Pediatric Abusive Head Trauma

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Faculty

Susan Engman Lazear, RN, MN, received her undergraduate education at the Walter Reed Army Institute of Nursing in Washington, D.C. After completing her BSN, she served as an Army Nurse at Letterman Army Medical Center in San Francisco for four years. She then attended the University of Washington School of Nursing and received a Master's in Nursing, specializing in Burn, Trauma and Emergency Nursing. After receiving her MN, she started Airlift Northwest, the air ambulance service based in Seattle which serves the entire Northwest region, including Alaska. Mrs. Lazear left the air ambulance service to start her own nursing education and consulting business, Specialists in Medical Education. For the past 20 years she has been teaching emergency nursing courses throughout the country. She lives in the Seattle area. Mrs. Lazear continues to teach and publish. She is both an editor and contributing author of Critical Care Nursing, published by W.B. Saunders Company, in June of 1992. She served as an author and reviewer of the Emergency Nursing Core Curriculum 6th Edition, published by W.B. Saunders Company in 2007. She has been named to the Who's Who in American Healthcare list annually since 1992.

Faculty Disclosure

Contributing faculty, Susan Engman Lazear, RN, MN, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

Division Planner

James Trent, PhD

Director of Development and Academic Affairs

Sarah Campbell

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Audience

This introductory course is designed for all psychologists who may intervene to prevent or identify pediatric abusive head injuries.

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Course Objective

The purpose of this course is to raise awareness and provide psychologists with the knowledge and skills necessary to quickly and accurately identify pediatric abusive head trauma and to intervene in cases of abuse, which should decrease the morbidity and mortality experienced by the victims.

Learning Objectives

Upon completion of this course, you should be able to:

1. Outline the history and epidemiology of pediatric abusive head trauma.
2. Describe mechanisms and clinical presentations of pediatric head injuries resulting from abuse.
3. Identify and treat various types of head trauma that may present in pediatric victims of abuse.
4. Recognize signs and symptoms necessary to diagnose abuse in infants and children, and discuss the process of reporting abuse.
5. Access resources and devise a strategy for education and prevention of pediatric abusive head trauma.

Sections marked with this symbol include evidence-based practice recommendations. The level of evidence and/or strength of recommendation, as provided by the evidence-based source, are also included so you may determine the validity or relevance of the information. These sections may be used in conjunction with the course material for better application to your daily practice.

INTRODUCTION

Serious injuries that result in the death or debilitation of infants or young children are seldom the result of accidents. It is estimated that 95% of severe intracranial injuries and 64% of all head injuries in children 1 year of age or younger are caused by violence inflicted by parents or caretakers [10]. By contrast, the incidence of infant death by accidental falls or drops from low height (less than 4 feet) is less than 1 in 1 million [20]. Though widely known today as shaken baby syndrome (SBS), it is important for healthcare professionals to embrace the all-inclusive medical terminology pediatric abusive head trauma (AHT), not to detract from shaking as a mechanism of AHT, but to acknowledge the various mechanisms of purposeful injury to infants and children [1]. AHT is a spectrum, ranging from mild injury due to sub-lethal abuse, which can cause lethargy, irritability, poor feeding, and/or vomiting occurring for days or weeks, to the most severe injury leading to coma and/or death [1]. In fact, pediatric AHT is the leading cause of death and debilitation in children among all forms of physical abuse [2]. The symptoms and conditions associated with AHT have been found in children up to 7 years of age but occur most commonly between the ages of 2 and 9 months, coinciding closely with the peak of infant crying [38; 40; 70]. The great tragedy is that AHT (and especially SBS) is thought to be highly preventable with well implemented parental education programs and access to support networks and services.

HISTORY

Investigation of pediatric AHT began in the 1940s by Philadelphia physician John Caffey. Dr. Caffey published a seminal article in 1972 on whiplash-shaking of infants and what he termed "whiplash shaken infant syndrome." A variety of reasons for whiplash-shaking were found, but parents or caretakers would typically only admit to shaking infants or children to correct misbehavior [4]. At the time, giving a child "a good shaking" was an acceptable disciplinary technique. Through accumulated circumstantial evidence, the correlation was subsequently made between abusive treatment or violent shaking and injuries to the brain and its blood vessels, the vessels of the eyes, damage to the cervical spine, and long-bone injury, as it was often found that toddlers were shaken by their arms or hung upside down and shaken from their legs. Unfortunately, the widespread use of shaking to stop crying and as a form of discipline still persist to this day [51].

EPIDEMIOLOGY

It is difficult to gauge the exact incidence of AHT for a number of reasons, including the criminal nature of child abuse. Historically, discrepancies in defining and coding pediatric head trauma and abuse (and subsequent inconsistency in national data sets) have led to poor estimates [51]. Additionally, a vast number of cases evade clinical detection. Based on hospitalization data from the 2000, 2003, 2006, and 2009 Kids' Inpatient Database (Healthcare Cost and Utilization Project), the incidence of detected AHT in the United States is approximately 40 cases per 100,000 live births for children younger than 1 year of age and 7 cases per 100,000 for children 1 year of age or older; this equates to approximately 1,200 to 1,400 cases per year [48; 64; 70]. This rate varies regionally due to socioeconomic factors as well as whether or not AHT prevention education programs are provided to parents and/or other members of society involved in the care and safety of children [11; 48].

Specialists in pediatric abuse, neurology, and psychiatry consider undetected cases of AHT to be a major source of behavioral problems, developmental disorders, and intellectual disabilities of unknown etiology (19% to 90%), although to date, this association remains unconfirmed [51; 52; 53; 54; 55; 71]. The likelihood that most subclinical cases of abuse are never detected is high, as is the suspected number of AHT injuries that cause lesser degrees of behavioral/developmental symptoms, but the proof linking these symptoms to undetected abusive injuries may never be found.

