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CLINICAL REPORT

Evaluation of Suspected Child Physical Abuse

Nancy D. Kellogg, MD, and the Committee on Child Abuse and Neglect

Guidance for the Clinician in Rendering
Pediatric Care

ABSTRACT

This report provides guidance in the clinical approach to the evaluation of suspected physical abuse in children. The medical assessment is outlined with respect to obtaining a history, physical examination, and appropriate ancillary testing. The role of the physician may encompass reporting suspected abuse; assessing the consistency of the explanation, the child's developmental capabilities, and the characteristics of the injury or injuries; and coordination with other professionals to provide immediate and long-term treatment and follow-up for victims. Accurate and timely diagnosis of children who are suspected victims of abuse can ensure appropriate evaluation, investigation, and outcomes for these children and their families.

PREVALENCE

In 2004, 152 250 children and adolescents were confirmed victims of physical abuse in the United States.¹ Of the 4 types of child maltreatment (neglect, physical abuse, sexual abuse, and emotional abuse), physical abuse is second to neglect, constituting approximately 18% of the total.¹

Despite these statistics, the estimated number of victims is much higher; in 1 retrospective cohort study of 8613 adults, 26.4% reported they were pushed, grabbed, or slapped; had something thrown at them; or were hit so hard they got marks or bruises at some time during their childhood.² It has been estimated that 1.3% to 15% of childhood injuries that result in emergency department visits are caused by abuse.³ Physical abuse remains an underreported (and often undetected) problem for several reasons including individual and community variations in what is considered "abuse," inadequate knowledge and training among professionals in the recognition of abusive injuries, unwillingness to report suspected abuse, and professional bias. For example, in 1 study,⁴ 31% of children and infants with abusive head trauma were initially misdiagnosed. Misdiagnosed victims were more likely to be younger, white, have less severe symptoms, and live with both parents when compared with abused children who were not initially misdiagnosed. Such studies suggest a need for practitioners to be vigilant to the possibility of abuse when evaluating children who have atypical accidental injuries or obscure symptoms that are suggestive of traumatic etiologies but who do not have a history of trauma.

Child abuse has significant long-term medical and mental health morbidity.⁵ Children with abusive head or abdominal injuries are more likely to die or become more severely incapacitated than are children with head or abdominal injuries caused by accidents.⁶⁻⁸ Victims of physical abuse in childhood are more likely to

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The guidance in this report does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate

Key Words

physical abuse, child, child abuse, injury, evaluation

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develop a variety of behavioral and functional problems including conduct disorders, physically aggressive behaviors, poor academic performance, and decreased cognitive functioning.^{9,10} Additional problems include anxiety and depression, as well as social and relationship deficits.

CHARACTERISTICS OF VICTIMS AND RISK FACTORS

Child physical abuse affects children of all ages, genders, ethnicities, and socioeconomic groups. Male and female children experience similar rates of physical abuse. In 1 survey study of more than 2000 children and adolescents,¹¹ 15% of adolescents received injuries from a physical assault and were more likely than children in younger age groups to receive injuries from abuse. Although the risk of physical abuse increases with age, fatal abuse and serious abusive injuries are more common among children and infants younger than 2 years.¹ Children in homes with annual incomes of less than \$15 000 per year have 3 times the number of fatalities, 7 times the number of serious inflicted injuries, and 5 times the number of moderate inflicted injuries when compared with children living in homes with annual incomes of greater than \$15 000 per year.¹² Risk factors for infant maltreatment include maternal smoking, the presence of more than 2 siblings, low infant birth weight, and an unmarried mother.¹³ One study found that children living in households with unrelated adults were approximately 50 times more likely to die of inflicted injuries than were children residing with 2 biological parents.¹⁴ The US Department of Health and Human Services has indicated that the rate of physical abuse is 2.1 times higher among children with disabilities than children without disabilities.¹⁵ The presence of risk factors should not be used as indicators of child abuse but rather to provide guidance in prevention strategies as well as management and treatment plans.

