
Child Abuse

An Update on Surgical Management in 256 Cases

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In the period January 1982–July 1984, 1512 cases of suspected child abuse were evaluated in the emergency department of a major children's hospital, of which 256 (17%) required hospitalization. Failure-to-thrive with caloric malnutrition was present in 66 (26%), burns in 56 (22%), central nervous system injury in 53 (22%), soft tissue trauma in 21 (8%), ingestions in 20 (8%), skeletal injury in 15 (6%), neglect of an underlying disease in 10 (4%), sexual abuse in nine (3%), near-drowning in four (1%), and abdominal trauma in two (1%). Two-thirds of the children required surgical care and one-third of the surgical group needed operations. The majority of the patients were toddlers between 18 and 36 months of age. A long hospitalization occurred with a mean stay of 9.3 days. Mortality was 7% for the entire group, but children with central nervous system injury had a much higher mortality (26%) and morbidity (21%).

CONTEMPORARY SOCIETY recognizes child abuse as a serious medical and social problem. Twenty-three years ago, Kempe and colleagues¹ alerted physicians and the public to the "battered child syndrome" as a distinct and far more common entity than previously realized. Although neglect of and violence toward the young have been recorded throughout history,² an organized approach to the medical, legal, social, and preventive aspects of child abuse are of recent origin. Protean manifestations of child abuse have been documented: burns, trauma to the eyes, central nervous system, skeleton, soft tissues, and viscera, ingestions, near-drowning, starvation, strangulation, sexual abuse, abandonment, neglect, and failure-to-thrive.³ This study evaluates a major children's hospital's experience with child abuse with particular attention to types of injury that may need surgical intervention.

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Methods

The records of all patients with suspected child abuse who were examined in the emergency department of Children's Hospital, Columbus, Ohio, from January 1, 1982, to July 31, 1984, were reviewed. During this 31 month period, 1512 cases of suspected abuse were evaluated by a physician for emergency treatment and subsequently seen by a member of the Children's Hospital Child Abuse Team, an interdisciplinary group composed of two physicians, seven social workers, one nurse, one psychologist, and one educator/researcher.

Of the 1512 patients, 256 (17%) required hospitalization. Four children were admitted twice during the study period. Ten diagnostic categories were listed: abdominal trauma, burns, central nervous system (CNS) injury, failure-to-thrive, ingestions, near-drowning, neglect, sexual abuse, skeletal injury, and soft tissue trauma. Children with failure-to-thrive, ingestions, neglect, and near-drowning were admitted to the pediatric medical service, while those with the remaining diagnoses were cared for by a pediatric surgical service (general, neurosurgical, or orthopedic).

The charts of the 256 hospitalized children were analyzed for age, sex, and race of patient; diagnostic category of injury and number of systems affected; severity of injury by admission to the intensive care unit and receipt of blood transfusions; length of hospital stay; morbidity; mortality; operations performed; seasonal and monthly pattern of admission; family unit characteristics; suspected perpetrator of abuse; and placement following hospital discharge.

TABLE 1. *Diagnosis in 256 Patients Hospitalized for Child Abuse*

Pediatric Medical Admissions			Surgical Admissions		
Injury	No.	%	Injury	No.	%
Failure-to-thrive	66	26	Burns	56	22
Ingestions	20	8	CNS injury	53	22
Neglect	10	4	Soft tissue injury	21	8
Near-drowning	4	1	Skeletal injury	15	6
Total	100	39	Sexual abuse	9	3
			Abdominal injury	2	1
			Total	156	61

Results

Sixty-one per cent (156) of the children were admitted to a surgical service for burns in 56 (22%), CNS injury in 53 (22%), soft tissue trauma in 21 (8%), skeletal injury in 15 (6%), sexual abuse in nine (3%), and abdominal trauma in two (1%). Thirty-nine per cent (100) of the patients were cared for on the pediatric medical service for failure-to-thrive in 66 (26%), ingestions in 20 (8%), neglect in 10 (4%), and near-drowning in four (1%) (Table 1).