Approximately 18% to 25% of AHT victims will ultimately die from their injuries, and 65% to 80% of survivors will become significantly disabled, resulting in great societal and financial costs [49; 61; 62; 63; 65; 71]. The total economic impact of AHT is unknown, but overall child abuse-related costs are estimated to be $124 billion per year (in 2010 dollars) in the United States, with $18.6 billion attributed to AHT [51; 65]. This figure is based on the conservative estimates of $210,000 in lifetime medical costs for each case of nonfatal abuse and $1.2 million for each abuse-related death. Lifetime costs for each AHT case are likely much greater ($300,000 to more than $7 million) due to the wide range of serious injuries and permanent disabilities (e.g., depression, learning disabilities, visual disabilities, seizure disorders, cerebral palsy, paralysis) [51; 65]. Additionally, the lifetime costs related to undetected AHT are potentially massive. The direct medical costs of AHT admissions in the United States were estimated to be $70 million annually in 2015 [67].

AHT is not a phenomenon unique to the United States. One international study of child abuse found that the prevalence of shaking children 2 years of age or younger as discipline or punishment (equivalent to abuse) was between 20% to 63% in 9 of 16 communities sampled in Brazil, Chile, Egypt, India, and the Philippines [58]. Surveys of mothers in Canada and Holland revealed that 2% and 5%, respectively, agreed with a question that asked if "shaking is a good way to silence a crying infant" [42; 51; 59]. In Holland, 5.6% admitted to slapping, smothering, or shaking an infant because of his or her crying. A survey in North and South Carolina found that 2.6% of mothers routinely use shaking of infants and toddlers as discipline, a rate higher than was admitted by fathers [60].

RISK FACTORS

The abusive episode leading to head trauma almost always begins with a frustrated, stressed, or psychotic parent or caretaker being unable to calm a crying infant and acting in an impulsive and violent manner in an effort to silence them. Toddlers, on the other hand, often are abused for being "difficult" as well as for crying. Environmental risk factors for abuse include young parents, substance-addicted parents, low socioeconomic status, lack of family support, mental illness, and parental history of being abused as a child (i.e., additional stressors, inadequate coping mechanisms). Rates of AHT do not differ significantly among different racial/ethnic groups in the United States [49].

As with other forms of child abuse, poor economic stability and low income level seem to be key risk factors for AHT, although children in high-income households are not immune to abuse [11]. Child abuse in general has been found to increase as the economy worsens and access to social services decreases. One study in Pennsylvania, a state with a moderate incidence of AHT cases, reported nearly 10 cases of AHT per month during the recession of 2007–2009, up from about 6 cases per month before the recession [11]. The stress of losing a job and becoming the full-time caretaker of the child has been suggested as a contributing factor, and this was observed during the 2007–2009 recession in urban centers throughout the United States [15].

A 2003 study found that 72% of children with abusive head injuries were from single-parent households [34; 71]. Another study showed that marriage is a protective factor—children living in households with two unrelated adults were 50 times more likely to die of abusive injuries than a child living with two biologic parents—but also found that the risk of death from abuse in general is not increased in single parent households [50]. Factors that increase a child's risk for AHT include previous abuse, prematurity, chronic illness, mental retardation, and a "difficult disposition" [1; 12; 71]. When AHT cases are discovered, signs of prior abuse are apparent 30% to 70% of the time [51].

Gender is also a significant risk factor for AHT. Approximately 60% of victims and 60% to 70% of abusers are male [12; 13; 14]. Fathers and stepfathers account for 37% to 45% and boyfriends 21% to 25% of all AHT perpetrators in the United States (compared to 13% perpetrated by mothers) [14; 38]. One theory is that some male caretakers believe that it is okay for infant girls to cry, but not infant boys, despite their age [51]. The disproportionate size and strength of the adult abuser, male or female, is also a contributing factor to the severity of injuries.

MECHANISMS OF INJURY

Abusive behaviors associated with AHT include intentionally throwing, dropping, striking, and vigorously or violently burping, grabbing, pulling, pushing, shaking, or slamming an infant or young child. The majority of abuse-inflicted deaths and debilitations are the result of brain injury and cerebrovascular trauma combined with cervical spine injury and secondary injuries (e.g., hypoxia, ischemia, metabolic cascades) [1]. However, many instances of abuse-inflicted head injuries (e.g., lacerations, skull fractures) have been discovered without detectable neurologic complications [34].

As discussed, shaking is often given as the sole explanation of patients' injuries, most commonly attributed to misbehavior or persistent crying; one study found shaking to be the only admitted behavior in 68% of confirmed AHT cases [32]. This supports the belief that shaking is the primary mechanism of AHT and the widespread use of the "shaken baby syndrome" terminology. Shaking is commonly identified by abusers as being harmless; however, the American Academy of Pediatrics (AAP) notes that anyone witnessing an act of abusive shaking would recognize it as dangerous and likely to harm the child [1].

Some researchers believe that shaking alone cannot cause the pattern of injuries associated with "shaken baby syndrome" in an otherwise healthy infant, no matter how violent. These researchers assert that impact forces (from either soft or rigid surfaces), which are greater than shaking forces by a factor of 50, probably cause the majority of injuries in the AHT constellation [37]. However, this assertion is based on research using an adult primate model as an analogue for an infant brain, which is now thought to be an inaccurate comparison [20]. The abundance of research and literature supporting the causal relationship between violent shaking and pathologic findings suggests that shaking alone can cause sub-lethal injuries (e.g.,

concussion, minor intercerebral bleeding) and more severe injuries. Others have proposed that AHT is almost always a combination of shaking and impact forces.