ROLE OF THE PEDIATRICIAN

The role of the pediatrician encompasses prevention of abuse and detection and medical management of victims of abuse. Accurate identification of children who are suspected victims of abuse can facilitate appropriate evaluation, referral, investigation, and outcomes for these children and their families.¹⁶ Children usually sustain abuse at the hands of a caregiver who misinterprets and responds inappropriately to the child's behavior. For example, caregivers who had smothered, shook, or slapped their infant within the first 6 months of life were more likely to be worried about crying and to believe that their infants cried excessively.¹⁷ There is a close correlation between the age-specific incidence curve of infants hospitalized with abusive head trauma and the age-specific normal crying behavior of infants up to 36 weeks of age.¹⁸

In an anonymous telephone survey of 1435 mothers,

2.6% of children younger than 2 years were shaken by their mothers as a means of discipline.¹⁹ Caregivers may respond inappropriately to their child's behavior when they are unduly stressed. Poverty, significant life events, and caregiver role conflicts are stressors that are often associated with abuse.¹⁴ Pediatricians can effectively educate parents regarding the range of normal behaviors in infants and children, provide anticipatory guidance, and be a resource when the behavior becomes unmanageable for parents. In addition, pediatricians can screen for adult-partner violence; in 1 study, child abuse was 4.9 times more likely in families with identified spouse abuse than in families without identified spouse abuse.²⁰ Other conditions that place children at risk of being abused, such as maternal depression or drug abuse, may also be identified.

Careful medical assessment, detection of suspicious injuries, and reporting of abuse may prevent further abusive trauma in infants and adults.⁴ In 1 study of abuse victims younger than 24 months, 75% had evidence of previous trauma or history of a previous injury.²¹ Child abuse may recur 35% of the time without appropriate detection and intervention.²²

As with other types of child maltreatment, there have been recent advances in medical knowledge regarding physical abuse. Most recent developments have addressed more accurate differentiation between inflicted and accidental injuries as well as detecting conditions that may mimic abusive injuries. Although consideration of nonabusive causes of injuries may merit additional evaluation and testing, the physician is mandated by law to report suspicions of abuse and should not delay reporting pending confirmatory testing or information. In all states, the law also provides some type of immunity for good-faith reporting. Once a suspected victim is identified and further assessment and management is required, using a pediatric child abuse consultant, if available, early in this process may obviate the need for invasive or expensive testing and can help direct the pediatrician toward appropriate evaluation. The detection and diagnosis of child physical abuse depends on the clinician's ability to recognize suspicious injuries, conduct a careful and complete physical examination with judicious use of auxiliary tests, and consider whether the caregivers' explanation is supported by the characteristics of the injury or injuries and the child's developmental capabilities. The physician should also ensure that the child's immediate medical and safety needs are met. Child abuse injuries, particularly traumatic brain injuries, may result in significant long-term disabilities including learning deficits, attention-deficit/hyperactivity disorder, behavioral problems, seizures, spasticity, blindness, paralysis, and mental retardation.^{23,24} Continuity of care for such children is essential, especially if they are transferred to other caregivers or foster homes.

Many hospitals and communities have developed

child abuse–assessment teams of pediatricians and other professionals who specialize in the assessment of suspected victims of child abuse.²⁵ Such teams usually have access to additional information from law enforcement and child protective services, such as scene investigation, that may facilitate more thorough injury assessment and diagnosis. Involving such teams early in the process can ensure accurate and comprehensive assessments and information sharing among the medical and nonmedical disciplines involved and can provide for intermediate and long-term management of the child and family. Pediatricians with expertise in evaluating suspected abuse should provide training and assistance to emergency physicians and other first responders to enhance detection and appropriate referral of these patients.

Many regions do not have specialized child abuse teams but do have physicians with expertise in child abuse. Pediatricians should know which hospitals in their region have the most available expertise in the emergency evaluation of suspected child abuse. In turn, pediatricians with expertise in child abuse often act as consultants for emergency departments and child protective services. Close collaboration is necessary, particularly for establishing how the child should be transported between facilities, who should notify child protective services, who should notify the caregiver(s) of suspected abuse and when, and whether law enforcement should be notified. For those who do not require emergent transportation by ambulance, child protective services may facilitate transportation of a suspected child victim from one facility to another, assist in notifying the caregivers and law enforcement of suspected abuse, and provide an emergent safety plan on hospital discharge or clinic dismissal.

