Racial Differences in the Evaluation of Pediatric Fractures for Physical Abuse

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Context Child maltreatment is a significant problem within US society, and minority children have higher rates of substantiated maltreatment than do white children. However, it is unclear whether minority children are abused more frequently than whites or whether their cases are more likely to be reported.

Objectives To determine whether there are racial differences in the evaluation and Child Protective Services (CPS) reporting of young children hospitalized for fractures.

Design, Setting, and Patients Retrospective chart review conducted at an urban US academic children's hospital among 388 children younger than 3 years hospitalized for treatment of an acute primary skull or long-bone fracture between 1994 and 2000. Children with perpetrator-admitted child abuse, metabolic bone disease, birth trauma, or injury caused by vehicular crash were excluded.

Main Outcome Measures Ordering of skeletal surveys and filing reports of suspected abuse.

Results Reports of suspected abuse were filed for 22.5% of white and 52.9% of minority children ($P<.001$). Abusive injuries, as determined by expert review, were more common among minority children than among white children (27.6% vs 12.5%; $P<.001$). Minority children aged at least 12 months to 3 years (toddlers) were significantly more likely to have a skeletal survey performed compared with their white counterparts, even after controlling for insurance status, independent expert determination of likelihood of abuse, and appropriateness of performing a skeletal survey (adjusted odds ratio [OR], 8.75; 95% confidence interval [CI], 3.48-22.03; $P<.001$). This group of children was also more likely to be reported to CPS compared with white toddlers, even after controlling for insurance status and likelihood of abuse (adjusted OR, 4.32; 95% CI, 1.63-11.43; $P=.003$). By likelihood of abuse, differential ordering of skeletal surveys and reporting of suspected abuse were most pronounced for children at least 12 months old with accidental injuries; however, differences were also noted among toddlers with indeterminate injuries but not among infants or toddlers with abusive injuries. Minority children at least 12 months old with accidental injuries were more than 3 times more likely than their white counterparts to be reported for suspected abuse (for children with Medicaid or no insurance, relative risk [RR], 3.08; 95% CI, 1.37-4.80; for children with private insurance, RR, 3.74; 95% CI, 1.46-6.01).

Conclusion While minority children had higher rates of abusive fractures in our sample, they were also more likely to be evaluated and reported for suspected abuse, even after controlling for the likelihood of abusive injury. This suggests that racial differences do exist in the evaluation and reporting of pediatric fractures for child abuse, particularly in toddlers with accidental injuries.

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CHILD MALTREATMENT IS A SIGnificant problem within US society. Approximately 826 000 cases of child maltreatment were substantiated in the United States in 1999, of which more than 175 000 (21.3%) were cases of physical abuse.[1] Rates of substantiated child maltreatment were highest among black children and other racial and ethnic minorities. While there were 10.6 cases of substantiated maltreatment for every 1000 white children, the rates for black, Hispanic, and Indian/Alaskan Native children were 25.2, 12.6, and 20.1 cases/1000 children, respectively.[1]

While minority children have higher rates of substantiated maltreatment compared with white children, it is unclear whether minority children are abused more frequently, are more likely to be reported for abuse, or whether minority reports are more likely to be substantiated. It is possible that biases on the part of mandated reporters may contribute to these differences. Such biases may lead to abuse being overlooked in nonminority children and/or overidentified in minority children. Several studies have indicated that black and other minority children may be overrepresented in child maltreatment reporting compared with white children. Hampton and Newberger[2] compared National Incidence and Prevalence Study of Child Abuse and Neglect-1 data with actual child abuse hotline reports and found that hospitals were more likely to report suspected abuse among black and Latino children, and to avoid reporting among white children. Jenny et al[3] reviewed missed cases of abusive head trauma and found that inflicted injuries were more often overlooked in white children compared with minority children.