Typically, there are no witnesses to the abuse in almost all AHT cases, so the exact mechanisms of various head traumas are without validation [1; 57]. Violence is rarely volunteered as an explanation for a child's injuries, especially when there are no witnesses. When violence is suspected, many perpetrators (in the clinical setting; or through their legal counsel, in court) attempt to defend their actions by diminishing the severity of the incident. This can present problems for diagnosis in the emergency department and when prosecuting cases in court, as expert defense witnesses cite the lack of scientific evidence (i.e., lack of a model that accurately represents a human infant) that supports shaking alone as a cause of significant injury [57]. However, in one report of 29 judicial confessions in AHT cases, the perpetrators all described extremely violent shaking and 55% admitted repeated shaking from 2 to 30 times (average: 10 times), mostly because it stopped an infant's crying [56]. Daily shakings for weeks or months occurred in 20% of cases because of their admitted effectiveness in stopping crying episodes. Impact was confessed in 24% of cases. This report included data showing a similar pattern of injuries in 83 other judicial AHT cases where there was no confession of either shaking or impact [56].

In some presentations, there may not be marks or bruises to alert healthcare professionals to obvious physical abuse or to support the suspicion of abuse; this is often due to the abundance of soft household surfaces, such as pillows, sofas, or mattresses, that the child may be struck with or thrown onto. Although soft surfaces reduce obvious signs of abuse, they still cause sudden deceleration (e.g., a child being thrown into a crib) or acceleration (e.g., hitting the head with a pillow) injuries [18]. The lack of marks or bruises may also be due to the possibility that the only mechanism of injury was extremely violent shaking while the child was wrapped in something that provided some cushioning from a forceful grip, such as a thick blanket.

Direct injury to the brain can be caused by skull deformation (e.g., from a blunt impact; rigid object) or rapid acceleration and deceleration forces upon the brain, or by the rotational forces that can result from rapid acceleration/deceleration. Rotational forces can cause a range of direct brain injuries, from concussion to diffuse axonal injury. Rotational forces can also damage the intracranial vascular system, greatly impacting mortality and morbidity related to hemorrhage and associated brain damage. However, early diagnosis and treatment of bleeding offers a better outcome than direct brain injury, which may have more ambiguous symptoms. Although many assume that a blunt force impact with cranial deformation would cause greater damage than shaking, insults from shaking or repeated slamming against or hitting with soft objects may be many times worse [4]. This is because blunt impacts cause focal damage from linear forces, whereas rotational forces cause diffuse, lethal AHT injuries [20]. The brain of an infant is softer than an adult's, with the consistency of unset gelatin; as such, they are more easily affected by rotation [18].

Whiplash-type neck injuries are also common in abused pediatric patients because their heads are proportionally larger and heavier than adults' and their neck muscles are not well developed. Therefore, the infant head's relative mass amplifies trauma, and no shock absorbing effect is available. Damage to the cervical spine is not uncommon in AHT cases.

CLINICAL PRESENTATION

Because the goal of this type of abuse is usually to stop the child from crying or otherwise aggravating the caretaker, the end result is that the sustained injuries are typically of a magnitude that causes the infant or toddler to lose consciousness for an extended period of time. This is often the presenting condition.

Aside from being comatose, a pediatric patient with traumatic head injuries of abusive origin may be convulsing, have altered consciousness, have impaired ability to suck or swallow, and be unable to track with eye movements, smile, or vocalize [1]. Skin or lips with a blue hue and lethargic eyes are signs of AHT. However, in many cases there may not be any physical clues to assist the assessment.

The most apparent clinical sign of AHT is a scalp laceration. Blunt force applied to the head will cause tissue disruption, leading to hemorrhage. In small children, uncontrolled hemorrhage may cause exsanguination attributable to the high density of the vascular bed in the scalp. In most patients, pressure dressings applied to the injury may slow or stop this loss of blood. In acute situations, hemostats and ligation or cautery of scalp vessels may be required to staunch the ongoing blood loss.

Some patients will present with bruises on the arms, legs, body, neck, and/or head; bleeding; and/or skull deformation. However, in cases in which there are no obvious physical signs of abuse, radiologic imaging may be helpful in diagnosing intracerebral hemorrhage or spinal injury [18; 19]. Magnetic resonance imaging (MRI) and computed tomography (CT) will have limited usefulness in diagnosing certain conditions.

Injury to the neural tissue can vary in severity from a concussion or traumatic brain injury (TBI), the mildest form, to a contusion or a diffuse axonal injury, producing severe, profound coma. A concussion produces a temporary disruption of cerebral function, generally lasting less than one day.

Contusion injuries of the brain cause a more prolonged compromise of cerebral function than a concussion. On examination, the brain tissue is edematous and may have signs of localized hemorrhage. Loss of consciousness may occur for prolonged periods of time, and recovery outcomes may be unpredictable at the time of initial evaluation. Often, contusions occur as coup-contrecoup injuries. This injury emerges during rapid acceleration and deceleration of the head as occurs in a motor vehicle accident or in AHT. The coup injury occurs when the brain impacts the interior of the skull, leading to injury of the brain tissue at the site of impact. The contrecoup lesion can be of greater consequence; this lesion occurs on the brain at the side opposite from the initial impact. In other words, the brain has bounced inside the skull, causing damage to a number of areas in the brain. The greater the damage to the neural tissue, the greater the risk of severe brain injury.

TYPES OF INJURY

When the head is injured, it is important to remember that two types of injury are possible: primary and secondary. Primary injury to the head and brain occurs at the time of trauma. Healthcare professionals have little control regarding the development of this type of injury, with the exception of education regarding prevention. Secondary injuries occur as a result of the trauma; examples include cerebral edema, bony fragments, and delayed vascular injury. Trauma care of injuries to the head and brain is directed at preventing or controlling the development of secondary injury.