Mean age of the 256 children was 2.1 years with a range from 2 days to 17 years. The majority of patients were between 18 and 30 months of age, although those with failure-to-thrive had a mean age of 0.8 years and those with soft tissue trauma and sexual abuse had mean ages of 4.2 and 6.6 years, respectively. There were 156 males and 100 females. White children numbered 153, and 103 were black (Table 2).

The mean age of the 56 children with burns was 1.9 years (range: 1 month–12 years), of whom 39 were male and 17 were female. Mean body surface area of burn was 8.4% (range: 1–60%). One-quarter of the patients had a body surface involvement between 1% and 5%, while one-half were between 5% and 10%. Most patients presented to the hospital with second degree burns, although nine children had third degree burns. The mechanism of burn included hot water scalding (39), contact with a hot object

(9), flame (6), and hot grease (2). Of the 39 hot water scald burns, buttocks, perineum, and lower extremity accounted for the majority of sites. Of the nine children burned by contact with a hot object, trunk and buttocks were the most frequent locations. Of the six patients involved in house fires, four were unattended by adults. In a particularly tragic instance, two brothers were alone in a home deliberately set ablaze by their father. Three of these six children required endotracheal intubation for smoke inhalation injury. Debridement of the burn in the operating room and/or skin grafting was required in 19 patients. The mean length of hospitalization was 19 days (range: 2–71 days). None of these children died.

Of the 53 patients with injury to the CNS, mean age was 1.5 years (range: 1 month–12 years), with 28 girls and 25 boys. Eight were dead on arrival to the emergency department, and six children died from their CNS injury within 48 hours of admission for a mortality of 26%. Injuries included cranial skull fracture (19), cerebral concussion (13), subarachnoid hemorrhage (3), epidural hematoma (1), and cerebral edema (1). Two-system injuries (CNS and skeletal) occurred in 10 children, of whom six died. Three-system trauma (CNS, skeletal, and abdominal) was present in two patients, both of whom were dead on arrival. Sixteen of the 39 survivors (28%) required operative procedures: Richmond Bolt for intracranial pressure monitoring (7), subdural tap (2), craniotomy with clot evacuation (2), ventriculoperitoneal shunt (2), elevation of depressed skull fracture (1), evacuation of subdural hematoma (1), and Broviac catheter for hyperalimentation (1). Eight of the 39 survivors (21%) developed neurologic sequelae: seizure disorder in seven and a right hemiparesis in one. The mean hospital stay was 13 days (range: 1–53 days).

The 21 children (16 males, 5 females) with soft tissue trauma sustained severe bruises to the face, neck, trunk, genitalia, buttocks, or extremities. Their mean age was 4.2 years (range: 1 month–17 years). One developed a soft tissue abscess of the thigh requiring incision and drainage, and another required laryngoscopy under anesthesia following attempted strangulation. The mean hospital stay was 5 days (range: 1–34 days). There were no deaths in this group.

Fifteen patients incurred skeletal injury, with a mean age of 2.0 years (range: 1 month–17 years). Fourteen were male and one female. Bones fractured included femur (7), humerus (5), ribs (3), radius-ulna (3), mandible (1), clavicle (1), tibia-fibula (1), and pelvis (1). One child had three skeletal fractures, and two patients had two bones fractured. External casting was performed in 10 and open reduction with internal fixation in three. The mean length of hospitalization was 5.5 days (range: 1–12 days). No children in this group died.

Sexual abuse occurred in nine children, eight girls and

TABLE 2. *Mean Ages and Sex of Children with Child Abuse*

Diagnosis	Mean Age (Years)	Males	Females
Failure-to-thrive	0.8	43	23
Near-drowning	1.2	3	1
CNS injury	1.5	25	28
Burns	1.9	39	17
Skeletal injury	2.0	14	1
Neglect	2.5	4	6
Abdominal trauma	(2, 4)	2	—
Ingestions	3.0	8	12
Soft tissue trauma	4.2	16	5
Sexual abuse	6.6	1	8

one boy, with a mean age of 6.6 years (range: 18 months–16 years). In all cases, patients were admitted either to undergo an examination under anesthesia to evaluate the extent of injury or for a definitive operative procedure. Three required repair of vaginal lacerations, and in another a darning needle was removed from the vagina. One girl had fulguration of perineal condylomata acuminata, and the boy, a 6-year-old, had fulguration of penile condylomata. Their mean stay in the hospital was 2 days (range: 1–6 days).