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The overrepresentation of minority children in the child welfare system, and previous research documenting the existence of racial differences in the evaluation and treatment of possible abuse, prompted us to investigate whether reporting differences exist in our own community. We chose to examine differences in the evaluation and reporting of long-bone and skull fractures because we could find no previous examination of this topic in our review of the medical literature. Our primary goal was to determine whether minority children are more likely than white children to be reported to Child Protective Services (CPS) for suspected abuse. Our second goal was to determine whether minority children are more likely than white children to be medically evaluated for abuse by having a skeletal survey performed.

METHODS

Patients

All children younger than 3 years admitted to the Children's Hospital of Philadelphia between 1994 and 2000 for treatment of an acute primary skull or long-bone fracture were identified from a hospital database of discharge *International Classification of Diseases, Ninth Revision* codes. Long-bone fractures included fractures of the humerus, radius, ulna, femur, tibia, or fibula. Primary criteria for admission to the hospital included concern about possible child abuse or a parent's ability to care for the child, need for surgical intervention or cast-care teaching for children with femur fractures, delay in time to casting due to significant swelling, young age of the child, and other significant diagnoses or injuries warranting admission.

The initial cohort identified from this search consisted of 550 children. Charts from 28 (5.1%) children were unavailable for review and were therefore excluded. An additional 28 cases were excluded because the primary reason for admission was not treatment of an acute primary skull or long-bone fracture (2 patients admitted for same-day surgery and 26 patients in whom fractures were noted incidentally). Patients were also excluded if the injury was the result of perpetrator-admitted child abuse (n=2), a vehicular or bicycle crash (n=38), birth trauma (n=9), or if the diagnostic evaluation revealed the presence of metabolic or other bone disease (n=19). As there were only 12 Asian children in the cohort, these children were excluded to simplify the data analysis. The remaining 414 children became the participants for the study. Children were not excluded if they had other injuries in addition to the skull or long-bone fractures.

Hospital charts of these 414 children were abstracted by a senior medical student (R.M.). Demographic data were obtained, including the child's race/ethnicity (white vs black or Hispanic), age (<12 months vs ≥12 months [≥12 months to 3 years defined as toddlers]), and insurance status (private vs none or Medicaid). Demographic information was obtained from the child's admission data sheet, as reported by the child's parent or caretaker. Also abstracted was specific information about the injury, including reported mechanism, presence of other injuries, history or identification of previous injury, and diagnostic studies performed. The main outcome measures were the ordering of a skeletal survey to detect occult fractures and the reporting of the case to CPS.

To simplify the data analysis, several covariates in the model were condensed into a single measure referred to as likelihood of abuse. One author (C.W.C.) reviewed a brief history of each case, including the age of the child, reported mechanism, past medical history and history of previous injury, and presence of other external injury. The author was blinded to the child's name, insurance status, and racial/ethnic background. The author was also blinded to child protection team involvement and, whenever possible, specific historical details that might identify the child. As only 45% of cases were reviewed by the child protection team during hospitalization, the majority of cases had never been reviewed previously by the authors. Additionally, the 177 patients in this study that were seen by the child protection team represent only a fraction of the more than 1000 inpatient cases evaluated by the team during the time frame of this study.

After reviewing each history, the author was asked if a skeletal survey should be performed. If a skeletal survey was requested and had been obtained, the result of the study was provided. Based on the history and study results, the reviewer was then asked whether the case should be identified as likely or definitely accidental (subsequently referred to as accidental), indeterminate, or likely or definitely abusive (subsequently referred to as abusive). The ordering of a skeletal survey was determined to be appropriate if the reviewer had wanted it to be performed.