Abusive head trauma can be divided into three categories of injury that may or may not appear concurrently: intracranial injuries, skull fractures, and spinal injury.

INTRACRANIAL INJURIES

The most common intracranial injuries associated with AHT are diffuse axonal injury, acute subdural hematomas, and subarachnoid hemorrhage [18]. Intracranial injury can cause irreversible brain damage that may lead to blindness, hearing loss, seizures, learning disability, and cerebral palsy.

Diffuse Axonal Injury

Severe rapid acceleration/deceleration has been found to cause rotational forces that generally result in traumatic diffuse axonal injury (DAI), which is most often seen in motor vehicle accidents in adults and AHT in pediatric patients [16]. With this injury, axons, the part of a neuron that makes contact with other neurons or cells, are stretched or torn from their connections. The damage process usually involves the brain's denser grey matter sliding over and tearing from the lighter density white matter, due to sudden deceleration, or white matter shearing from the cerebral cortex. While it was once thought that the shearing of axons themselves was the major factor in DAI, it is now understood that a biochemical cascade, involving calcium and sodium influx to the damaged axons, is responsible for the majority of post-injury cell death, localized edema, and general brain swelling [8]. Often there is secondary injury to the corpus callosum, and in rare instances, there is bleeding within the brain [18]. DAI leads to a loss of consciousness, ranging from hours to months, with upwards of 90% of cases resulting in permanent coma or death [3].

DAI is initially difficult to diagnose; the only symptom may be unconsciousness [18; 19]. Definitive diagnosis of DAI may only be made postmortem [18]. Long-term effects of DAI in patients who awake from a coma include [17]:

- Diminished or altered state of consciousness, which results in an impairment of cognitive abilities or physical functioning
- Disturbance of behavioral or emotional functioning
- Partial or total functional disability or psychosocial maladjustment

Acute Subdural Hematoma

Another classic injury associated with AHT is subdural hemorrhage leading to acute subdural hematoma. When small bridging blood vessels between the dura and the brain surface are torn, mainly due to rotational forces or blunt trauma, blood begins to leak, pool, and congeal between the dura and arachnoid layers. Subdural hemorrhaging is usually venous in origin and is the most common type of intracranial hemorrhage in children. Symptoms of acute subdural hematoma in infants and toddlers include [9]:

- Irritability
- High-pitched cry
- Persistent vomiting
- Feeding difficulties
- Increased sleepiness or lethargy
- Increased head circumference
- Bulging fontanelles
- Separated skull sutures
- Focal seizures
- Generalized tonic-clonic seizure

Complications of acute subdural hematoma include [9]:

- Brain herniation (pressure on the brain severe enough to cause coma and death)
- Persistent symptoms such as memory loss, dizziness, headache, anxiety, and difficulty concentrating
- Seizures
- Weakness, numbness, difficulty speaking

These complications may fade with time, but many patients develop chronic subdural hematomas.

Traumatic Subarachnoid Hemorrhage

Subarachnoid hemorrhage also can occur when bridging veins are torn and blood is deposited between the arachnoid and meningeal layers. A variety of AHT injuries can produce this type of intracranial hemorrhage, and symptoms in infants and toddlers are similar to those of subdural hemorrhage. If a subarachnoid hemorrhage is suspected, a lumbar puncture will provide confirmation. However, lumbar punctures should be avoided in patients with epidural or subdural hematomas and should only be performed when these types of intracranial hemorrhages have been first ruled out and there is no evidence of increased intracranial pressure [71].

RETINAL HEMORRHAGE

Retinal hemorrhages are seen in 70% to 90% of AHT cases, with two-thirds of AHT patients having hemorrhages too numerous to count [1; 18; 21]. Although retinal hemorrhages can develop for many reasons (e.g., hypoxia, increased intrathoracic pressure, increased intracranial pressure, anemia), the repeated acceleration/deceleration forces of AHT are the usual cause in infants and children when no other plausible explanation exists [21]. Hemorrhages may be viewed through an indirect ophthalmoscopy by dilating the pupils or by the natural dilation effect resulting from injuries; use of a direct ophthalmoscope might be insufficient [21]. A long-term effect can be visual impairment, though this can possibly be attributed to direct injury of visual centers in the brain.

SKULL FRACTURES

Skull fractures are described by their type: linear, depressed, compound, basilar, ping-pong ball, and growing. These injuries are not typical of the SBS subset and are less common in the AHT constellation; however, they can all be of abusive origin and are usually inflicted with hard objects or caused by impact with rigid surfaces.

SPINAL INJURIES

As noted, young children have disproportionately large heads and higher centers of gravity. In flexion injuries, the head will be the leading object, causing significant change in the shape of the vertebral column and cord. The muscles of the neck are underdeveloped, so flexion and extension injuries, such as whiplash, are common. This flexibility of the spinal column means that children have a lesser number of fractures and a higher incidence of compression injuries when compared to adult patients. Regardless of this degree of movement, it is vital to remember that the cord is fixed both distally and anteriorally. The cord is anchored by the cauda equina at the termination of the cord and attached by the lumbar and brachial plexus at the anterior end. Thus, with movement, the cord will either be stretched or compressed.

Diagnosis of spinal injury includes positive findings during physical assessment, radiologic evidence, and a high index of suspicion of abuse. Cervical spine imaging should be included in the evaluation of shaken infants and toddlers [5]. A single lateral cervical x-ray is not adequate in many instances; however, three views (i.e., cross-table lateral, anteroposterior, and odontoid views) will improve the diagnostic accuracy. The series must include all seven cervical vertebrae to allow for full evaluation. While x-rays remain the standard for rapid evaluation and gross screening of injury, MRI provides the practitioner with the most definitive information. MRIs allow for screening of soft tissue injuries, including edema and hematomas, and are considered the diagnostic method of choice for determination of cord injury.