DEFINITIONS

The recognition and reporting of physical abuse is hindered by the lack of uniform or clear definitions. Many state statutes use words such as “risk of harm,” “substantial harm,” “substantial risk,” or “reasonable discipline” without further clarification of these terms. Many states still permit the use of corporal punishment with an instrument in schools; on the other hand, the American Academy of Pediatrics has proposed that “striking a child with an object” is a type of physical punishment that “should never be used”²⁶ and has recommended that corporal punishment be abolished in schools.²⁷ The variability and disparities in definitions may hinder consistent reporting practices.

CLINICAL PRESENTATIONS AND SETTINGS

Most physical abuse injuries are likely to not be detected or reported. Minor injuries may not require medical attention and may be obscure or hidden. Infants and children are reported as suspected victims of physical abuse when 1 or more of the following occurs: an indi-

vidual (including a professional) sees and reports a suspicious injury; an individual witnesses an abusive event; a caregiver observes symptoms and brings the child in for medical care but is unaware that the child has sustained an injury; an individual asks a child if he or she has been hurt in an abusive way; the abuser thinks the inflicted injury is severe enough to require medical attention; or the child victim discloses abuse. The American Academy of Pediatrics has indicated that “hospitalization of children requiring evaluation and treatment for abuse or neglect should be viewed by third-party payors as medically necessary.”²⁸

The clinical approach to an infant or child with possible abusive injuries is not significantly different from standard pediatric care. As with all patients, a severely injured child must be stabilized before further evaluation is undertaken. This initial evaluation may encompass a trauma response team and pediatric specialists in surgery, emergency medicine, and critical care. Careful documentation may not be possible initially and must always be secondary to resuscitation and stabilization of the patient. Once the child is stabilized, a careful and well-documented history, as always, is the most critical element of the medical evaluation. Using quotes whenever possible, the pediatrician should document descriptions of the mechanisms of injury or injuries, onset and progression of symptoms, and the child’s developmental capabilities. The physical examination should include detailed documentation, either by body diagrams and/or photographs, of any concerning cutaneous findings and should include a thorough search for other signs that may suggest a nontraumatic cause. If the child is verbal, it may be helpful to gather parental and patient histories separately. If abuse is a concern after this preliminary evaluation, consultation with a child abuse pediatrician, pediatric specialist, or pediatrician experienced in this area, if available, may be helpful in determining the best way to proceed with assessment.

Physical discipline is commonly inflicted on areas of the body that are concealed by clothing (eg, back/buttocks). When inflicted injuries are visible or incidentally discovered, child victims and their abusers typically explain the injuries as accidental; if clinicians or professionals are not critical or skeptical of this information, the injuries may be incorrectly attributed to accidental causes. Other victims present with severe inflicted injuries that require medical care. The initial history is typically vague and/or benign and may become inconsistent as the investigation progresses.

MEDICAL HISTORY

The interview of parents or caregivers of infants or children who present with serious injuries may be conducted in an outpatient or inpatient setting. If the child presents to a clinic with a serious injury that requires further medical care in a specialty (eg, orthopedics) or

hospital setting, the clinician may opt to gather the minimum information to establish a need for reporting to child protective services. Any statements made by the caregiver regarding the injury should be documented accurately and completely. Once the clinician has assessed all the injuries, including approximate ages of injuries (when possible), a careful, complete, and detailed history should be obtained from the caregivers.

Explanations that are concerning for intentional trauma include:

1. no explanation or vague explanation for a significant injury;
2. an important detail of the explanation changes dramatically;
3. an explanation that is inconsistent with the pattern, age, or severity of the injury or injuries;
4. an explanation that is inconsistent with the child's physical and/or developmental capabilities; and
5. different witnesses provide markedly different explanations for the injury or injuries.