While specific algorithms do not exist to help distinguish accidental from abusive fractures, several authors have identified factors that indicate an increased risk for abusive injury.[4-6] These factors include: absence of reported injury, reports of very minor injury, and long-bone fractures in children younger than 1 year. In our study, child abuse was also determined by the presence of serious injury to other organ systems or multiple fractures in the absence of metabolic bone disease, including injuries in different stages of healing. Guidelines have been published for the ordering of skeletal surveys; however, they leave much room for clinical judgment. The American Academy of Pediatrics Section on Radiology has stated that skeletal surveys should be mandatory in all children younger than 2 years with suspected abuse. For children between 2 and 5 years of age, the decision to order a skeletal survey should be "handled individually, based on the specific clinical indicators of abuse."[7] The American Academy of Pediatrics recommendations and the above-cited child abuse literature were incorporated into the clinical decisions to order a skeletal survey and to identify an injury as abusive or accidental.

Because of possible subjectivity in determining the likelihood of child abuse, a random sample of 100 patients was reviewed by an expert in child abuse from outside our institution. We calculated interrater reliability (κ) for these cases to strengthen the validity of the likelihood of abuse variable. This study was reviewed and exempted by the Children's Hospital of Philadelphia institutional review board.

Data Analysis

Initial analysis included determining means for continuous variables and frequencies for categorical variables. Because the likelihood of abuse changes dramatically at 1 year of age, when most children become ambulatory, age was coded as a dichotomous variable denoting children younger or older than 12 months of age.[4] Bivariate χ^2 analysis was used to demonstrate crude associations between the 2 outcome measures (ordering of skeletal survey and CPS reporting) and covariates that included race, age, insurance status, and likelihood of abuse. Logistic regression was used to measure the independent association of race with ordering of a skeletal survey, while controlling for likelihood of abuse, appropriateness of ordering a skeletal survey, age, and insurance status. Logistic regression analysis was also used to report the association between race and CPS reporting, while controlling for age, likelihood of abuse, and insurance status. Models were validated using the technique of Hosmer and Lemeshow.[8] Because this was a retrospective cohort study and the results of the logistic regressions reported odds ratios (ORs), we used conditional standardization to estimate relative risks (RRs) with 95% confidence intervals (CIs) of the outcome by race for differing levels of the covariates.[9] The RRs were estimated from the logistic regression by fixing the covariates at clinically meaningful levels and estimating CIs from the variance/covariance matrix. All data were analyzed using STATA statistical software, version 6.0 (StataCorp, College Station, Tex). $P<.05$ was considered statistically significant.

RESULTS

After initial exclusions were made, a total of 414 children were available for data analysis. Information about race was missing for 26 children (6.3%). These children were compared with the total cohort, the white group, and the minority group using bivariate χ^2 analysis to determine which group's baseline characteristics they most closely resembled. The results of this analysis justified their exclusion from further analysis (TABLE 1).

After these final exclusions were made, 388 children remained. Slightly more than half of the population was minority and 58% were male children. The mean (SD) age of the total cohort was 13.0 (10.7) months. Although the mean (SD) age of the minority children (11.8 [10.0] months) was slightly lower than that of the white children (14.2 [11.2] months), the distribution of age was nonparametric and the median ages were quite similar (8.5 vs 10.5 months, respectively; $P=.14$). Nearly half (48.5%) of the children (n=188) had skeletal surveys performed. However, more than 65% (n=128) of minority children had skeletal surveys performed, while only 31% (n=60) of white children had this test performed ($P<.001$). Fewer CPS reports were filed for white children compared with minorities (43 [22.5%] vs 101 [52.9%]; $P<.001$).

Also listed in Table 1 are the proportions of minority and white children with accidental, abusive, and indeterminate injuries. Of the white children, 75.5% (n=145) had accidental injuries. More of the minority children experienced abuse (54 [27.6%] vs 24 [12.5%]; $P<.001$). Because of concerns regarding subjectivity in this abuse assessment, interrater reliability was determined. We calculated a conservative unweighted κ of 0.68 (82% agreement). This constituted substantial agreement,[8] thus validating our own reviewer's independent assessment.