Neck injuries involve more than the cord and vertebrae, as the ligaments, the vasculature, and the airway may also be compromised. The most common finding upon physical examination in the child with a cervical spinal injury is midline cervical tenderness. Neurologic deficits may be present upon initial examination or may not develop until later in the course of care. Any child with a mechanism of injury suggestive of a spinal injury should be treated with full spinal precautions.

TREATMENT OF AHT

Immediate measures in trauma resuscitation for the patient include management of the airway, breathing, and circulation (ABC) while simultaneously determining if he or she has sustained any life-threatening injuries. In the child, these steps take on even more importance, as the loss of the airway can be rapid and result in devastating consequences. The limited size of the pediatric airway increases the risk of rapid deterioration and subsequent difficulties in management. All pediatric head trauma patients should be managed as if a spinal cord injury exists. This requires utilizing the jaw-thrust maneuver to open the airway while maintaining alignment of the cervical spine. Once positioned, the airway should be examined for debris, such as loose teeth, blood, or saliva that can be mechanically removed. As the ABCs are stabilized, the primary survey includes assessing the level of disability and requires a complete examination of the patient for rapid identification of any underlying injuries. The primary survey should take no longer than 5 to 10 minutes for assessment and stabilization.

TRAUMATIC HEAD INJURY

Evaluation of the child with a suspected or confirmed traumatic injury to the head requires astute observation of the child's initial level of function and any subsequent changes in this level. Brain injuries are classified as mild, moderate, or severe based upon the child's Glasgow Coma Scale (GCS) score. The difficulty in utilizing the GCS score is that the method of scoring does not take into consideration children at varying levels of developmental maturation; thus, the Modified GCS for Infants and Children has been developed (***Table 1***).

Identification of the extent of injury includes assessment of the child over a period of time, recognition of symptoms and signs that carry an increased risk for delayed complications, and the use of diagnostic evaluation tools such as CT scans and MRIs. Unfortunately, no purely clinical indicators, either alone or in combination, have been found to detect structural brain injury. Imaging recommendations have been developed to afford the healthcare provider with an organized strategy in determining when a child is a candidate for imaging studies. The liberal use of these studies can place undue burden upon the healthcare system, while the underuse of these studies can lead to an increased risk of missed injuries, possibly leading to death or permanent disability of the child. One study demonstrated that 63% of scans in children with a GCS score of 13 or 14 were abnormal; these children had sustained injuries such as skull fractures, intracerebral hemorrhages, and cerebral contusions despite good neurologic function upon initial evaluation [24].

MODIFIED GLASGOW COMA SCALE FOR INFANTS AND CHILDREN			
Score	**Responses by Age**		
Eyes Opening			
	Patient >1 year of age		Patient <1 year of age
4	Spontaneously		Spontaneously
3	To verbal command		To shout
2	To pain		To pain
1	No response		No response
Motor Response			
	Patient >1 year of age		Patient <1 year of age
6	Obeys		Spontaneous
5	Localizes pain		Localizes pain
4	Flexion-withdrawal		Flexion-withdrawal
3	Flexion-abnormal (e.g., decorticate rigidity)		Flexion-abnormal (e.g., decorticate rigidity)
2	To pain		To pain
1	No response		No response
Verbal Response			
	Patient >5 years of age	Patient 2 to 5 years of age	Patient ≤23 months of age
5	Oriented and converses	Appropriate words or phrases	Smiles or coos appropriately
4	Disoriented and converses	Inappropriate words	Cries and consolable
3	Inappropriate words	Persistent cries and/or screams	Persistent inappropriate crying and/or screaming
2	Incomprehensible sounds	Grunts	Grunts or is agitated or restless
1	No response	No response	No response

Source: [31] *Table 1*

If obtaining a scan is not practical, overnight hospitalization for observation and serial clinical assessment may be indicated. For the child with overt signs of neurologic compromise, CT scanning should definitely be utilized to rule out underlying cranial injury. Children younger than 2 years of age are more difficult to assess for a number of reasons. Verbal and motor skills may not be adequately developed to allow for accurate assessment, and the sequelae of the head injury may vary. Infants may develop scalp hematomas in conjunction with a skull fracture. The liberal use of neuroimaging and skull radiographs is considered appropriate after injury in this age group [25].

If neuroimaging does not demonstrate evidence of underlying brain pathology, the child may be considered a candidate for discharge. Discharging the child to home is impacted by a number of issues, including medicolegal concerns, economic factors, and suspicion of abuse by a parent or guardian. Because the family must have access to proper care, distance and transportation to an appropriate medical facility must be investigated prior to discharging the child.

Moderate and major TBIs are those that produce a GCS score of less than 13. A GCS score of 9 to 12 is classified as a moderate injury. A child who is discharged after sustaining a TBI must be cared for by an individual who will comply with recommended discharge instructions. The importance of frequent observation of the victim cannot be over-emphasized. Reiteration of the following instructions will enhance care provider compliance. The child should be awakened every two hours and should be assessed for the ability to speak coherently (if old enough) and move his/her arms and legs. Pupils should be checked, and the care provider should receive a demonstration on how to best check pupillary size and response. Any possible abnormal responses should be listed on home care instructions, along with actions to take should these abnormal responses develop during the course of care. The care provider should notify the emergency department (or appropriate healthcare provider) if the child:

- Demonstrates excessive sleepiness
- Vomits more than twice
- Has unequal or abnormally shaped pupils
- Develops slurred speech
- Complains of a headache that worsens
- Demonstrates change in ambulation
- Develops seizures

If any of these signs are present, the child should be transported to the appropriate healthcare facility for further evaluation. The key to prevention of long-term sequelae is the early detection of patient deterioration.

