

# The Impact of an Emergency Department Bruising Pathway on Disparities in Child Abuse Evaluation

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**Objectives:** Previous research has shown racial, ethnic, and socioeconomic disparities in provider medical evaluations and reporting to child protective services (CPS) and law enforcement (LE) for cases of suspected child physical abuse. Our hospital standardized evaluation and reporting of high-risk bruising using a clinical pathway. We aimed to assess whether standardization impacted disparity.

**Methods:** We performed a retrospective observational study including children evaluated in the emergency department who had a social work consult for concern for child abuse or neglect between June 2012 and December 2019. From this group, we identified children with high-risk bruising. We compared outcomes (receipt of skeletal survey, CPS report, or LE report) before and after implementation of a standard bruising evaluation pathway to determine how the intervention changed practice among various racial, ethnic, and socioeconomic groups.

**Results:** During the study period, 2129 children presented to the ED and received a social work consult for child abuse or neglect. Of these, 333 had high-risk bruising. Children without private insurance had a higher risk of having a CPS (adjusted relative risk, 1.32; 95% confidence interval, 1.09–1.60) or LE (adjusted relative risk, 1.48; 95% confidence interval, 1.11–1.97) report prepathway, but not after pathway implementation. No significant associations were seen for race or ethnicity.

**Conclusions:** A standardized clinical pathway for identification and evaluation of high-risk bruising may help to decrease socioeconomic disparities in reporting high-risk bruising. Larger studies are needed to fully evaluate disparities in assessment and reporting of child abuse.

**Key Words:** maltreatment, equity, bruising

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**B**ruising is often the first or only sign of child physical abuse.<sup>1–12</sup> It is important to evaluate for other forms of trauma when certain types of bruising are present, and sometimes necessary to report concerning bruising to social services to ensure a child's safety.<sup>1–12</sup> A medical provider's decision to initiate a workup for child physical abuse or to report bruising to social

services can be influenced by bias or racism. Bias in this type of medical decision-making has been previously noted to occur with regard to certain racial, ethnic, and socioeconomic groups.<sup>13–24</sup>

Large national databases have shown disproportionality in the child welfare system for minority children and children living in poverty. Studies of the National Child Abuse and Neglect Dataset have noted that Black and Hispanic children are more likely to live in poverty, likely secondary to structural racism, which is one of the drivers of overrepresentation of minority groups in the child welfare system in the United States.<sup>21</sup> Entry into the child welfare system is often preceded by contact with the medical system.

Biased impressions of risk of abuse in minority children and children living in poverty may impact decisions to perform medical evaluations for abuse. In an analysis of Pediatric Health Information System data for 39 pediatric hospitals, in patients with traumatic brain injury, children with public or no insurance, as well as Black or Hispanic children, had higher rates of skeletal survey evaluation compared with privately insured and White, non-Hispanic children.<sup>25</sup> In a similar evaluation of 18 pediatric sites, minority race/ethnicity patients were more likely to be evaluated and reported to social services for abusive head trauma concerns after adjusting for age, sex, and head injury mechanism.<sup>16</sup> A previous systematic review of 32 publications showed that minority children and children without private insurance were more likely to be evaluated with skeletal survey for abuse concerns.<sup>26</sup> A chart review of 388 pediatric patients hospitalized for skull or long bone fracture showed that minority children were significantly more likely to have a skeletal survey and Child Protective Services (CPS) report than White children, even when controlling for insurance and likelihood of abuse as determined by a child abuse pediatrician.<sup>20</sup> A case-based study performed by Anderst et al<sup>13</sup> did not replicate these findings.

These associations demonstrate systemic patterns of racial discrimination, but other studies have more directly shown individual bias. A study of child abuse pediatricians showed that individual social risk perception is highest for poor nonminority families and minority families. Indeed, diagnostic decisions changed in 40% of vignette cases when social risk indicators (such as type of employment, mental health history, and presence of social supports) were reversed.<sup>17</sup> Laskey et al<sup>22</sup> determined that 2000 general pediatricians were more likely to diagnose abuse in patients with low socioeconomic status (SES), but not in patients with minority race.