Two children sustained severe blunt abdominal trauma. A 2-year-old boy was kicked by his mother, admitted with pneumoperitoneum, and had a perforated rectosigmoid colon. A loop sigmoid colostomy with repair of the colonic laceration was performed. A 4-year-old boy was pushed from a second-story window by an older sibling and presented in hypovolemic shock. His ruptured spleen was managed by splenorrhaphy. Both recovered from their injuries without complication.

Failure-to-thrive with chronic malnutrition in the absence of a diagnosed organic disease was present in 66 patients, 43 males and 23 females, with a mean age of 0.8 years (range: 1 week–3 years). Either loss of weight (below third percentile) or absence of appropriate weight gain was noted in all 66. Coexisting diverse problems not directly related to the failure-to-thrive were found in 19 children. These included cleft lip, craniosynostosis, cerebral palsy, hemophilia, sickle cell disease, neurofibromatosis, mental retardation, and bilateral inguinal hernias. Two patients died: a 1-month-old with severe malnutrition, acidosis, and sepsis and a 2-month-old with multiple organ failure following a perforated gastric ulcer. The mean period of hospitalization was 13 days (range: 3–123 days).

Twenty children, 12 girls and eight boys, with a mean age of 3 years (range: 7 months–11 years) were admitted for drug ingestion. Valium was the most frequent agent (5), while alcohol, tricyclic antidepressants, and barbiturates were the poisons in the remaining 15. No child sustained neurologic impairment and none died. The mean length of hospitalization was 3.3 days (range: 1–7 days).

Ten patients were classified as neglect with inadequate care of a known underlying disease. Their mean age was 3.0 years (range: 2 weeks–12 years), with six females and four males. The one death in this group, a 2-month-old with bronchopneumonia, had delay in seeking medical attention and was moribund at admission. The other conditions considered improperly cared for at home included cyanotic heart disease (2), iron deficiency anemia (2), urinary tract infection (2), asthma (2), and diabetes mellitus (1). The mean hospital stay was 10 days (range: 2–29 days).

Near-drowning occurred in three patients; a fourth was dead on arrival at the emergency department. The child

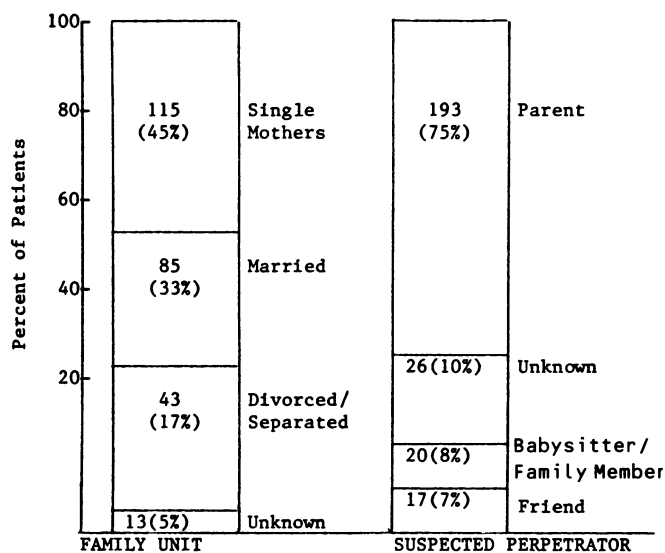


FIG. 1. Family unit characteristics and suspected perpetrator of child abuse in 256 patients.

who died was a 1-year-old who had been held underwater in a bathtub by a babysitter. Two children, ages 8 and 14 months, were unattended by an adult while in a bathtub. A third child, 2 years of age, was left unobserved in a wading pool. No child required endotracheal intubation for longer than 36 hours, and all were discharged by the fourth day.