A GCS score of 8 or less is an indicator of severe injury, and of these patients, 50% will die as a result of their injury [29]. The most frequent pathologic finding after severe head injury is diffuse brain swelling and edema; this is two to five times more common in children than adults [30]. Signs and symptoms suggestive of moderate-to-severe brain injury include a loss or decreasing level of consciousness, focal neurologic abnormalities, and coma. Management of neurotrauma in this population is based upon two mainstays of treatment: controlling hypotension and controlling hypoxemia. Initial resuscitative efforts should be directed at preventing these two complications beginning in the field and progressing through the emergency department and into the critical care unit.

Management of brain injuries in children remains an area of intensive research and study. Resuscitation of the brain of the injured child involves achieving a balance between intracranial pressure (ICP) reduction strategies and enhancing cerebral perfusion. Reduction of secondary injury should be paramount in the minds of all healthcare providers caring for the child with head injuries.

Diffuse Axonal Injury

This type of injury is without a specific treatment other than treatment for general head injury (i.e., stabilization of the patient, prevention of ischemia, and reduction of ICP). Induced hypothermia may offer a reduction in secondary injury but is not a common practice in the United States.

Acute Subdural Hematoma

Children with known or suspected acute subdural hematoma should be managed in a critical care unit with neurosurgery consultation. As with any traumatic head injury, ABCs and ICP should be managed first. Depending on the patient's GCS score, endotracheal intubation should be con-

sidered. Hyperventilation to a partial pressure of carbon dioxide (pCO_2) of 30 mm Hg should reduce ICP initially, and mannitol may also be started intravenously to decrease ICP. Venous outflow from the brain can be aided by elevating the head of the bed to 30 degrees and by making sure the head and neck are in the midline position.

Hematoma(s) leading to increased ICP can cause pupillary dilation of one or both eyes. This should be carefully watched for and noted, as this sign is used as a guide for surgical treatment. In the instance of multiple hematomas, the side with the first dilated pupil should be surgically evacuated first, at which time any bleeding should be stopped. Guidelines for the surgical drainage of hematomas are as follows [33]:

- Hematoma greater than 10 mm thick or midline shift greater than 5 mm on a CT scan, with any GCS score
- Hematoma less than 10 mm thick and a midline shift less than 5 mm on a CT scan, GCS score less than 9 and has decreased 2 or more points between time of injury and time of admission, and/or the patient presents with asymmetric or fixed and dilated pupils, and/or the ICP exceeds 20 mm Hg

Small acute subdural hematomas can usually be managed by examination, imaging, and observation.

Traumatic Subarachnoid Hemorrhage

Management of subarachnoid hemorrhage is similar to that of acute subdural hematoma. Any large hemorrhagic effect or signs of continued subarachnoid hemorrhage may require surgical intervention to control bleeding. Radiologically guided techniques may be used for a less invasive approach.

Retinal Hemorrhage

Treatment for retinal hemorrhage is performed by an ophthalmologist using a laser to repair leaking vessels. Nutritional supplementation to strengthen and repair damaged areas of the retina may also be useful.

SKULL FRACTURES

Owing to the soft nature of the child's skull and the fact that 75% of pediatric skull fractures are linear, the vast majority of these fractures can heal without significant intervention [72]. All that can be done is to assure the head is protected until fractures heal. Basilar fractures that are open and leaking should be treated with antibiotics. A drainage tube may be implanted to help the torn dura heal. Compound, depressed, ping-pong, and growing fractures should be assessed via CT or MRI and may require surgical removal of bone fragments. Head injuries associated with skull fractures are treated separately and accordingly.

SPINAL CORD INJURY

Management of the child with spinal cord injury depends upon age, severity of injury, and the degree of neurologic compromise. Children with unstable fractures or those with worsening neurologic deficits are surgically managed. For those children not surgically stabilized, halo stabilization should be a part of treatment [35].

Immediate evaluation of the ABC status of the child must be undertaken, remembering that the increased incidence of high cervical injuries in small children predisposes them to lose their ventilatory drive. If required, intubation should be performed with minimal neck movement. Only practitioners with an appropriate level of experience should attempt intubation in this patient.

Evaluation of concurrent injuries must be a priority. A child may survive the spinal insult but may not survive the subsequent massive intracranial bleed. Recognition of other injuries should be systematically evaluated utilizing the head-to-toe approach, as recommended in trauma life support courses. Documentation of the level and type of neurologic findings should be instituted early and repeated on a frequent, regular basis. It is important to remember that the child may have a fracture at one level and disc injury at another level. Improvement or deterioration of the patient's condition will be quickly recognized utilizing this systematic approach.

Although controversial, treatment with high doses of steroids in the first eight hours after injury (the Bracken protocol) has been shown to improve outcomes for certain patients with spinal cord injuries [36]. While the initial studies documenting the benefits of the Bracken protocol did not include pediatric patients, administering steroids may be beneficial to some children, though not without risk of serious complications [28]. The dosage regimen requires a 30 mg/kg IV bolus of methylprednisolone followed by a drip at 5.4 mg/kg per hour for the subsequent 23 hours. It is important to remember that the majority of benefits of steroids will only be achieved if this therapy is initiated within eight hours after the injury. In addition, studies have showed that the most effective duration of methylprednisolone is 24 hours for injuries treated within the first 3 hours of initial event and 48 hours for injuries treated 3 to 8 hours after the initial event [73].

Children with spinal cord injuries have better outcomes after injury as compared to adult trauma patients, but spinal cord injury is considered catastrophic and has the potential to cause permanent paralysis. As changes in spinal cord management continue to develop, children will live longer, more productive lives after injury. Prevention of these injuries should continue to be a priority.