TABLE 2 provides unadjusted RRs for obtaining a skeletal survey and reporting suspected child abuse by race, insurance status, likelihood of abuse (ac-

Table 1. Demographic Characteristics of the Study Population*

	No. (%)			No. (%)		
Characteristic	White (n = 192)	Minority (n = 196)	*P* Value	Total Cohort (n = 388)†	Unknown (n = 26)	*P* Value
Age, mean (SD), mo	14.2 (11.2)	11.8 (10.0)	NA	13.0 (10.7)	13.1 (12.6)	NA
Median (interquartile range)‡	10.5 (3.5-23.5)	8.5 (4.0-18.5)	.14	9.0 (4.0-22.0)	5.5 (2.0-26.0)	.70
Sex, male	107 (55.7)	117 (59.7)	.43	224 (57.7)	14 (53.9)	.70
Insurance status, HMO or private	141 (73.4)	35 (18.3)	<.001	176 (46.0)	14 (53.9)	.44
History of injury provided by caregiver	172 (89.6)	157 (80.1)	.01	329 (84.8)	21 (80.8)	.58
Skeletal survey performed	60 (31.3)	128 (65.3)	<.001	188 (48.5)	14 (53.9)	.59
Child Protective Services report filed	43 (22.5)	101 (52.9)	<.001	144 (37.7)	11 (42.3)	.64
Type of injury according to expert review						
Accident	145 (75.5)	108 (55.1)		253 (65.2)	16 (61.5)	
Indeterminate	23 (12.0)	34 (17.3)	<.001	57 (14.7)	1 (3.9)	.10
Abuse	24 (12.5)	54 (27.6)		78 (20.1)	9 (34.6)	

*NA indicates not applicable; HMO, health maintenance organization.
†Because of missing data, numbers for insurance status are 383 and Child Protective Services report filed are 382.
‡Used nonparametric Mann Whitney test because underlying distribution was not normal.

cident, indeterminate, or abuse), and age. Minority children were more likely to have skeletal surveys performed (RR, 2.07; 95% CI, 1.64-2.60; $P<.001$) and to be reported for suspected abuse (RR, 2.36; 95% CI, 1.76-3.17; $P<.001$) than were white children. Children with private insurance were less likely to have skeletal surveys performed (RR, 0.58; 95% CI, 0.46-0.74; $P<.001$) and less likely to be reported for suspected abuse (RR, 0.37; 95% CI, 0.27-0.50; $P<.001$) than were children with Medicaid or no insurance. Age and abuse assessment were also significant determinants of skeletal survey ordering and child abuse reporting.

The independent association of race with the ordering of a skeletal survey, while controlling for likelihood of abuse, appropriateness of skeletal survey, insurance status, and age, is examined in TABLE 3. A test for interaction indicated that this association was modified by the age of the child, such that the association was more pronounced in the older children (≥12 months). Minority children aged at least 12 months were significantly more likely to have a skeletal survey performed than were white children in the same age group (adjusted OR, 8.75; 95% CI, 3.48-22.03; $P<.001$). Racial differences in ordering of skeletal surveys for children younger than 12 months had only borderline significance (adjusted OR, 2.01; 95% CI, 1.00-4.04; $P=.05$). There was no difference in ordering of skeletal surveys by insurance status (adjusted OR, 0.93; 95% CI, 0.51-1.69; $P=.81$).

Point-estimated RRs of obtaining a skeletal survey were derived from the ORs and are presented in TABLE 4, stratified by likelihood of abuse, age, insurance status, and the appropriateness of ordering a skeletal survey. Differences in skeletal survey ordering between minority and nonminority children became more pronounced as age increased and as the likelihood of abuse decreased. Minority children aged at least 12 months with accidental injuries were more than 5 times more likely to have a skeletal survey obtained than were their white counterparts, particularly when the skeletal survey was not indicated (with private insurance, RR, 5.53; 95% CI, 2.89-8.16; without private insurance, RR, 5.39; 95% CI, 2.41-8.36). In contrast, minority children younger than 1 year with abusive injuries had a nearly equal likelihood of a skeletal survey being performed as their white counterparts. This racial difference in ordering skeletal surveys preferentially in older minority children was also seen among those with indeterminate injuries.