Forty-two children were admitted to an intensive care unit: 24 with CNS injury, six with smoke inhalation and burns, four with ingestion, three with near-drowning, and two with abdominal trauma. Of the survivors, 28 patients received one or more blood transfusions within 24 hours of admission, most with CNS, skeletal, and abdominal trauma.

Eighteen patients (7%) died as a result of child abuse. The highest mortality (26%) occurred in patients with CNS injury. Nine children were dead on arrival, eight from head trauma and one from drowning. The greatest long-term morbidity occurred in patients with head injuries with neurologic sequelae in 21%. Additionally, at least 50% of those with burns developed hypertrophic scars.

Single, never-married mothers comprised 45% of the family-unit households. Thirty-three per cent were married and living together, 17% were separated or divorced with mother at home, and in 5% the family unit was undetermined. In 32% of cases, either the patient or a sibling had a previous consultation for suspected abuse, while four children with failure-to-thrive were admitted twice during the study period (Fig. 1).

The child's parent was the suspected perpetrator in 193 instances (75%); boy or girlfriend of parent in 17 (7%); babysitter in 10 (4%); family member in 10 (4%); and undetermined in 26 (10%) (Fig. 1). Mothers were sus-

pected to be responsible for all failure-to-thrive cases and most cases of neglect, ingestions, and burns. Fathers or maternal boyfriend were suspected in all sexual abuse cases. The suspected perpetrators among those with CNS, soft tissue, and skeletal trauma were equally divided between men and women.

Of the 238 survivors, 91 children (38%) were placed in foster care at hospital discharge. Return to the primary family occurred in 147 cases after evaluation by a member of Children's Hospital Child Abuse Team.

Children were hospitalized at an average rate of eight patients per month (range: 7–9 per month) with no seasonal or monthly predominance. The overall mean length of hospitalization was 9.3 days (range: 1–123 days).

Discussion

Within society and medicine, the status of the child has undergone an evolution during the period of recorded Western civilization. Historically, the young have occupied an insecure and subservient position from the Roman "patria potestas," granting the father the right to sell, mutilate, abandon, or kill his children, to the indentured servitude practice of the Middle Ages. In medical literature, the relationship of violent childhood death to parental brutality was first noted in 1860.⁴ Ambrose Tardieu, a professor of legal medicine in Paris, described the autopsies of 32 children with injuries to brain, soft tissue, and bone, which we recognize today as part of the child abuse syndrome. Eighty-six years later in 1946, Caffey linked the occurrence of long bone fractures in infants with chronic subdural hematomas,⁵ but little concern was aroused. In 1961 Dr. Henry Kempe conducted a symposium on "The Battered-Child Syndrome" at the American Academy of Pediatrics Meeting, which, along with his subsequent article detailing the medical aspects of child battering, alerted the American public and physicians to the problem.

Although twentieth century children have achieved a degree of comfort and privilege, their place in society remains questionably secure. For instance, homicide accounts for 5% of all deaths in children less than 18 years of age in the United States and is one of the leading causes of death after the age of 6 months.⁶ In infants between 6 and 12 months of age, abuse is the number one cause of death.⁶ In a comparison of childhood homicide rates among 24 developed countries using World Health Organization statistics, the United States ranked second with 10.2 deaths per 100,000 population.⁷

An additional indication of the magnitude of child abuse is that 929,310 reports of suspected abuse and neglect were filed in the United States in 1982.⁶ At the regional level, the 1512 cases of suspected abuse that formed the basis of this study occurred over a 31-month period

and represented approximately one-third of the counties of the state of Ohio. Those children with serious injury and neglect requiring hospitalization in this series represent a minority of the total spectrum of patients. While direct surgical care was necessary in 61% of these hospitalized children, the vast majority of suspected abuse cases are managed by emergency department and primary care physicians.