Racial, ethnic, and socioeconomic biases are often implicit. Standardization of processes for certain presenting injuries may help to prevent the influence of implicit bias on medical decision-making. Previous literature has shown that creating algorithms for child abuse screening can improve equity in medical evaluation.<sup>27,28</sup> However, not all research has shown positive results for screening pathways. Larger data analyses, including a study of the Pediatric Health Information System database, showed that standard pathways for child abuse increased odds of screening but did not necessarily decrease disparity, possibly due

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to problems with pathway adherence.<sup>29</sup> These mixed results in the literature and a paucity of studies specifically looking at bruising suggest that further research is needed into whether a standard pathway to screen for and evaluate high-risk bruising could decrease disparity.

The specific aim of this study was to describe the effects of a standardized bruising screening pathway on the racial, ethnic, and socioeconomic characteristics of children who receive a skeletal survey or social services report in the emergency department (ED) for high-risk bruising.

## METHODS

The study setting was an ED at a pediatric hospital, which is a 407-bed quaternary care center providing services for the 5-state surrounding region. The ED cares for approximately 45,000 children each year. The hospital supports a number of clinical pathways to standardize care across a variety of diagnoses based on current evidence.<sup>30–33</sup>

The ED Bruising Clinical Standard Work Pathway<sup>34</sup> was implemented in November 2016 to consistently screen every child aged younger than 48 months for potentially abusive bruising as well as standardize the medical evaluation and reporting response to cases of high-risk bruising. Implementation and results of this pathway have been previously described.<sup>30</sup>

This study was a retrospective preobservational to post-observational study comparing racial, ethnic, and socioeconomic characteristics of children receiving a skeletal survey or report to CPS or law enforcement (LE) for concern of a high-risk bruise before and after implementation of a standard pathway for bruising identification and management. It was hypothesized that the pathway would reduce socioeconomic and racial/ethnic disparities in decisions to evaluate or report high-risk bruising.

Children aged younger than 48 months with an abuse or neglect concern were identified based on having received a social work consult in the ED for concern for child abuse or neglect between June 2012 and December 2019. Medical charts of those patients were then manually screened by 2 researchers for presence of high-risk bruising. Those with a record of high-risk bruising made up the study population. Records of this group were then reviewed to collect social and demographic information as well as information about other injuries present.

Race and ethnicity categories were self-reported by patient caregivers from these prespecified options: White, Black or African American, American Indian or Alaskan Native, Native Hawaiian or Pacific Islander, or Asian. For ethnicity, families could choose Hispanic or Latino or not Hispanic or Latino. Due to the smaller sizes of certain groups, for purposes of this study, all caregivers reporting patient race as Black or African American were grouped into a single category, even if multiracial identity was reported. Patient insurance type was the only socioeconomic factor ultimately included in analyses.

High-risk bruising was defined as bruising anywhere on a child aged younger than 6 months, bruising to the torso, ears, or neck in children aged 6 months to younger than 48 months, or patterned bruising. This definition for high-risk bruising was chosen based on the institution's bruising pathway.<sup>34</sup> Of note, the pathway does not require nurses to perform a whole-body skin examination on children older than 6 months; rather, nurses only examine skin in the torso, ears, and neck areas. However, patterned bruises are eligible to be included in the pathway if identified.

## ANALYSIS

Study data were collected and managed using REDCap (Vanderbilt University, Nashville, Tenn) electronic data capture