Information regarding the child's behavior before, during, and after the injury occurred, including feeding times and levels of responsiveness, should be gathered. Victims of significant trauma usually have observable changes in behavior. Access to caregivers and caregiver activities before, during, and after the injury occurred are also important to document. Frequently, infants and children present to medical settings with a history of a fall. Recent studies have indicated that short falls may result in bruising; however, more significant types of head trauma, including skull fractures, are exceedingly uncommon but possible.^{29,30}

Information should be gathered in a nonaccusatory but detailed manner. Other information that may be useful in the medical assessment of suspected physical abuse includes:

1. past medical history (trauma, hospitalizations, congenital conditions, chronic illnesses);
2. family history (especially of bleeding, bone disorders, and metabolic or genetic disorders);
3. pregnancy history (wanted/unwanted, planned/unplanned, prenatal care, postnatal complications, postpartum depression, delivery in nonhospital settings);
4. familial patterns of discipline;
5. child temperament (easy to care for or fussy child);
6. history of past abuse to child, siblings, or parents;
7. developmental history of child (language, gross motor, fine motor, psychosocial milestones);
8. substance abuse by any caregivers or people living in the home;

9. social and financial stressors and resources; and
10. violent interactions among other family members.

PHYSICAL EXAMINATION

Most injuries of childhood are not the result of abuse or neglect. Minor injuries in children are exceedingly common. Physicians must also consider that unusual events, including accidents, do happen to children³¹ and may produce injuries that are not characteristically seen from accidental causes. An injury pattern is rarely pathognomonic for abuse or accident without careful consideration of the explanation provided. In addition, both inflicted and accidental injuries may be seen simultaneously in a child.

General Assessment

The child's alertness and demeanor may reflect neurologic status and degree of discomfort and pain. A thorough and complete neurologic examination must be performed. For example, if alertness appears compromised, eye-opening, verbal, and motor responses should be assessed systematically. Spontaneous and symmetrical movement of all extremities should be noted, as well as any of the child's responses that indicate pain when extremities are examined and moved. Because abusive caregivers are rarely informative regarding the injuries that have been inflicted, special care should be taken during the examination of the child's extremities and neck, which may be fractured and require immobilization until diagnostic radiographs can be performed. Evidence of spinal cord injury, such as abnormal reflexes, muscle tone, or responsiveness to tactile stimuli, should be carefully pursued.

When the child is stable, height, weight, and fronto-occipital circumference should be carefully measured and then plotted on a growth chart. Previous measurements obtained from past medical visits should also be obtained to gauge whether growth velocity has been appropriate. Plotting parameters is essential, because clinicians may miss significant growth failure in infants and children if the clinician relies only on their clinical impressions. Physical abuse and failure to thrive are sometimes concurrent^{32,33}; in addition, some children are starved intentionally.³⁴

Evidence of neglect may be seen during the general examination of the infant or child; extensive dental caries, severe diaper dermatitis, or neglected wound care may be noted in addition to injuries that raise suspicion of abuse. Bald areas on the scalp may sometimes be seen with severe nutritional deficits or with traumatic alopecia. These findings should be differentiated from non-abusive or benign causes such as tinea capitis, alopecia areata, and occipital bald spots caused by supine positioning of young infants.

If the child can be interviewed, his or her demeanor

should be noted during questioning. Some children display strong nonverbal cues of anxiety and reluctance when answering questions regarding potential abuse, because they are protective of their abuser or they fear retribution for "telling." Others may appear openly fearful of their abuser. Such responses may be important to consider when a safety plan for the child is made.

Skin Injuries

Location, size, and shape of any bruises, lacerations, burns, bites, or other skin injuries should be documented in a medical chart as well as with high-quality 35-mm or digital photographs. Inspection for injuries should be thorough and involve all aspects of the neck and head; mouth; extremities, including feet and hands; genitals; anus; buttocks; torso; and back. Obscure sites for inflicted injuries include the ears, especially the posterior aspects, the neck and angle of the jaw, scalp, and the frenula of the lip and tongue. In contrast to accidental injuries, inflicted injuries tend to occur on surfaces away from bony prominences, such as the neck, head, buttocks, trunk, hands, and upper arms.^{35,36} In 1 patient series, approximately 60% of abused children had injuries on the head, face, or neck.³⁷ Hematomas of the scalp may be detected through palpation or may be visualized on radiographs. Some deeper bruises may not be readily visible for several hours; areas that are painful to palpate may require further examination in 1 to 2 days, when bruises may become apparent. Measurement of skin injuries may assist in determining the mechanism of injury and/or object used to inflict the injury. For example, a child that is kicked may have a discernable shoe imprint, or a knuckle imprint may be apparent if the child was punched.

