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Can we increase detection? A nationwide analysis of age-related fractures in child abuse

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ABSTRACT

Purpose: The purpose of this study was to stratify fractures associated with child abuse in relation to the child's age.
Methods: The Kids' Inpatient Database (1997–2012) was queried for all patients (<18 years old) with a diagnosis of fracture and child abuse. The primary outcome was age-related determinants of fracture distribution. Chi-squared analysis was used for statistical analysis where appropriate, with significance set at $p < 0.05$.
Results: More than 39,000 children were admitted for child abuse, and 26% sustained fractures. Most were infants (median age 0 year [IQR 0–1]). 28% sustained multiple fractures, and 27% had skull fractures.
By age, infants had the highest rate of multiple fractures (33% vs 16% 1–4 years), and the highest rate of closed skull fractures (33% vs 21% ages 1–4), while adolescents had more facial fractures (43% vs 11% ages 9–12), all $p < 0.001$. Multiple rib fractures were more commonly seen in infants (28% vs 8% ages 1–4), while children 5–8 years had the highest rates of clavicular fractures (7% vs 3% in infants), all $p < 0.001$.
Conclusion: Age-related fracture patterns exist and may be due to changing mechanism of abuse as a child grows. These age-related fracture patterns can help aid in healthcare detection of child abuse in hopes to thwart further abuse.
Type of study: Retrospective comparative study.
Level of evidence: Level III.

Child abuse is a devastating, preventable public health concern that has been shown to have long-term health consequences in abuse victims [1,2]. Decades of research and governmental initiatives have attempted to curtail child abuse, yet despite these attempts the incidence has not significantly decreased [3]. According to the 4th National Incidence Study of Child Abuse and Neglect, a surveillance report published by the U.S. congress every 10 years, nearly 1.3 million children are maltreated every year [4]. Fractures are the second most common type of injury seen in child abuse [5] and a recent national study of child abuse injury patterns in the U.S. demonstrated 35% of children presented with extremity fractures and 24% with skull fractures [6]. However, caregivers presenting with injured children may give an inaccurate history of the injurious event, leading to as many as 20% of abusive fractures being initially missed by healthcare providers [7]. Children with fractures attributed to abuse have a twofold increased risk of mortality than fractures of accidental or pathologic etiologies [8]; thus, improving detection methods of abusive fracture patterns in children is imperative.

Certain injury patterns are well characterized and raise healthcare provider's index of suspicion for child abuse. For instance, clavicular and long bone diaphyseal fractures should raise a red flag in younger, nonambulatory children [9]. Considering patient age and development with respect to fracture patterns could enhance the clinician's ability to identify children at high risk for child abuse and higher mortality. Available analyses relating age and development with specific fracture patterns in abusive injury are limited to either specific bones or specific age groups, or lack nationally representative data [10–13].

Thus, we sought to utilize a nationally representative database of inpatient admissions of child abuse in the U.S. to study the presence of abusive fractures and determine distinct fracture patterns associated with different age groups of children. We hypothesized that pediatric victims of abuse would have distinct fracture patterns based on their age at time of injury.

1. Methods

The Kids' Inpatient Database (KID) was utilized for this study. It is maintained by the Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Quality and Research and is a database, released triennially, which contains information from pediatric discharges from 22 states in its inception to 44 states in the 2012 release. It contains 3 million unweighted pediatric discharges (6.7 million weighted) and

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includes variables such as primary and secondary diagnoses, procedures codes, patient demographics, hospital characteristics, and information on resource utilization such as cost and length of stay. Diagnoses and procedures from each hospitalization are coded using the *International Classification of Disease, 9th revision Clinical Modification* (ICD-9CM).

For this study, KID was analyzed for the triennial dataset releases 1997 through 2012 (totaling 6 database releases) utilizing ICD-9CM diagnoses codes for child maltreatment, which includes abuse and neglect (99,550, 99,551, 99,552, 99,553, 99,554, 99,555, 99,559, 99,580, 99,581, 99,582, 99,583, 99,584, 99,585, V7181) [14] or E-code for assault (codes E960–E969), which resulted in a database with hospital admissions of child victims of all types of abuse. In order to analyze victims of abusive fractures, this database was then further categorized by ICD-9CM diagnosis codes for fractures, 800–829. Patients with dispositions coded as "transfer to short-term hospital" and "other transfers, including skilled nursing facility, intermediate care, and other type of facility" were excluded from analyses to avoid inclusion of duplicate cases. Cases were weighted as per HCUP specifications to allow national estimates. All analyses were limited to available data.