In our study, 75% of the children were between 18 and 36 months of age with a total group mean age of 2.1 years. This is in agreement with most published series^{1,3} in which the toddler has the highest risk of being battered. However, in most categories of injury in our series the age range was quite variable, from infants less than 1 month old to teenagers. As might be anticipated, certain types of abuse were more likely to occur at certain ages. In particular, failure-to-thrive from caloric malnutrition was a problem mainly in infancy, with a mean age of 0.8 years. Those children who required hospitalization for management of severe soft tissue trauma and sexual abuse were somewhat older, with mean ages of 4.2 and 6.6 years, respectively. Although no sex predilection was present within the entire group, boys far outnumbered girls in soft tissue and skeletal injury, while girls were most frequently the victims of sexual abuse. There was no predilection by race in these patients.

In reviewing the family-unit characteristics in this series, 45% were single, never-married mothers, and 17% were separated or divorced mothers. The suspected perpetrator of the abuse was a parent in three-quarters of the cases, while another family member, babysitter, or friend was responsible in less than one-quarter. As might be expected, certain types of abuse such as failure-to-thrive were more likely to be inflicted by the mother. Males were responsible for all cases of sexual abuse in our series. The sociologic etiology of child abuse is believed to be associated with several complex risk factors: poverty, isolation, recent and chronic stress, and the parent's own childhood experience with violence.^{6,8} Following evaluation of the home situation by the Child Abuse Team, 38% of our patients were placed in foster care at hospital discharge. Of the 62% returned to the home, careful and regular follow-up by the Child Abuse Team was necessary for each case.

Serious burns accounted for nearly one-quarter of the patients in our series. The appropriate evaluation of a child with burns as a possible victim of inflicted injury requires an understanding of certain aspects of intentional thermal abuse. While scald burns are the most frequent cause of accidental and intentional thermal injury,⁹ tap water causes most abusive burns and only 20% of accidental burns.¹⁰ In our group of 39 children with scald burns, all were caused by tap water. In addition, most accidental scald burns occur when a toddler overturns a pot of hot liquid on a stove or spills a cup of hot liquid

on a table. These accidents result in poorly defined splash patterns of burns, usually to face, upper chest, or arms. All of our scald-burned children had well-demarcated burns located on the buttocks, perineum, or in a circumferential pattern on an extremity. In the nine patients with contact burns, an obvious outline of the applied object, usually an iron, was visible. Several factors should alert the physician to the suspicion of intentional thermal injury⁹⁻¹⁴: (1) coexistent soft tissue trauma, either recent or old; (2) a child below the third percentile for height and weight or fall from previous growth pattern; (3) delay in seeking medical attention; (4) discrepancy in historical reporting of time and mechanism of burn; (5) a mechanism of injury inappropriate to the child's neuromotor development; (6) a location of burn unlikely for accidental injury; (7) a symmetric, well-delineated, or circumferential burn; (8) a child whose behavior and affect are inappropriate to the circumstances of hospitalization.

CNS injury represented the most lethal form of abuse in our group of patients, with 14 of 53 children dying as a direct result of head trauma. Significant long-term morbidity occurred in nearly one-quarter of the surviving 39 patients: seizures in seven and a hemiparesis in one. Almost all of these patients had other signs of abuse, usually soft tissue bruising of both recent and old origin. This is in agreement with the belief that CNS trauma is a late manifestation of chronically abused children who typically present with evidence of other old injuries.¹⁵ Significant discrepancy existed between the alleged mechanism of injury and the severity of trauma. In almost all instances, the infant or child was said to have either fallen out of a crib or bed or tumbled down a flight of stairs. The actual mechanism of trauma was later shown to be either beating or having been thrown down a stairway. It is of interest that of 246 young children who accidentally fell out of cribs or bed, 80% had no overt sign of injury, 18% had a single bruise or abrasion, 1% had a fracture of the clavicle or humerus, and 1% had a single, linear skull fracture with no serious head injury.¹⁶