Bite marks can yield important forensic information; referral to professionals that can gather such information and maintain a chain of custody is advisable.³⁸ Bite marks, recent or healed, should be carefully measured and photodocumented when possible; an intercanine distance of more than 2 cm suggests a human adult-sized bite.³⁹ In some facilities, forensic odontologists are available and may use special examination and photographic techniques to analyze bite marks. Fresh bites should be swabbed with sterile, premoistened cotton-tipped applicators for forensic analysis of potential genetic markers found in saliva.

The age of a bruise cannot be determined accurately.⁴⁰ Soft tissue swelling is seen more commonly with recent trauma but can persist for several days. The age and developmental capabilities of the infant or child also determine the frequency of bruising. For example, 1 study of infants and toddlers presenting for health maintenance examinations found that 17.8% of infants starting to "cruise" and 51.9% of ambulatory toddlers had bruises; bruises were observed only 2.2% of the time in infants who were not yet cruising.³⁶ In addition to acci-

dents, bruising may occur secondary to coagulopathies and vasculitides such as idiopathic thrombocytopenic purpura, vitamin K deficiency, Henoch-Schönlein purpura, hemophilia, or von Willebrand disease.

Burn injuries may be chemical, thermal (including exposure to scalding liquids or hot objects), or electrical. The child's clothing worn during the burn should be collected and may provide information regarding the cause of the burn. Burns inflicted with hot objects can be difficult to differentiate from accidental mechanisms, because both burns may be patterned. The history, number of burns, and continuity of the burn pattern over curved body surfaces may indicate a greater probability of inflicted trauma. Accidental scalds most commonly involve hot liquids pulled or splashed onto the child's upper extremities, torso, and or neck and head.⁴¹ Inflicted scalds or forced-immersion burns may be well demarcated in pattern, with few or no splash marks. When evaluating an apparent burn injury, other noninflicted causes to consider include chemical burns of the buttocks with senna-containing laxatives,⁴² bullous impetigo, and accidents.

Cranial Injuries

Head trauma is the leading cause of child abuse fatalities.⁴³ When compared with child victims of severe accidents, children with abusive head trauma are more likely to have subdural and subarachnoid hematomas, multiple subdural hematomas of differing ages, more extensive retinal hemorrhages, and associated cutaneous, skeletal, and visceral injuries.⁶ The inflicted injuries tend to occur in younger patients. Abusive head trauma tends to result in higher mortality and longer hospital stays than does accidental head trauma.^{6,7} Infants with intracranial injuries frequently have no or nonspecific symptoms,^{44,45} so the absence of neurologic symptoms should not exclude the need for imaging. Careful consideration of symptoms, signs, history, and judicious use of other ancillary tests should guide the clinician in determining the need for imaging.

Skull fractures can occur from accidents or inflicted injury. Studies have indicated that simple linear skull fractures can result from short falls of less than 3 ft and that such fractures are usually associated with scalp bruising or swelling.⁴⁶ However, it is unknown how many infants and children sustain skull fractures from simple falls, are asymptomatic, and, therefore, never present for a medical evaluation; hence, the incidence of skull fractures among infants who sustain such falls is likely unknown. Abuse should be suspected when there is a history of minor head trauma such as a short fall in children with multiple, complex, diastatic, or occipital skull fractures.⁴⁷ Whenever an infant or child presents with a skull fracture, care should be taken to ensure that there are no other injuries.

Conditions that may be confused with abusive head

trauma include glutaric aciduria type 1 (macrocranium, subdural hematoma, sparse intraretinal and preretinal hemorrhages, frontotemporal atrophy) and hemorrhagic disease of the newborn (including risk factors such as home birth, no vitamin K prophylaxis, or breastfeeding).