Demographics are reported as *n* (%). Quantitative variables are reported as mean ± standard deviation (SD) for normally distributed variables or median [IQR] for nonparametric variables. Univariate associations of quantitative variables were analyzed using Student's t-test or Mann–Whitney U test, as appropriate. Qualitative variables were analyzed by cross-tabulation and the chi-square statistic. Owing to the nature of the KID, all survival/mortality analyses in our study refer to in-hospital survival/mortality. All analyses were two-sided, and significance was defined at alpha level 0.05 or 0.01 when applicable after Bonferroni correction, and were performed using SPSS Statistics version 25.0 (International Business Machines Corp., Armonk, New York). This retrospective comparative analysis was deemed exempt from review from the University of Miami Miller School of Medicine IRB committee as the data source contains deidentified patient information.

2. Results

2.1. Patient demographics of child abuse cohort—Table 1

During the study period, there were more than 39,000 victims of child abuse that required hospitalization. Overall, the mortality rate after child abuse in this cohort was 4%. The population was very young with a median age of 0 year [0–1 year], half were male (51%), and almost half of the total cohort (48%) was Caucasian, while African American and Hispanic children made up less proportions (27% and 18% respectively). Public insurance (Medicare/Medicaid) was the primary payer for 71% of the study population. Physical abuse, including abusive head trauma (AHT, formerly known as "shaken baby syndrome"), made up 60% of all cases of abuse requiring hospitalization. The most common types of physical abuse seen were head trauma ($n = 10{,}445$, 27%) and fractures ($n = 10{,}010$, 26%).

Table 1
Patient characteristics of pediatric child abuse, Kids Inpatient Database (1997–2012).

Characteristics	*n* (%)
All abuse	39,127
Mortality during admission	1476 (4)
Sex	
Female	18,977 (49)
Male	20,126 (51)
Age[a], years	0 (0–1)
Infants age	
1–3 months	4264 (26)
4–6 months	3922 (25)
7–9 months	3921 (25)
10–12 months	3885 (24)
Race/ethnicity	
Caucasian	14,022 (48)
African American	7799 (27)
Hispanic	5189 (18)
Asian/Pacific Islander	390 (1)
Native American	337 (1)
Other	1678 (5)
Type of abuse	
Physical	18,184 (46)
Abusive head trauma	5623 (14)
Emotional	7678 (20)
Sexual	2916 (7)
Neglect	33 (0.1)
Other/uncategorized	4693 (12)
Type of injury	
Fractures	10,010 (26)
Burns	1858 (5)
Head trauma	10,445 (27)
Facial trauma	1487 (4)
Torso	7501 (19)
Upper extremity	6273 (16)
Lower extremity	6046 (15)
Injury to organs	2487 (6)
Multiple trauma	19,816 (51)
Children's hospital designation	
Children's general hospital	13,294 (40)
Children's unit in general hospital	11,111 (33)
General hospital	9128 (27)
Payer type	
Public insurance[b]	27,733 (71)
Private insurance	7841 (20)
Self-pay/other	3553 (9)

[a] Data presented as median (interquartile range).
[b] Medicare/Medicaid.

2.2. Characteristics of pediatric abuse fractures—Table 2

All pediatric abuse fractures had an in-hospital mortality rate of 4% with a similar age range to the general population with a median age of 0 year [0–1 year] and 96% were children <5 years old. However, males were more likely to have sustained fractures when compared to child victims of abuse with other injuries (58% vs 50%, $p < 0.001$). There was a similar racial/ethnic distribution between the overall population and those with fractures. Skull fractures were the most common fractures (39%), followed closely by lower extremity (35%) and upper extremity fractures (25%). Multiple fractures were seen in 28% of children and closed skull fractures were the most common type of skull fracture seen. The most common types of upper extremity fractures were closed humerus (61%) and closed radial/ulnar fractures (24%), while lower extremity fractures were most commonly closed femur (73%) and closed tibia/fibula fractures (20%). Of all fractures of the torso, rib fractures were by far the most common, with 71% being multiple rib fractures and 16% single rib fractures. Pelvic and spinal fractures were less common; however, pubis bone fracture (45%) was the most commonly fractured bone in the pelvis and the lumbar vertebrae (41%) were more commonly fractured in the spine. Of those with fractures, 28% required a major operative procedure during their hospitalization; these ranged from open reduction internal fixation (ORIF), tracheostomy, and craniotomy.