tools hosted at the University of Washington.<sup>35,36</sup> Analyses were performed using Microsoft Excel (Microsoft Corp, Redmond, Wash) and using Stata Statistical Software: Release 14 (StataCorp LP, 2015, College Station, Tex). Logistic regression was used to estimate adjusted proportions, and generalized linear models with a log link and robust variance estimator were used to estimate adjusted relative risks (RRs), given that the outcomes are not rare and thus odds ratios would be expected to overestimate the RR. Models were adjusted for potential confounding and precision variables as indicated. Precision variables and confounders were chosen a priori, based on creation of a directed acyclic graph by the principal investigator with use of previous literature. Children brought in by CPS were excluded from analysis of CPS and LE reporting outcomes because it would be anticipated that 100% of these children would have a CPS or LE report before arrival. In analysis of the skeletal survey outcome, children aged older than 24 months were excluded because the bruising pathway only routinely recommends skeletal survey performance for children younger than 24 months. Sensitivity analyses of RR estimates were conducted to assess whether additionally including children brought in by CPS/LE, as well as those specifically brought in by a caregiver with a concern of child abuse, changed the results. Statistical significance was defined as an alpha < 0.05.

## Ethical Considerations

The Seattle Children's Hospital Institutional Review Board approved this study. The study team elicited expert opinion from a local university scholar regarding research into disparity before starting this project. The research team would like to acknowledge the problematic nature of capturing the lived experience of racial and ethnic minorities in research, as well as the conflict between describing a precise exposure and fully capturing the complex impact of biases in our health care system.

## RESULTS

During the study period, 2129 children aged younger than 48 months treated in the ED had a social work consult for concerns of child abuse or neglect. Three hundred thirty-three children were found to have high-risk bruising in this group, with approximately equally sized groups before and after the pathway implementation (n = 157 and n = 176, respectively). A comparison of age, sex, and other injury between the prepathway and postpathway groups are presented in Table 1. There were no significant differences in age of child, sex of child, caregiver type, or proportion of children with skeletal survey before and after pathway implementation. Children were more likely to have a single bruise in a high-risk area identified in the postpathway group (versus multiple bruises or a patterned bruise).

A comparison of the racial/ethnic and socioeconomic distributions of the study group as well as similar groups from the overall ED and surrounding county<sup>37</sup> was performed. The study group had a higher proportion of government, charity, or self-pay patients than the ED population. This information is available in the supplemental digital content (Supplemental Table 1, <http://links.lww.com/PEC/B128>).

The overall racial/ethnic and socioeconomic distributions were similar in prepathway and postpathway study groups, with Pearson  $\chi^2$  P values of 0.34 for race distribution and 0.21 for insurance type distribution (Table 2). The age-adjusted proportion of children in each racial/ethnic group who received interventions is also shown in Table 2. Most proportions were statistically similar in the prepathway and postpathway groups, although there were proportional decreases in Hispanic/Latinx children with a high-risk bruise receiving a CPS or LE report and nonprivately

**TABLE 1.** Demographic and Clinical Characteristics of the Study Population, Prepathway Versus Postpathway Implementation

	<u>Prepathway</u> n = 157	<u>Postpathway</u> n = 176	<u>P</u>
Age, mo, mean (SD)	19.1 (14.2)	18.0 (14.9)	0.50
Age, mo			0.54
<6	43 (27.4%)	56 (31.8%)	
6 to <24	53 (33.8%)	61 (34.7%)	
24 to <48	61 (38.9%)	59 (33.5%)	
Male sex, n (%)	91 (58.3%)	100 (56.8%)	0.78
Caregiver type			0.42
CPS	15 (9.6%)	22 (12.5%)	
Foster	5 (3.2%)	5 (2.8%)	
Kinship/relative	11 (7.0%)	6 (3.4%)	
Biological or adoptive parent	126 (80.3%)	143 (81.3%)	
Concern for physical abuse by caregiver on arrival			0.028
No	84 (53.5%)	115 (65.3%)	
Yes	73 (46.5%)	61 (34.7%)	
No. bruises in high-risk areas			0.004
No bruise in high-risk area (ie, patterned bruise)	16 (10.2%)	10 (5.7%)	
1 bruise in high-risk area	52 (33.1%)	89 (50.6%)	
2 bruises in high-risk area	21 (13.4%)	27 (15.3%)	
3 or more bruises in high-risk area	68 (43.3%)	50 (28.4%)	
Skeletal survey			0.74
No	49 (31.2%)	52 (29.5%)	
Yes	108 (68.8%)	124 (70.5%)	
Fractures on skeletal survey			0.15
Not done	49 (31.2%)	52 (29.5%)	
No	71 (45.2%)	98 (55.7%)	
Yes	35 (22.3%)	24 (13.6%)	
Possible fracture	2 (1.3%)	2 (1.1%)	
Head injury			0.71
No	142 (90.4%)	157 (89.2%)	
Yes	15 (9.6%)	19 (10.8%)	
CPS involvement			0.072
No	22 (14.0%)	38 (21.6%)	
Yes	135 (86.0%)	138 (78.4%)	
LE involvement			0.006
No	55 (35.0%)	88 (50.0%)	
Yes	102 (65.0%)	88 (50.0%)	
Did the study hospital call CPS?			0.98
No	68 (43.3%)	76 (43.2%)	
Yes	89 (56.7%)	100 (56.8%)	
Did the study hospital call LE?			0.007
No	92 (58.6%)	128 (72.7%)	
Yes	65 (41.4%)	48 (27.3%)	

