of abuse. *BMJ.* 1997;315(7112):855–856.
51. Pless IB, Sibald AD, Smith MA, Russell MD. A reappraisal of the frequency of child abuse seen in pediatric emergency rooms. *Child Abuse Negl.* 1987;11(2):193–200.
52. Chassin MR, Loeb JM. The ongoing quality improvement journey: Next stop, high reliability. *Health Aff (Millwood).* 2011;30(4):559–568.
53. Lindberg DM, Wood JN, Campbell KA, et al. Research priorities for a multi-center child abuse pediatrics network—CAPNET. *Child Abuse Negl.* 2017;65:152–157.
54. Lindberg DM, Scribano PV. A child abuse research network: Now what? *Child Abuse Negl.* 2017;70:406–407.
55. Pediatric Health Information System. <https://www.childrenshospitals.org/phs>. Accessed May 9, 2021.
56. Peterson C, Florence C, Klevens J. The economic burden of child maltreatment in the United States, 2015. *Child Abuse Negl.* 2018;86:178–183.
57. Office of Extramural Research, National Institutes of Health, U.S. Department of Health and Human Services. Estimates of Funding for Various Research, Condition, and Disease Categories. *Research Portfolio Online Reporting Tools (RePORT).* February 10, 2016.
58. Wildeman C, Emanuel N, Leventhal JM, Putnam-Hornstein E, Waldfogel J, Lee H. The prevalence of confirmed maltreatment among US children, 2004 to 2011. *JAMA Pediatr.* 2014;168(8):706–713.
59. Act 31 of 2014 Child Abuse Recognition and Reporting Continuing Education Providers. <https://www.dos.pa.gov/ProfessionalLicensing/BoardsCommissions/Pages/Act-31.aspx>. Accessed May 13, 2021.
60. Mandated Training Related to Child Abuse. <http://www.op.nysed.gov/training/camemo.htm>.
61. 2021/2022 Prevention Resource Guide. U.S. Department of Health and Human Services Children's Bureau Office on Child Abuse and Neglect; 2021.

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