A fundoscopic examination for retinal hemorrhages should be considered for any infant or young child who is a suspected victim of physical abuse. Under optimal conditions, an ophthalmologist with pediatric experience should conduct an examination of dilated pupils by using indirect ophthalmoscopy. The ophthalmologist should provide documentation of the retinal hemorrhages by photography or detailed annotated drawings. Location, depth, and extent of retinal hemorrhages may distinguish between abusive and nonabusive causes of head trauma.⁴⁸ Retinal hemorrhages occur in approximately 85% of infants and children who are subjected to abusive, repetitive, acceleration-deceleration (shaking) forces with or without impact.⁴⁸ Although newborn infants may have retinal hemorrhages in the superficial nerve fiber layers, most resolve by 2 weeks of age, and most intraretinal hemorrhages resolve by 4 to 6 weeks of age.⁴⁹

Thoracoabdominal Injuries

Inflicted injuries that involve the heart are rare and severe. Rib fractures in infants are usually caused by forceful squeezing of the chest⁵⁰; posterior or lateral rib fractures or multiple rib fractures are especially predictive of abusive trauma.⁵¹ Cardiopulmonary resuscitation, whether performed by experienced or inexperienced individuals, is an unlikely cause of rib fractures⁵² or retinal hemorrhages. Acute rib fractures may be associated with shallow breathing attributable to pain and splinting; in severe cases, a fractured rib may puncture the lung. Alterations in respiratory patterns may also signal central nervous system damage or response to pain. Other rare injuries associated with abusive blows or compressive forces to the chest include hemopericardium, cardiac contusions occurring as a result of abusive blows to the chest, and shearing of the thoracic duct resulting in chylothorax.^{53,54}

Auscultation, performed before palpation, may reveal decreased or no bowel sounds if the child has sustained intraabdominal injury. If the intestines, liver, or spleen have been ruptured, guarding or abdominal muscle rigidity may be noted on palpation. Abdominal bruising is often not seen, even with severe blows to the abdomen.⁵⁵ In 1 study,⁵⁶ solid organ injuries were most common in children with accidental and inflicted abdominal trauma, but abused children were more likely to have a hollow viscus injury or both hollow viscus and solid organ injuries than were children with accidental abdominal injuries. In comparison with children who sustain accidental trauma to the abdomen, victims of inflicted intraabdominal injury tend to be younger, are

more likely to have delayed presentations to a clinical setting, have a higher mortality rate, and are more likely to have an injury to hollow viscera.⁸ Liver and pancreatic enzyme tests are helpful in screening children for abdominal trauma, especially when the child presents with acute symptoms or shortly after the incident has occurred. A urinalysis may also lead to the discovery of unexpected trauma to the urinary tract and kidneys. Radiographic studies, including computed tomography, are helpful in determining the types and severity of intraabdominal trauma and are warranted in most cases when the physical examination is unreliable because of patient age, presence of other injuries that may obfuscate the abdominal examination, or the presence of head injury.

Skeletal Injuries

Careful palpation of the legs, arms, feet, hands, ribs, and head may reveal acute or healing (callus formation) fractures. If a fracture is suspected, surfaces should be carefully examined for "grab marks" that may indicate restraint or areas that were pulled or twisted to create the fracture; however, absence of such bruising does not exclude abusive mechanisms of injury. Soft tissue swelling, with or without bruising, may indicate more recent trauma. Many fractures, including rib and metaphyseal fractures, may not be clinically detectable, so a negative clinical examination should not preclude the need for a skeletal radiologic survey when inflicted trauma is suspected, particularly in children younger than 2 years.

Long-bone fractures that should be evaluated carefully for nonaccidental causes include metaphyseal fractures and spiral/oblique fractures, especially in nonambulatory infants; both types of fractures have been associated with accidental mechanisms of injury as well. Accidental causes of lower-extremity spiral or oblique fractures have been described among infants in "exersaucers"⁵⁷ and in the tibia of newly ambulatory toddlers.⁵⁸ Osteogenesis imperfecta is a rare congenital disorder that typically presents with bone fragility. Other associated findings are common and include deep-blue sclera, ligamentous laxity, osteopenia, wormian skull bones, dentinogenesis imperfecta, positive family history, and hearing loss. Less common types of this disease may present with fewer and less-severe clinical symptoms.⁵⁹ Patients with osteogenesis imperfecta are often suspected as victims of abuse before diagnosis, because the history of the injury insufficiently explains the severity of the fracture, and osteopenia may be lacking in occult cases of this disease.⁶⁰

A complete neurologic assessment, including reflexes, cranial nerves, sensorium, gross motor, and fine motor abilities, should be conducted. Abnormalities may reflect current or past injuries to the central nervous system. Abused children may also have developmental disabili-

ties because of deprivation in the home environment or other causes.