Soft tissue trauma constitutes the most common and easily recognized physical sign of child abuse.¹⁷ The majority of children with inflicted bruises are cared for in an outpatient setting or without any medical attention. Thus, those children who are hospitalized represent instances of very severe trauma. Nearly all of our patients sustained bruises to the buttocks and genitalia. The site and pattern of the bruising may assist in the differentiation of accidental from intentional injury. Most accidental bruises result from falls or rough activity and occur on the skin overlying bony prominences, such as knee, chin, or forehead. Inflicted bruises typically are located on buttocks, lower back, genitalia, inner thighs, cheek, and neck. An additional clue is a discrepancy between the alleged time of the injury and the actual color of the bruise at presen-

tation. The color of the bruise allows dating of the injury with reasonable accuracy.¹⁸

Skeletal injury was the major problem in 6% of the children in our series. In each of the 15 patients, an indication that abuse was the etiology of the trauma was evidence of soft tissue bruising at sites remote from the fracture, radiologic evidence of old fractures, or a history incompatible with the degree of injury. When cases of suspected abuse are being evaluated, radiologic examination may provide objective evidence of trauma. Certain features of skeletal fractures occur more commonly in battered children: metaphyseal fracture with epiphyseal separation, exaggerated periosteal reaction, multiple fractures, and fractures in different stages of healing.¹⁹ It has also been observed that rib fractures are relatively frequent in cases of abuse, particularly in association with a long bone fracture, and are located near the lateral margins (from squeezing or shaking the child with both hands) or near the tubercles (from direct blows to the back).²⁰ Complications of thoracic trauma, such as hemothorax, may result from severe rib cage injury. Certain underlying diseases may mimic the battered child syndrome on radiologic examination: osteogenesis imperfecta, scurvy, syphilis, infantile cortical hyperostosis, and metastatic malignancies.¹⁹

Although sexual abuse accounted for only nine of the admissions, this type of injury represents a significant number of all abuse cases. In 1983, for example, of the 545 children reported abused by the Children's Hospital Child Abuse Team, 218 were sexually molested.²¹ Those patients who come to surgical care will usually have significant genital trauma and require careful examination under anesthesia for appropriate evaluation. In addition to obtaining vaginal, rectal, and pharyngeal cultures for gonorrhea and wet prep specimens for motile sperm, a serological test for syphilis and urine for pregnancy should be obtained. Repair of vaginal lacerations was necessary in three of our children. In two of the patients, genital condylomata acuminata were managed by fulguration.

Abdominal visceral trauma was present as the major injury in two youngsters, one with a ruptured spleen and one with a perforated rectosigmoid colon. The occurrence of serious abdominal injury from intentional battering has been well-recognized.^{15,22-24} The mechanisms that result in blunt visceral trauma, namely compression, crush, and acceleration, explain accidental as well as intentional injury.²⁵ Compression by a kick or blow to the abdomen usually affects those organs distended with gas or fluid, particularly the stomach and colon. Crush injury resulting from compression of an organ against the immobile vertebral column may injure the kidneys, spleen, liver, or pancreas. Acceleration-deceleration injury occurs when the child is thrown and may result in shearing injury of intra-abdominal organs at their posterior abdominal at-

tachments, such as a laceration of the jejunum at the ligament of Treitz. Since the full spectrum of abdominal trauma associated with accidental blunt injury may occur in battered children, a high index of suspicion is necessary for appropriate diagnosis.

Of the 100 children admitted to the pediatric medicine service with failure-to-thrive, ingestions, neglect of an underlying disease, and near-drowning, surgical intervention was necessary in 8%. A 2-month-old infant with severe malnutrition developed a perforated gastric ulcer during hospitalization, and died after operation from multiple organ failure. Two infants with neglected cyanotic congenital heart disease underwent urgent pulmonary-systemic shunting. The remaining five children had operations for unrelated conditions, including inguinal hernias and cleft lip. Although none of the 20 children with drug ingestions drank caustic agents, surgical management of pharyngeal, esophageal, and gastric burns may be necessary in such cases.