The independent association of race with reporting of suspected child abuse, while controlling for likelihood of abuse, age, and insurance status, is examined in TABLE 5. Most significant was that racial differences again were noted in the reporting of suspected abuse to CPS. This association was modified by age, such that reporting differences by race were noted only for children aged at least 12 months (adjusted OR, 4.32; 95% CI, 1.63-11.43; $P=.003$). This association remained significant, even after adjustment for major confounding variables, including likelihood of abuse (for indeterminate injuries, adjusted OR, 6.19; 95% CI, 3.16-12.13; $P<.001$; for abusive injuries, adjusted OR, 42.30; 95% CI, 17.45-102.54; $P<.001$) and insurance status (adjusted OR, 0.36; 95% CI, 0.18-0.71; $P=.003$).

Point-estimated RRs of reporting to CPS were derived from the ORs and are presented in TABLE 6, stratified by likelihood of abuse and insurance status.

Table 2. Unadjusted Relative Risks for Obtaining a Skeletal Survey and Reporting of Child Abuse According to Race, Insurance Status, Abuse Assessment, and Age*

Outcome	Risk if Exposed, %	Risk if Unexposed, %	Relative Risk (95% CI)	P Value
Skeletal survey				
Race (minority vs white)	65.3	31.6	2.07 (1.64-2.60)	<.001
Insurance status (private vs none/Medicaid)	35.0	59.9	0.58 (0.46-0.74)	<.001
Abuse assessment				
Indeterminate vs accident	67.2	30.9	2.18 (1.69-2.81)	<.001
Abuse vs accident	92.0	30.9	2.98 (2.47-3.60)	<.001
Age (≥12 mo vs <12 mo)	37.8	56.4	0.67 (0.53-0.84)	<.001
Child Protective Services report				
Race (minority vs white)	52.9	22.4	2.36 (1.76-3.17)	<.001
Insurance status (private vs none/Medicaid)	19.4	52.7	0.37 (0.27-0.50)	<.001
Abuse assessment				
Indeterminate vs accident	58.6	16.3	3.60 (2.54-5.10)	<.001
Abuse vs accident	90.7	16.3	5.57 (4.20-7.38)	<.001
Age (≥12 mo vs <12 mo)	29.2	43.7	0.67 (0.50-0.89)	.004

*CI indicates confidence interval. Exposed risk indicates the presence of the first independent variable listed (eg, minority). Unexposed risk indicates the presence of the second independent variable listed (eg, white).

Table 3. Logistic Regression Analysis of the Independent Association of Race, Likelihood of Abuse, Appropriateness of Skeletal Survey, and Insurance Status on the Likelihood of Ordering a Skeletal Survey*

Variable	Adjusted Odds Ratio (95% Confidence Interval)	P Value
Race (minority vs white)		
<12 mo	2.01 (1.00-4.04)	.05
≥12 mo	8.75 (3.48-22.03)	<.001
Likelihood of abuse		
Abuse vs accident	14.86 (5.87-37.58)	<.001
Indeterminate vs accident	2.35 (1.18-4.69)	.02
Skeletal survey warranted vs unwarranted	4.89 (2.08-11.47)	<.001
Insurance status (private vs none/Medicaid)	0.93 (0.51-1.69)	.81

*Adjusted odds ratio for all other independent variables included. Model validated using the technique of Hosmer and Lemeshow ($P=.24$).[8]

Similar to the ordering of skeletal surveys, differences in reporting between minority and nonminority children became more pronounced with increasing age and decreasing likelihood of abuse. Minority children aged at least 12 months with accidental injuries were more than 3 times more likely to be reported to child welfare (with private insurance, RR, 3.74; 95% CI, 1.46-6.01; without private insurance, RR, 3.08; 95% CI, 1.37-4.80). In contrast, minority children younger than 1 year with abusive injuries had a nearly equal likelihood of being reported to child welfare as white children. Interestingly, in the indeterminate category of abuse, minority children were reported to CPS at greater frequency than their white counterparts, particularly in the older age group. The magnitude of this effect was less dramatic than for the ordering of skeletal surveys.