DIAGNOSTIC TESTING AND CONSULTATIONS

When abuse is suspected as the cause of an injury, the clinician may conduct tests to screen for other injuries or underlying medical causes for the injury. The extent of diagnostic testing depends on several factors including the severity of the injury, the type of injury, the age of the child, and examination findings. In general, the more severe the injury and younger the child, the more extensive is the need for diagnostic testing for other injuries. Table 1 is a summary of tests, some of which may be used during a medical assessment for suspected abuse.

When 1 child is identified as a suspected victim of abuse, siblings and other child contacts of the suspected abuser should also be assessed for injuries. The extent of

the assessment depends on the child's age, symptoms, and signs; infants and toddlers may require more extensive testing, because symptoms and signs may be less useful in determining the presence of occult inflicted injuries.

DOCUMENTATION AND DIAGNOSTIC CONSIDERATIONS

Complete documentation of visible injuries on body diagrams and with photographs is strongly urged and facilitates peer review as well as court testimony, when required. In some regions, investigators from law enforcement or child protective services are specially trained to take forensic photographs. Diagnostic impressions should address whether the explanation adequately correlates with the severity, age, pattern, and distribution of the injury or injuries and the likelihood of nonaccidental causes for the injury. If a child has sustained a serious injury because he or she was left un-

TABLE 1 Diagnostic Tests That May Be Used in the Medical Assessment of Suspected Physical Abuse and Differential Diagnoses

Type of Injury or Condition	Diagnostic Tests	Comments
Fractures	Skeletal survey: humeri, forearms, femurs, lower legs, hands, feet, skull, cervical spine, thorax (including oblique views ⁶¹) and lumbar spine, pelvis ⁶²	<ol style="list-style-type: none"> 1. Recommended for all children with fractures and children with any suspicious injuries under age 2 2. Repeat skeletal survey in 2 wk for high-risk cases⁶³ 3. Single whole-body films are unacceptable
Bruises	Tests for hematologic disorders: CBC count, platelets, prothrombin time, partial thromboplastin time, INR, bleeding time; additional testing (eg, factor levels) may be indicated after initial screening tests	<ol style="list-style-type: none"> 1. Recommended when bleeding disorder is a concern because of clinical presentation or family history 2. A DIC screen should be performed for patients with intracranial injury, because intraparenchymal damage can alter coagulation⁶⁴ 3. PFa-100: platelet function activity is preferable to bleeding time for establishing platelet function but is not widely available
Liver injury	Liver enzyme tests: aspartate aminotransferase and alanine aminotransferase	<ol style="list-style-type: none"> 1. May be helpful in diagnosing occult hepatic injury⁶⁵
Pancreatic injury, pseudocyst	Pancreatic enzymes: amylase and lipase	
Urinary system/renal injury	Urinalysis	
Intracranial and extracranial injury	MRI: head/neck	<ol style="list-style-type: none"> 1. Diffusion-weighted scan may surpass CT in characterizing extent of intercerebral edema⁶⁶ 2. May provide better dating of intracranial injuries than CT 3. More sensitive than CT for subtle intracranial injuries in patients with normal CT results and abnormal neurologic exams⁶⁷ 4. More sensitive than plain radiographs and CT for detecting cervical spine fractures/injury⁶⁸
Intracranial and extracranial injury	CT scan: head ^a	<ol style="list-style-type: none"> 1. When used in conjunction with radiographs, may enhance detection of skull fractures
Intracranial injury	Urine: organic acids	<ol style="list-style-type: none"> 1. Screen for glutaric aciduria type 1
Intra-abdominal injuries	CT scan: abdomen	<ol style="list-style-type: none"> 1. IV contrast should be used and is preferable to PO⁶²
Cardiac injury	Cardiac enzymes: troponin and creatine kinase with muscle and brain subunits (CK-MB)	
Skeletal	Radionuclide bone scan	<ol style="list-style-type: none"> 1. Better for acute rib fractures and subtle, nondisplaced long-bone fractures⁶²
Osteogenesis imperfecta	Skin biopsy for fibroblast culture and/or venous blood for DNA analysis	
Bone-mineralization disorders: rickets	Calcium, alkaline phosphatase, phosphorus, vitamin D, and parathyroid hormone	