It is clear from this study that a significant number of abused children require surgical care for their injuries and for complications of these injuries. The responsibility of the surgeon goes beyond prompt recognition and appropriate management. In all 50 states, the physician is mandated by law to report each case of suspected child abuse.²⁶ While such laws are crucial to avoid further abuse and violence toward an individual child, the ultimate successful prevention of child battering will require a societal effort of massive proportion.

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References

1. Kempe CH, Silverman FN, Steele BF, et al. The battered-child syndrome. *JAMA* 1962; 181:17-24.
2. Radbill SX. Children in a world of violence: a history of child abuse.

- In* Kempe CH, Helfer RE, eds. *The Battered Child*. Chicago: The University of Chicago Press, 1980; 3-20.
3. Fontana VJ, Donovan D, Wong RJ. The "maltreatment syndrome" in children. *N Engl J Med* 1963; 269:1389-1394.
4. Silverman F. Unrecognized trauma in infants, the battered child syndrome, and the syndrome of Ambrose Tardieu. *Radiology* 1972; 104:337-353.
5. Caffey J. Multiple fractures in long bones of infants suffering from chronic subdural hematoma. *AJR* 1946; 56:163-173.
6. Heins M. The "battered child" revisited. *JAMA* 1984; 251:3295-3300.
7. Christoffel KK, Liu K. Homicide death rates in childhood in 23 developed countries: U.S. rates atypically high. *Child Abuse Negl* 1983; 7:339-345.
8. Spearly JL, Lauderdale M. Community characteristics and ethnicity in the prediction of child maltreatment rates. *Child Abuse Negl* 1983; 7:91-105.
9. Stone ND, Rinaldo L, Humphrey CR, Brown RH. Child abuse by burning. *Surg Clin North Am* 1970; 50:1419-1424.
10. Feldman K, Schaller RT, Feldman JA, McMillon M. Tap-water scald burns in children. *Pediatrics* 1978; 62:1-7.
11. Gillespie RW. The battered child syndrome: thermal and caustic manifestations. *J Trauma* 1965; 5:523-534.
12. Lenoski EF, Hunter KA. Specific patterns of inflicted burn injuries. *J Trauma* 1977; 17:842-846.
13. Ayoub C, Pfeifer D. Burns as a manifestation of child abuse and neglect. *Am J Dis Child* 1979; 133:910-914.
14. Kumar P. Child abuse by thermal injury—a retrospective survey. *Burns* 1984; 10:344-348.
15. O'Neill JA, Meacham WF, Griffin P, Sawyers JL. Patterns of injury in the battered child syndrome. *J Trauma* 1973; 13:332-339.
16. Helfer RE, Slovis TL, Black M. Injuries resulting when small children fall out of bed. *Pediatrics* 1977; 60:533-535.
17. Ellerstein NS. The cutaneous manifestations of child abuse and neglect. *Am J Dis Child* 1979; 133:906-909.
18. Wilson EF. Estimation of the age of cutaneous contusions in child abuse. *Pediatrics* 1977; 60:751-752.
19. Silverman FN. Radiologic and special diagnostic procedures. *In* Kempe CH, Helfer RE, eds. *The Battered Child*. Chicago: The University of Chicago Press, 1980; 215-240.
20. Dorst JP. Child Abuse. *Radiology* 1982; 22:335-341.
21. Annual Report: Child Abuse Program 1983; Children's Hospital, Columbus, Ohio.
22. McCort J, Vaudagna J. Visceral injuries in battered children. *Radiology* 1964; 82:424-428.
23. Touloukian RJ. Abdominal visceral injuries in battered children. *Pediatrics* 1968; 42:642-646.
24. Grosfeld JL, Ballantine TVN. Surgical aspects of child abuse. *Pediatr Ann* 1976; 45:106-120.
25. Haller JA Jr. Injuries of the gastrointestinal tract in children, notes on recognition and management. *Clin Pediatr (Phila)* 1966; 5: 476-480.
26. Highlights of Official Child Neglect and Abuse Reporting. Annual Report of 1981. Denver: American Humane Association, 1983.