DIAGNOSIS OF ABUSE

It is important to remember that severe head trauma in infants and young children is rarely accidental. When no other explanation of severe trauma is clear (e.g., a vehicle collision) or the provided history does not match the child's developmental age, an investigation of abuse should be pursued [26]. The proper authorities should be notified, and specialists in ophthalmology, pediatric radiology, pediatric neurology, and/or pediatric neurosurgery and a child abuse pediatrician should be part of the treatment team [1]. It is also essential for all pediatricians and other healthcare professionals involved in the care of children to be aware of the more subtle signs of physical abuse and past head trauma and for pediatricians to be confident in properly examining children for abuse. Other healthcare workers who suspect child maltreatment should enlist the help of a pediatrician, preferably one that specializes in child abuse.

As noted, abusive injuries can range from minor bruises and lacerations to the more severe head trauma discussed in this course. Physical abuse is one of the most easily identifiable forms of abuse and is the type most commonly identified by healthcare professionals. Physical injuries that may be indicative of abuse include bruises/welts, burns, long-bone and rib fractures, abdominal injuries, lacerations/abrasions, and manifestations of central nervous system trauma. Bruises and welts are of concern, particularly those that appear on:

- Face
- Lips
- Mouth
- Ears
- Eyes
- Neck
- Head
- Trunk

- Back
- Buttocks
- Thighs
- Extremities
- Multiple body surfaces

Patterns, such as shapes of the article used to inflict the bruise or welt (e.g., a cord, belt buckle, teeth, or hand), should be noted. Cigar or cigarette burns are common indicators of abuse, and they will often appear on the child's soles, palms, back, or buttocks. Patterned burns that resemble shapes of appliances, such as irons, burners, or grills, are of particular concern.

When examining patients, note bruises on the abdominal wall; any intestinal perforation; ruptured liver or spleen; and blood vessel, kidney, bladder, or pancreatic injury, especially if explanations for the cause do not make sense. Look for signs of abrasions on the child's wrists, ankles, neck, or torso. Lacerations might also appear on the child's lips, ears, eyes, mouth, or genitalia. Healing lacerations or scars on a child's head, especially when concurrent with other recent injuries, are cause for suspicion of abuse. All injuries should be documented and photographed.

Fractures that result from abuse might be found on the child's skull, spine, ribs, hands, feet, nose, or any facial structure. These may be multiple or spiral fractures at various stages of healing. As discussed, mechanisms of injury that cause AHT, especially injuries from shaking, can cause multiple long-bone end fractures. It is recommended that certain high-risk groups with normal neurologic statuses, especially patients younger than 1 year of age, be selected for radiologic imaging of the head and a complete skeletal survey when no reasonable explanation of injuries exists. This includes those with rib fractures, multiple fractures, or facial injury [34]. This is because skeletal survey alone can miss more than 25% of cases of abusive head injury [34]. One study found that up to 30% of AHT is initially undiagnosed, and mean time to diagnosis is seven days, having potentially deadly consequences [7].

According to the American College of Radiology, imaging the head in children with suspected abuse depends on the child's age and type of presentation. In children with skull fractures or clinical signs and symptoms of intracranial injury, an immediate noncontrast computed tomography scan of the head should be performed.

(https://acsearch.acr.org/docs/69443/Narrative. Last accessed May 12, 2020.)

Level of Evidence: 9 (Usually appropriate)

As discussed, retinal hemorrhages are characteristic of AHT cases, with more extensive bleeding associated with a greater extent of brain injury [1; 39]. Retinal hemorrhaging has long been used to make a more definitive diagnosis of abuse.

SCREENING FOR ABUSE IN NON-ENGLISH-PROFICIENT FAMILIES

Communication with patients and families regarding signs and history of abuse is a necessary step in obtaining an accurate diagnosis. When there is an obvious disconnect in the communication process between the practitioner and patient due to the patient's lack of proficiency in the English language, an interpreter is required. Frequently, this may be easier said than done, as there may be institutional and/or patient barriers.

In this multicultural landscape, interpreters are a valuable resource to help bridge the communication and cultural gap between patients and practitioners. Interpreters are more than passive agents who translate and transmit information back and forth from party to party. When they are enlisted and treated as part of the interdisciplinary clinical team, they serve as cultural brokers, who ultimately enhance the clinical encounter. When providing care for patients for whom English is a second language, the consideration of the use of an interpreter and/or patient education materials in their native language may improve patient understanding and outcomes.

REPORTING SUSPECTED CHILD ABUSE

The decision of whether or not to report suspected abuse is ethically challenging. Although healthcare professionals are ethically and legally obligated to report suspected child abuse, suspicion of abuse is somewhat of a judgment call, and certain biases may influence the decision to report. A 2008 prospective observational study found that clinicians did not report 27% of injuries considered "likely or very likely caused by child abuse" and 76% of injuries considered "possibly caused by child abuse" [23]. However, patients who had an injury that was not a laceration, who had more than one family risk factor, who had a serious injury, who had a child risk factor other than an inconsistent injury, who were black, or who were unfamiliar to the clinician were more likely to be reported. The AAP makes several useful recommendations regarding the diagnosis and reporting of AHT [1]:

- Remain cognizant of the possibility of AHT in infants who present with both subtle and overt neurologic symptoms.
- Take seriously the ethical and legal mandates to report suspected child abuse to governmental agencies for investigation.
- Consider alternative hypotheses when presented with a patient with findings suggestive of AHT.
- On some occasions, the diagnosis is apparent early in the course of the evaluation because some infants and children have injuries to multiple organ systems that could only be the result of inflicted trauma.
- On other occasions, the diagnosis is less certain, and restraint is required until the medical evaluation has been completed.
- Make a working diagnosis, as is done with many other diagnoses, and take the legally mandated steps for further investigation when indicated.
- Consult a subspecialist in the field of child abuse pediatrics to ensure that the medical evaluation is complete and the diagnosis is accurate.
- A medical diagnosis of AHT is made only after consideration of all the clinical data.
- When child protective services or law enforcement is involved in an investigation, the pediatrician is required to interpret medical information for nonmedical professionals in an understandable manner that accurately reflects the medical data.
- Do not apportion blame or investigate potential criminal activity, but identify the medical problem, treat the child's injuries, and offer honest medical information to parents and families.
- Help prevent AHT by providing anticipatory guidance to new parents about the dangers of shaking or impact and providing methods for dealing with the frustration of a crying infant.