Tests should be ordered judiciously and in consultation with the appropriate genetics, hematology, radiology, and child abuse specialists. Careful consideration of the patient's history, age, and clinical findings should guide selection of the appropriate tests. CBC indicates complete blood cell; INR, international normalized ratio; DIC, disseminated intravascular coagulation; CT, computed tomography; IV, intravenous; PO, oral; CK-MB, creatine kinase MB band.

^a CT scanning may provide clinically relevant information more expeditiously than MRI in some facilities.

pervised in a dangerous environment, the physician should report suspected neglect or inappropriate adult supervision, including injuries sustained while under the care of an intoxicated adult, to child protective services.⁶⁹ When the child is evaluated or tested for other nonabusive causes, documentation should reflect the results of this assessment as well. In general, concern for abuse is greatest for infants younger than 12 months regardless of the severity of the injury.

TREATMENT

Once medical assessment and stabilization are achieved and a referral has been made to investigative agencies, the physician should ensure that the child receives the necessary follow-up services. The child's primary care physician should be notified, and child protective services should ensure that the family complies with the plan of care. These services should not only include referral to appropriate medical providers but also address the psychological effects of abuse or neglect on the young child, the siblings, and the nonoffending caregiver. Because adult-partner violence commonly co-occurs with child abuse, several family members may require medical and mental health assistance. Medical passports, which are abbreviated medical chart forms usually kept by foster parents and presented at each medical visit, are recommended to optimize treatment regimens in children who are shifted among agencies and individuals during the course of the child abuse investigation.⁷⁰

LEGAL ISSUES

All 50 states have statutes that mandate reporting of suspected child abuse and neglect; the physician is not required to prove abuse before reporting. Familiarity with state laws will ensure that physicians report to the appropriate agency within the required time frame; some states have provided the option of making such a report through the Internet. Information on specific state laws are provided by the Children's Bureau (Administration for Children and Families, US Department of Health and Human Services; see www.childwelfare.gov/systemwide/laws_policies/search/index.cfm). Many states have laws that permit physicians to evaluate children who are suspected victims of abuse, to conduct tests, and to take photographs without parental consent.

The physician may be required to write a sworn statement of his or her findings and to testify in civil or criminal trial proceedings. Civil hearings include testimony about the safety of the child and the need for appropriate placement with caregivers or state agencies. Judgments are based on a "preponderance of the evidence" with respect to the likelihood of abuse. Criminal hearings involve testimony about the guilt or innocence of an individual with respect to causing the injuries in a child. The burden of proof is greater than that of civil

hearings; cases must be proven "beyond a reasonable doubt." Physicians are expected to testify to the facts on the basis of their knowledge and experience in pediatrics and, when appropriate, in child abuse. As such, they may be asked to render opinions regarding the normal developmental capabilities of children at certain ages as well as the mechanisms of injury, severity of the injury, and prognosis. Pediatricians should not testify to anything that is beyond their level of knowledge or expertise. Physicians act primarily as scientists and educators in legal settings rather than as child advocates.

CONCLUSIONS

Child physical abuse is a common problem of childhood. The physician must be able to recognize suspicious injuries, conduct a comprehensive and careful examination with appropriate auxiliary tests, critically assess the explanation provided for the injury or injuries, and establish the probability that the explanation does or does not correlate with the pattern, severity, and/or age of the injury or injuries. The physician is responsible for reporting suspected abuse, documenting his or her opinions clearly, and providing the necessary information and expertise to investigative and legal personnel and parents, when appropriate. In addition, pediatricians are uniquely qualified to work with parents and caregivers to prevent abuse by providing anticipatory guidance on normal child behavior and its management. Finally, physicians must advocate that children in foster care who have medical or mental health problems receive the appropriate services and medications and continuity of care through a medical home, and that a medical passport is maintained for these children.

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