COMMENT

Despite abusive injuries occurring more commonly among minority children, our results showed that there was still a significant difference in the evaluation of skull and long-bone fractures for abusive injury between minority and nonminority children. These racial differences remained significant, even after adjustment for the likelihood of abuse. We also controlled for insurance status and found that, despite the protective effect that higher socioeconomic status affords, the effect of race on ordering of skeletal surveys and reporting to CPS remains significant. Interestingly, the large differences in ordering a skeletal survey and reporting between the racial groups were most pronounced in toddlers with accidental and indeterminate injuries. Minority toddlers with accidental injuries were more likely to have skeletal surveys and be reported to CPS than were their white counterparts.

These results are concerning, but not surprising, as a number of other studies have identified differences in health care provision between minorities and nonminorities. For example, several studies have documented that minorities receive unequal care for cardiac conditions. Nonwhite patients presenting to the emergency department with angina or acute myocardial infarction appear to be hospitalized less often than white patients.[10,11] Minority patients are also less likely to receive cardiac procedures such as cardiac catheterization, coronary angioplasty, and bypass surgery.[12-17] Racial differences have also been noted in the treatment of early-stage lung cancer and in analgesic provision in the emergency department.[18,19] Racial differences have been documented in psychiatric care as well. Research has shown that clinicians spend less time with and prescribe more medication for blacks compared with whites,[20,21] and blacks are more frequently labeled as psychotic.[22]

Table 4. Point-Estimated Relative Risks of Obtaining a Skeletal Survey by Race*

Type of Injury	Weighted Percentage: Minority	Weighted Percentage: White	Relative Risk (95% Confidence Interval)
Accidental injury			
Age, <12 mo (n = 128)			
Private insurance			
Skeletal survey appropriate	49.4	32.7	1.51 (1.01-2.01)
Skeletal survey not appropriate	16.6	9.0	1.84 (0.90-2.78)
Medicaid or no insurance			
Skeletal survey appropriate	51.2	34.3	1.49 (0.92-2.06)
Skeletal survey not appropriate	17.7	9.6	1.83 (0.85-2.81)
Age, ≥12 mo (n = 125)			
Private insurance			
Skeletal survey appropriate	77.7	28.4	2.73 (1.44-4.02)
Skeletal survey not appropriate	41.6	7.5	5.53 (2.89-8.16)
Medicaid or no insurance			
Skeletal survey appropriate	78.9	30.0	2.63 (1.23-4.04)
Skeletal survey not appropriate	43.3	8.0	5.39 (2.41-8.36)
Indeterminate injury			
Age, <12 mo (n = 37)			
Private insurance			
Skeletal survey appropriate	69.6	53.3	1.31 (1.00-1.61)
Skeletal survey not appropriate	31.9	18.9	1.69 (0.92-2.45)
Medicaid or no insurance			
Skeletal survey appropriate	71.1	55.1	1.29 (0.95-1.63)
Skeletal survey not appropriate	33.5	20.1	1.67 (0.87-2.48)
Age, ≥12 mo (n = 20)			
Private insurance			
Skeletal survey appropriate	89.1	48.3	1.84 (1.11-2.57)
Skeletal survey not appropriate	62.6	16.1	3.90 (1.72-6.08)
Medicaid or no insurance			
Skeletal survey appropriate	89.8	50.2	1.79 (1.05-2.54)
Skeletal survey not appropriate	64.3	17.1	3.77 (1.48-6.05)
Abusive injury			
Age, <12 mo (n = 60)			
Private insurance			
Skeletal survey appropriate	93.5	87.8	1.07 (0.99-1.14)
Skeletal survey not appropriate	74.8	59.6	1.25 (0.91-1.60)
Medicaid or no insurance			
Skeletal survey appropriate	94.0	88.6	1.06 (0.98-1.14)
Skeletal survey not appropriate	76.1	61.3	1.24 (0.90-1.58)
Age, ≥12 mo (n = 18)			
Private insurance			
Skeletal survey appropriate	98.1	85.5	1.15 (0.98-1.32)
Skeletal survey not appropriate	91.4	54.7	1.67 (0.93-2.41)
Medicaid or no insurance			
Skeletal survey appropriate	98.2	86.4	1.14 (0.98-1.30)
Skeletal survey not appropriate	91.9	56.5	1.63 (0.93-2.32)