insured children with a high-risk bruise receiving an LE report after the pathway implementation.

The adjusted relative risk (aRR) of receiving a skeletal survey, CPS report, or LE report were compared across racial/ethnic and socioeconomic groups in prepathway and postpathway periods. White, non-Hispanic children were the reference group in a comparison to (1) not Black and Hispanic/Latinx children, (2) Black/Black multiracial children, and (3) not Black, multiracial/other race/refused race/ethnicity children. Privately insured children were chosen as the reference group for not privately insured

children. The comparison of race/ethnicity groups was adjusted for number of high-risk bruises, insurance type, if presenting caregiver had concern for physical abuse, and (for CPS/LE study outcomes only) whether skeletal survey was positive. For the insurance type comparison, relative risks were adjusted for number of high-risk bruises, if presenting caregiver had concern for physical abuse, and (for CPS/LE study outcomes only) whether skeletal survey was positive. The final analysis suggested that children without private insurance were more likely than privately insured patients to have a CPS or LE report prepathway (aRR of CPS

**TABLE 2.** Age-Adjusted\* Proportion of Study Population Receiving Each Intervention (SS, CPS, LE)

	N			Skeletal Survey			CPS			LE		
	Pre	Post	P	Pre	Post	P	Pre	Post	P	Pre	Post	P
Race/ethnicity			0.34									
White, non-Hispanic	87	86		69%	69%	0.96	84%	76%	0.18	61%	44%	<b>0.021</b>
Non-Black, Hispanic/Latinx	25	34		67%	62%	0.59	92%	63%	<b>0.005</b>	69%	38%	<b>0.009</b>
Black/Black Multiracial	16	14		76%	86%	0.41	88%	93%	0.64	81%	79%	0.90
Other/multiple	29	42		72%	79%	0.54	82%	93%	0.22	59%	52%	0.60
Insurance			0.21									
Private	47	64		72%	63%	0.26	74%	70%	0.62	53%	39%	0.13
Government/charity	110	112		70%	72%	0.72	91%	83%	0.078	70%	55%	<b>0.017</b>

Numbers listed in bold are < 0.05, the predetermined level of significance for this study.

\*Adjusted for age category: 0–6, 7–24, 25–48 mo.

SS indicates skeletal survey.

report, 1.32; 95% confidence interval [CI], 1.09–1.60; aRR of LE report, 1.48; 95% CI, 1.11–1.97). This association was not seen postpathway. The race/ethnicity group comparisons revealed no significant associations prepathway or postpathway between groups and skeletal survey or CPS/LE reports.

When children brought to the ED by CPS after removal from their caregivers were included in analysis, similar results were seen, with an association between insurance type and CPS/LE reports prepathway that was no longer seen postpathway. However, in this analysis, there was an increased risk of a child before or at presentation having an LE report in Black/Black multiracial children when compared with White, non-Hispanic children postpathway (aRR, 1.71; 95% CI, 1.19–2.45) that was not seen prepathway (aRR, 1.16; 95% CI, 0.85–1.59). This postpathway association was no longer statistically significant (aRR, 1.86; 95% CI, 0.87–3.96) when looking specifically at reports made to LE by hospital staff or providers.