2.3. Analysis of age-related fracture patterns—Table 3

Children were then stratified into five age groups which attempt to cluster patients into physical abilities and development. The groups consist of infants (<1 year old), toddlers (1–4 years old), young elementary school-aged children (5–8 years old), preadolescent children (9–12 years old), and adolescents (13–18 years old). Infants were the most likely to present with multiple fractures when compared to all other age groups (33% vs. 16% toddlers, $p < 0.001$).

2.3.1. Head/spine/torso fractures

Adolescents were by far the most likely to present with facial fractures (85% vs 35% preadolescent children, $p < 0.001$) and infants

Table 2
Patient characteristics of pediatric child abuse related fractures, Kids Inpatient Database (1997–2012).

Characteristics	*n* (%)
All fractures	10,010
Mortality during admission	376 (4)
Sex	
Female	4239 (42)
Male	5765 (58)
Age[a], years	0 [0–1]
Age groups (years)	
Infants (<1 year)	7262 (72)
Toddlers (1–4 years)	2393 (24)
Young elementary school-aged (5–8 years)	149 (1.5)
Preadolescent (9–12 years)	57 (1)
Adolescent (13–18 years)	149 (1.5)
Race/ethnicity	
Caucasian	3726 (48)
African American	1962 (25)
Hispanic	1541 (20)
Asian/Pacific Islander	59 (1)
Native American	59 (1)
Other/not categorized	497 (5)
Type of fracture	
Upper extremity	2539 (25)
Lower extremity	3545 (35)
Pelvic	53 (0.5)
Torso	3152 (31)
Spine	123 (1)
Skull/face	3900 (39)
Multiple fractures	2837 (28)
Type of upper extremity fracture	
Radial/ulnar closed	606 (24)
Radial/ulnar open	224 (9)
Humerus closed	1542 (61)
Humerus open	* (<0.1)
Hand	160 (6)
Elbow	* (<0.2)
Type of lower extremity fracture	
Tibia/fibula closed	719 (20)
Tibia/fibula open	* (<0.08)
Femur closed	2578 (73)
Femur open	* (<0.04)
Ankle/foot	244 (7)
Type of pelvic fracture	
Ischium	* (<18)
Ilium	* (<20)
Pubis	24 (45)
Acetabular	* (<17)
Type of torso fracture	
Scapular	61 (2)
Clavicular	341 (11)
Rib, one	520 (16)
Rib, multiple	2226 (71)
Sternal	* (<0.1)
Type of spine fracture	
Cervical spine	39 (32)
Thoracic spine	20 (16)
Lumbar spine	50 (41)
Sacrum	14 (11)
Type of skull/face fracture	
Facial	136 (3)
Closed skull, no coma	2937 (75)
Closed skull, coma	816 (21)
Open skull, no coma	* (<0.2)
Open skull, coma	* (<0.1)
Major operative procedures[b]	1660 (28)[b]
Orthopedic surgery	203 (12)
General surgery	485 (29)
Genitourinary surgery	31 (2)
Neurosurgery	941 (57)

Cells marked with an asterisk (*) represent actual values censored from publication in accordance with the Healthcare Cost and Utilization Project Data Use Agreement.
[a] Data presented as median (interquartile range).
[b] Percentages of data provided from patients with procedural codes available, $n = 5931$.

similarly had the highest rates of skull fractures without coma (82% vs 60% toddlers, $p < 0.001$). While young elementary school-aged children did not have the highest rates of skull fracture, they did have the highest rate of skull fractures with coma (51% vs 34% toddlers, $p < 0.001$). Spine fractures were rare overall, yet cervical fractures were most common in adolescents (80% vs 38% in young elementary school aged children, $p < 0.001$), lumbar fractures were most common in preadolescent children (100% vs 56% in infants, $p < 0.001$), and thoracic fractures were most common in young elementary school aged children ($p < 0.001$). Torso fractures were much more common in the youngest patient groups; however, clavicle fractures had the highest rate in preadolescent children (100% vs 85% in young elementary school aged children, $p < 0.001$) while infants had the highest rate of multiple rib fractures (74% vs 52% in toddlers, $p < 0.001$). Rib fractures were less commonly seen in children more than 5 years of age, but adolescents had an increased rate (30% vs 7.5%, $p < 0.01$).