*Derived from a logistic regression model across different levels of the covariates, to account for varying proportions of children having a skeletal study performed.

Racial differences have also been documented in the field of child abuse. Although all 3 National Incidence Studies of Child Abuse and Neglect have shown no racial differences in maltreatment,[23] black and Hispanic children are more likely than white children to be involved in the child welfare system.[1,2] This disparity may be due to racial differences in the reporting rates for minority and white children as documented by Hampton and Newberger[2] in their analysis of reporting by hospitals and Jenny et al[3] in their review of patients with head trauma. Both underreporting of whites and overreporting of minorities may contribute to these differences.[24]

We found it quite interesting that significant differences were identified not only in skeletal survey ordering by race but also in reporting to child welfare. However, the magnitude of this effect was small when compared with the ordering of skeletal surveys. We suspect that when a fracture is thought to be inflicted, physicians are aware of their legal mandate to report to CPS and do so with less consideration of other factors, consciously or unconsciously, such as race. However, physicians may still express biases by searching for additional injuries and reporting more frequently in minority patients.

Table 5. Logistic Regression Analysis of the Independent Association of Race, Likelihood of Abuse, and Insurance Status on the Likelihood of Reporting to Child Protective Services*

Variable	Adjusted Odds Ratio (95% Confidence Interval)	*P* Value
Race (minority vs white)		
<12 mo	1.21 (0.54-2.73)	.64
≥12 mo	4.32 (1.63-11.43)	.003
Likelihood of abuse		
Abuse vs accident	42.30 (17.45-102.54)	<.001
Indeterminate vs accident	6.19 (3.16-12.13)	<.001
Insurance status (private vs none/Medicaid)	0.36 (0.18-0.71)	.003

*Adjusted odds ratio for all other independent variables included. Model validated using the technique of Hosmer and Lemeshow ($P = .70$).[8]

Table 6. Point-Estimated Relative Risks of Reporting to Child Protective Services by Race*

Type of Injury	Weighted Percentage: Minority	Weighted Percentage: White	Relative Risk (95% Confidence Interval)
Accidental injury			
Age, <12 mo (n = 128)			
Private insurance	11.4	9.6	1.19 (0.47-1.91)
Medicaid or no insurance	26.3	22.8	1.16 (0.56-1.75)
Age, ≥12 mo (n = 125)			
Private insurance	17.6	4.7	3.74 (1.46-6.01)
Medicaid or no insurance	37.3	12.1	3.08 (1.37-4.80)
Indeterminate injury			
Age, <12 mo (n = 37)			
Private insurance	44.3	39.6	1.12 (0.68-1.55)
Medicaid or no insurance	68.9	64.7	1.07 (0.82-1.32)
Age, ≥12 mo (n = 20)			
Private insurance	56.9	23.4	2.43 (1.24-3.62)
Medicaid or no insurance	78.7	46.0	1.71 (1.01-2.41)
Abusive injury			
Age, <12 mo (n = 60)			
Private insurance	84.4	81.7	1.03 (0.92-1.15)
Medicaid or no insurance	93.8	92.6	1.01 (0.96-1.06)
Age, ≥12 mo (n = 18)			
Private insurance	90.0	67.6	1.33 (0.97-1.69)
Medicaid or no insurance	96.2	85.3	1.13 (0.97-1.28)

*Derived from a logistic regression model across different levels of the covariates, to account for varying proportions of children being reported.