**DISCUSSION**

In summary, implementation of a standardized clinical pathway for identification and management of high-risk bruising in young children may have impacted socioeconomic disparities. The prepathway associations observed between nonprivate insurance and CPS and LE reporting were no longer present after pathway implementation.

Overall, the observed trends suggest that the pathway decreased the proportion of non-Black, Hispanic/Latinx children with reports to CPS or LE and decreased the proportion of nonprivately insured children with an LE report. The pathway potentially improved equity in reporting high-risk bruises for nonprivately insured children.

A sensitivity analysis including patient in CPS custody on arrival to the ED suggested the potential for increased risk of having a skeletal survey and LE report in Black/Black multiracial children compared with White, non-Hispanic children postpathway, but small sample sizes limit interpretation. The radiation exposure of a skeletal survey presents a small but not negligible risk to children for future malignancy, so appropriate use of this medical test is important. Inequity in medical procedure delivery would be consistent with previous themes of inequity in medical care for abused Black and African American children. Falcone et al<sup>14,15</sup> demonstrated in 2 separate analyses that Black and African American children have higher odds of mortality after abusive head trauma (2008) as well as all types of abuse (2007), despite controlling for multiple factors in both studies, including injury severity and physiology at presentation in the 2007 study. Our research team questions whether the presence of a standard medical evaluation

pathway may lead to increased delivery of abuse medical testing in marginalized groups if it is not applied consistently, similar to what was seen in the Stavas et al<sup>29</sup> 2020 study. Providers may use the presence of the standard recommended medical evaluation to act on their own implicit biases when children present in CPS custody.

For our analysis, we were careful to separate race/ethnicity and SES; however, previous studies have suggested that medical providers often confound race and social class in cases of child abuse.<sup>24</sup> A future study with a larger study population or prospective design could potentially analyze similar themes in more specific subgroups to assess whether SES modifies the association between patient race and delivery of care.

Of note, the pathway was not specifically created to decrease racial, ethnic, or socioeconomic disparity in bruising evaluation, but it was anticipated by the pathway creators that disparities could be reduced as a result of standardizing evaluations.

**Limitations**

Although creation of the pathway initiated a standard process to identify and document high-risk bruising, this process did not exist before the pathway. It was therefore not possible to identify all cases of high-risk bruising, including those without social work consult, retrospectively before the pathway existed without manual chart reviews of all ED patients, which was not feasible. Ascertainment of the study population was atypical due to the complex nature of identifying bruising in medical documentation before pathway creation. Our methods may have missed children with a bruise who did not have a report or intervention of any kind. A separate study performed by one of the authors determined that approximately 50 children with high-risk bruising who were identified by the pathway screening process were not captured by our study inclusion criteria (ie, social work consult) and not included in the postpathway group. It was determined that these children would not be included in the analysis to prevent bias because these children would not have experienced a study outcome, and comparable children would not have been captured in the prestudy population for comparison. The demographics of this small population of patients is presented in the supplemental digital content (Supplemental Table 2, <http://links.lww.com/PEC/B128>). It is notable that the proportion of patients with White race or private insurance in this group is a larger number than in the study postpathway group.

The preanalysis/postanalysis design was limited by a small population size and small proportion of patients with the outcome, which did not allow for a more complex analysis of repeated

outcomes, such as would be performed in an interrupted time series or other design.

Standardized pathways of care are part of the culture at our institution. This strategy may not be generalizable to places where such pathways are not so widely accepted.

The finding of no associations between race and outcomes in our main analysis does not suggest that systemic racism does not impact medical care or reporting. Systemic racism contributes to health inequities at many layers of both society and health care, regardless of what is evident in a single study of a limited set of questions.

## CONCLUSIONS

A standardized clinical pathway for identification and evaluation of high-risk bruising in young children may help to decrease disparity in reporting high-risk bruising in nonprivately insured patients. Larger studies are needed to analyze patterns of racial inequity in high-risk bruising evaluation and reporting.

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