2.3.2. Extremity fractures

Lower extremity fractures were commonly seen overall; however, there were specific age-related patterns. Adolescent patients had the highest rate of tibia/fibula fractures when compared to other age groups (79% vs 33% preadolescent patients vs. 19% toddlers, $p < 0.001$) whereas femur fractures were more common in infants and toddlers and its incidence decreased with increasing age (73% vs 21% in adolescents, $p < 0.001$). Ankle and foot fractures were most common in preadolescent children (42% vs 18% young elementary aged children, $p < 0.001$). Upper extremity fractures were also common and were found to have associated age-related patterns of injury. Radius/ulnar fractures were most common in infants and toddlers (35% and 30% respectively, vs adolescents 3%, $p < 0.001$), and had a decreasing incidence with increasing age. Humerus fractures were also more commonly seen in the youngest age groups (62% vs 18% in preadolescent children, $p < 0.001$). Fractures of the hand had the highest incidence in adolescents (66% vs 3% infants, $p < 0.001$).

3. Discussion

This study represents a nationwide analysis of abusive fractures in children (age < 18 years) with respect to their age and development. Our study reveals distinct injury patterns associated with a child's age that could potentially aid healthcare professionals and social workers in developing improved detection methods. Differentiation between abusive and accidental injuries in children is paramount because the decisions from both the healthcare providers and social workers can have severe consequences such as (i) missed abuse with the child remaining in a dangerous situation, (ii) underestimation of the severity of child maltreatment which also places child at continued endangerment and (iii) misplacement of blame, resulting in familial investigations and the risk of losing child custody, parental employment, or even incarceration. In any case of potential child abuse, the stakes are extremely high, and thus further studies in improved measures of detection of abusive injuries in children are warranted.

Multiple fractures in children often increase suspicion of child abuse. However, underlying genetic conditions such as osteogenesis imperfecta and deficiencies in vitamin D and copper can also result in multiple fractures in children [15]. Thus, careful determination of the mechanism of injury and using other screening tools such as the skeletal survey are important when faced with a child with a potential for multiple fractures. The American Academy of Pediatrics released guidelines on particular cases where the skeletal survey should be performed, although its use is limited to infants and toddlers [16]. In addition to skeletal survey, medical workup of potential pathologic causes for fractures in children is also recommended [15]; however, the presence of conditions that decrease bone density does not exclude the possibility of child abuse. Leventhal et al. demonstrated that the presence of multiple fractures in young children (<36 months of age) increased the risk of

Table 3
Analysis of age-related fracture patterns in child victims of abusive.

Type of fracture	<1 year	1–4 years	5–8 years	9–12 years	13 + years	p-value
Multiple	2421 (33)	383 (16)	18 (12)	* (<5)	11 (7)	**0.001**
Head fractures						**0.001**
Facial	14 (1)	46 (6)	* (<16)	* (<35)	64 (85)	
Skull, w/o coma	2417 (82)	501 (60)	13 (33)	* (<47)	* (<7)	
Skull, w/ coma	506 (17)	286 (34)	20 (51)	* (<18)	* (<8)	
Spinal fractures						**0.001**
Cervical spine	19 (32)	13 (27)	* (<38)	* (<1)	* (<80)	
Thoracic spine	* (<7)	12 (24)	* (<50)	* (<1)	* (<1)	
Lumbar spine	33 (56)	13 (27)	* (<12)	* (<100)	* (<20)	
Sacrum	* (<5)	11 (23)	* (<1)	* (<1)	* (<1)	
Torso fractures						**0.001**
Scapula	43 (1)	18 (5)	* (<1)	* (<1)	* (<1)	
Clavicle	244 (9)	76 (20)	11 (85)	* (<100)	* (<50)	
Rib, single	431 (16)	84 (23)	* (<7.5)	* (<1)	* (<21)	
Rib, multiple	2027 (74)	193 (52)	* (<,7.5)	* (<1)	* (<29)	
Sternal	* (<1)	* (<1)	* (<1)	* (<1)	* (<1)	
Lower extremity						**0.001**
Tibia/fibula	554 (21)	143 (19)	11 (25)	* (<33)	11 (79)	
Femur	1989 (73)	560 (73)	25 (57)	* (<25)	* (<21)	
Ankle/foot	172 (6)	59 (8)	* (18)	* (<42)	* (<1)	
Upper extremity						**0.001**
Radius/ulnar	589 (35)	217 (30)	17 (26)	* (<23)	* (<3)	
Humerus	1051 (62)	448 (62)	33 (51)	* (<18)	* (<31)	
Hand	55 (3)	58 (7.5)	15 (23)	13 (59)	19 (66)	
Elbow	* (<1)	* (<1)	* (<1)	* (<1)	* (<1)	
Pelvic						**0.001**
Ischium	* (<13)	* (<27)	* (<1)	* (<1)	* (<1)	
Ilium	* (<38)	* (<17)	* (<1)	* (<1)	* (<1)	
Pubis	* (<20)	17 (56)	* (<100)	* (<1)	* (<1)	
Acetabular	* (<31)	* (<1)	* (<1)	* (<1)	* (<100)	