Minority children with fractures of indeterminate origin had more skeletal surveys ordered than white children with injuries of indeterminate origin. Furthermore, although these numbers were small, white children with fractures of indeterminate origin were less likely to be reported to CPS. Perhaps skeletal surveys were ordered more frequently for minority children to provide assurance that additional injuries were not missed, while this assurance was not deemed necessary among white children. Our expert reviewer requested that a skeletal survey be performed on nearly all of these children; however, while 29 of 34 minority children in this category had a survey completed, only 9 of 23 white children received the test. For both infants and toddlers with indeterminate injuries, the absolute proportion of white children who were reported was less than 50%. It is quite possible that cases of abuse were overlooked in white children because no study was performed, and that some of the overall differences in child abuse reporting may have been the result of underdetection of abuse among white children rather than overdetection among minorities. This finding is not surprising, in light of previous data demonstrating that white race can delay the diagnosis of child abuse.[3]

There were a number of limitations to this study. Abusive injuries were more common among minority children in our study, a finding supported or suggested by several authors[24,25] but refuted by others.[23,26,27] Unfortunately, we were unable to measure a number of potential factors, such as single and/or teenage parenthood, depression, unemployment, stress, and lack of social support, that may have contributed to racial differences in actual rates of abuse.

Differential reporting of abuse to CPS by race was seen among toddlers with accidental and indeterminate injuries. Racial biases may have played a role in this differential reporting. However, other factors that we were unable to measure in this study may also have contributed. For example, we were unable to account for the role that supervision played in the decision to file a report of suspected abuse. It is possible that some toddlers with accidental injuries were reported to CPS because they were unsupervised when the injury occurred. Whether minority children were more likely to be playing without adult attention and were reported for this reason remains unknown. Furthermore, it is possible that lapses in supervision by minority families were more often reported to CPS because of concerns about possible neglect. In addition, we were unable to account for other factors such as parental drug use that may have contributed to the decision to report.

Our study was also limited by other factors. First, we only reviewed charts of patients hospitalized for their fractures. Therefore, the differences in evaluation and reporting of suspected abuse applies only to this population and cannot be generalized. However, we suspect that differences in evaluation and reporting by race might be even more pronounced if we had included children who were treated in the emergency department and released. In our experience, children who are suspected victims of child abuse are more likely to be admitted to the hospital. Therefore, if white children were less likely to be suspected, it is possible that they were differentially discharged from the emergency department compared with minority children. A comparison between evaluation and reporting of admitted vs released patients by race warrants further study.

Patients included in this study were frequently referred from other hospitals. Many of these children had CPS reports filed by outside physicians, prior to their transfer to our hospital. We were unable to determine for all patients whether the skeletal survey or CPS report had been generated at our institution or at an outside facility. Therefore, we can make no conclusions about whether our own staff was responsible for differential evaluation and reporting, or whether this was more likely to occur at community hospitals. In addition, we had no information on the race or other characteristics of the physician ordering the skeletal survey or reporting suspected abuse. Therefore, we were unable to control for these factors in our analysis.

In 1990, the Council on Ethical and Judicial Affairs of the American Medical Association published a review of black-white disparities in health care and made several recommendations.[28] These recommendations suggested greater awareness among physicians of existing and potential disparities in treatment and continued development of practice parameters, including criteria that would preclude or diminish racial disparities in health care decisions. This article has sought to identify disparities in the evaluation and reporting of fractures for possible abuse. Clearly, differences do exist in the evaluation and reporting of pediatric fractures for suspected abuse, particularly in toddlers with accidental injuries. Additional education regarding racial differences in health care and identification of abusive injuries may be warranted within our community.

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Acquisition of data: Rubin, Monteith.
Analysis and interpretation of data: Lane, Rubin.
Drafting of the manuscript: Lane, Monteith.
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