Asterisks (*) represent actual values censored from publication in accordance with the Healthcare Cost and Utilization Project Data Use Agreement.

having an abusive etiology four to six-fold, which correlates with our data as younger children with abusive fractures were more likely to have multiple fractures [13]. Another study of femur fractures in children found a significant difference in the number of associated bruises between nonaccidental fractures and accidental. [17] While our data are congruent with past studies, it further characterizes that the youngest children are the most at-risk population of receiving multiple fractures. We surmise that this is likely owing to decreased developmental abilities and inability to escape from an abusive perpetrator compounded with the presence of osteopenia of prematurity which correlates to bone fracturing with less blunt force [18].

Accidental skull fractures are common in children, especially those less than one year old, as short falls onto hard surfaces can cause certain types of skull fractures [12,19–21], which makes distinguishing skull fractures of abuse difficult. Interestingly, our data revealed that while infants had the highest rates of skull fractures overall, half of elementary school-aged children with skull fractures presented with coma. This may suggest that elementary school-aged children present with more severe skull fractures owing to a mechanism of injury that produces more force than a simple fall or shaking method seen in infants. Our data also suggest that facial fractures are a phenomenon of older children, specifically adolescent and preadolescents. Adolescent children in particular are often similar in size to the adult perpetrator and thus are more likely to present with injuries often found in adult assault victims, such as facial fractures.

Rib fractures have the highest specificity of any fracture for abusive etiology and are often linked to infants who have AHT as well, suggesting the "shaking" mechanism of injury [11,22]. Our data also demonstrated a statistically significant increase in rib fractures in infants when compared to any other age group, and considering that shaking is a common method of physical abuse in infants, this is likely one of the main drivers of infant rib fractures. Some have speculated that cardiopulmonary resuscitation (CPR) can cause rib fractures in children, although this is somewhat controversial [23,24]. In order to ensure this would not bias results, we determined in our cohort of more than 10,000 fractures only 0.6% ($n = 59$) received CPR, and only 16% of these patients were diagnosed with rib fractures. While we are unable to distinguish whether these fractures were because of the abuse or whether they required CPR owing to other abusive trauma and the CPR caused the rib fractures, this is a very small number and is unlikely to affect the analysis of the dataset.

Upper and lower extremity fractures associated with abusive injury have been well described in the literature; however our study improves upon the literature by identifying patterns associated with specific ages. Pierce et al. performed an analysis of young children with femur fractures who had reportedly fallen down stairs, a common history given for both accidental and abusive injuries, and developed an injury plausibility model to determine whether differences exist in accidental and abusive femur fractures [17]. Their study (among others) demonstrated that abusive injuries of the femur were more commonly transverse fractures, which correlate to a higher impact force, consistent with abusive trauma [17,25,26]. Our study also demonstrated that younger patients tended to have higher rates of femur fractures while Pierce et al. characterized that younger children (<12 months) were more likely to have spiral femur fractures and older children were more likely to have buckle femur fractures. A meta-analysis of abusive fractures by Kemp et al. also demonstrated that the mean age of abusive femur fractures was significantly lower than the mean age of accidental fractures, which we also demonstrated [11]. Coffey et al. also reported that children <18 months presenting with tibia/fibula fractures were almost always the result of abuse [27]. However, our study demonstrated that adolescents had the highest age-related incidence of tibia/fibular fractures and that preadolescents had the highest association of abusive ankle/foot injuries, which were previously undescribed in the literature. The abusive humerus fracture has also been previously described as occurring in younger children with reports of 1 in 2 chance of an abusive etiology [11,28]. Our data also demonstrated a high rate of humerus fractures with a higher rate in younger patients. While the age-related

TYPE OF FRACTURES	<1 YEAR	1-4 YEARS	5-8 YEARS	9-12 YEARS	13-18 YEARS
MULTIPLE FRACTURES	✓				
HEAD	SKULL FRACTURE, NO COMA		SKULL FRACTURE, WITH COMA		FACIAL FRACTURE
SPINAL			THORACIC	LUMBAR	CERVICAL
TORSO	MULTIPLE RIBS	SCAPULA	CLAVICLE	CLAVICLE	
LOWER EXTREMITY	FEMUR	FEMUR		ANKLE/FOOT	TIBIA/FIBULA
UPPER EXTREMITY	RADIUS/ULNAR HUMERUS	HUMERUS			HAND
PELVIC	ILIUM	ISCHIUM	PUBIS		ACETABULAR

Fig. 1. Visual aid for identification of age-related fractures of abuse.

differences in abusive radial/ulnar fractures were not as pronounced, there was an age-dependent decrease in incidence with increasing age. This study also demonstrated that adolescents are the most likely to have abusive hand fractures. We suspect this is likely because of the adolescent patients' ability to better defend themselves and thus are likely fractures related to self-defense or even an attempt to fight back.

This study is not without limitations. The utilization of ICD-9CM and E-codes to identify abused children has been shown to be an underestimation of the true incidence of child abuse [29]. Additionally, KID only identifies children that are hospitalized and thus any child that presents to the emergency department or ambulatory clinics for fractures are not present in the data. Thus, the population described in this work may be partially skewed towards children with more severe injuries which limits its ability to identify less severe injury patterns more likely to present at ambulatory centers. We also lack data on any prior or subsequent interactions with the healthcare system. Owing to the nature of an administrative database, errors in data entry, collection and administrative errors are also a limiting factor of this study. Owing to its retrospective nature, we were unable to account for the presence of fractures of varying ages, which have been shown to be associated with abuse [15]. Our analysis also lacks data on the history of injury, parental interactions or familial circumstances, specifics of fracture (i.e. spiral vs transverse vs buckle), or the additional burden of other injury types such as evidence of abrasions, lacerations, burns, ophthalmologic injuries, and internal injuries.

Despite its limitations, this study bolsters previous literature by offering a nationally representative analysis of age-related fracture patterns in child abuse victims. Future directions to decrease child abuse of any form are a complex topic that involves improved identification measures along with improved crosstalk between care systems and governmental agencies. A recent study by our group demonstrated that children with physical abuse often had previous admissions at multiple different hospitals and prior traumatic injuries, which indicate that perpetrators are attempting to avoid detection by utilizing multiple healthcare systems and sentinel abusive injuries are often undetected [30]. Unfortunately, there are currently no specific screening guidelines for abusive fractures suspicious for an abusive etiology; thus, continued studies into the specific presentations of fractures of abuse are warranted. Many of our novel findings may help improve current child abuse identification measures, which require further prospective studies for validation of their likelihood of association with abuse. Fig. 1 represents the main findings for each age-group in relation to their associated fracture patterns. The authors of this study hope that this visual guide will aid healthcare workers to maintain a high index of suspicion for the potential fractures of abuse in their pediatric patients.

4. Conclusion

This analysis of a large, nationally representative database of children victims of abuse demonstrates that certain fracture patterns seem to be related to the child's age at time of abuse. We propose that this is likely because of multiple factors including child's abilities, bone-maturity, and changing mechanism of abuse as a child matures. These age-related fracture patterns may help aid in healthcare detection of child abuse in hopes to thwart further abuse.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpedsurg.2020.09.027.

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