PREVENTING PEDIATRIC ABUSIVE HEAD TRAUMA

The foundation of AHT prevention is believed to be an infant shaking awareness program implemented on a large scale, targeted to new parents and child caretakers. Information regarding infant crying and how to deal with potential stress and rage associated with crying and infant care are provided in this training. However, the effectiveness of AHT reduction programs is uncertain, with two large studies published in 2015 and 2017 questioning the positive outcomes of earlier trials [41; 42].

Education regarding AHT provided to the mother and father (or father figure) before an infant is discharged from the hospital was shown to decrease the number of abusive infant-shaking cases by roughly half overall in one study [38]. The study initiated in 1998 in an eight-county region of western New York and involving all hospitals that provided maternity care began with the assumption that because parents are so often the perpetrators of abuse (roughly three out of four cases), an educational program targeted at new parents, rather than an awareness campaign to the general public, could more effectively reduce the incidence of AHT. The methodology incorporated assessment of parents' prior knowledge of the dangers of infant shaking (which proved to be high at 92%), education about normal infant behavior, alternative responses to persistent crying, obtaining a signed commitment statement from mothers (and whenever possible, fathers or boyfriends), and a follow-up seven months later with a random sampling of 10% of parents.

The nurse-parent interactions were kept brief; a five-minute teaching interaction was average. The rationale was that a less time-consuming interaction was more likely to be implemented by hospital staff and was acute enough to keep parents' attention while they were naturally preoccupied. Several low-cost (compared with the high cost of care for a child with head injuries) measures were implemented: brochures were handed out, posters were hung, and an 11-minute video was to be viewed before signing the commitment statement. At the follow-up, 94% remembered receiving information about shaking, primarily the written materials (98%), the commitment statement (92%), and the interaction with staff (89%). It became clear that most parents were not shown the video. The rate of AHT in the eight-county NY region during the six-year period before the study (41.5 cases per 100,000 live births) was used as a control; additionally, the rate of AHT in the state of Pennsylvania was used to bracket the control. With other factors reasonably accounted for, the incidence of AHT dropped almost in half, to 21 cases per 100,000 live births in the six-year study period, while rates in Pennsylvania remained essentially the same.

There are multiple studies documenting the success of infant shaking prevention programs, including the "Love Me…Never Shake Me" program in Ohio and "The Period of PURPLE Crying" program from the National Center on Shaken Baby Syndrome [41; 42]. Analysis of these programs shows that information given at or shortly after birth, along with continued reminders at each office visit, is the most effective in reducing traumatic abuse. Considering that most parents already know that violent infant shaking is harmful, it is perhaps important for parents to make the association between this knowledge and their own infant and for parents to learn the particulars about self-care along with information about normal infant behavior. Key points of the AHT education program should include [42; 43; 44]:

- Infant soothing techniques
- Stress reduction techniques
- Walking away from an infant that is inconsolable
- Techniques to help the infant wake less frequently during the night

- Understanding that all infants cry and fuss, and that some cry significantly more than others. Crying will continue to get worse from birth until the peak at 3 to 8 weeks; crying duration peaks at 2 months on average (also the time when most SBS occurs). Crying can start and stop at random, not because of anything the parent has done or not done. It can be very helpful for parents to know that there is an end in sight (i.e., the infant will cry far less after the first 3 to 5 months).

In The Period of PURPLE Crying program, the PURPLE acronym that can be a useful reminder for new parents in the two- to five-month period after birth, when infant shaking is most likely to occur [44]. The acronym stands for [44]:

- Peak of crying: The most intense crying is normally at 2 months and will lessen at 3 to 5 months.
- Unexpected: Crying can start and stop suddenly and for no apparent reason or fault.
- Resists soothing: Some infants will keep crying despite all efforts and good intentions.
- Pain-like face: Just because an infant is grimacing does not mean he or she is in pain.
- Long-lasting: Crying for up to five hours per day is not uncommon.
- Evening: Late afternoon and evening are times when some infants cry more often.

In light of the considerable decrease of AHT cases in New York due to the western NY pilot program, the same pilot program was initiated in Pennsylvania in 2002. State legislation was also passed in 2002 to require all birthing and children's hospitals to implement the Pennsylvania Shaken Baby Syndrome Prevention and Awareness Program by 2006 [45]. The original western New York program began implementing education in many of the region's pediatric offices in 2005, leading to an additional 10% decrease in AHT cases [45].

Despite these apparent successes, several failures have also been noted. A study published in 2017 found that a parent-targeted AHT prevention program failed to decrease the AHT hospitalization rate over a 10-year period [68]. The study included parents of almost 1.6 million infants in the state of Pennsylvania and compared the hospitalization rate to that of five other states without statewide AHT prevention campaigns. Although parents did demonstrate improved awareness of AHT, the incidence of AHT hospitalizations in Pennsylvania actually increased slightly (from 24.1 to 26.6, per 100,000 children), while those of the other states remained stable [68]. Only 20% of the parents saw both the brochure and video, and only 6% completed the entire intervention.

A 2015 North Carolina study (including more than 400,000 newborns) of The Period of PURPLE Crying intervention also failed to show a statistically significant reduction in AHT rates [69]. The study controlled for family's economic differences (e.g., unemployment, mortgage foreclosure) and used other state's AHT rates in the analysis. The authors discussed the potential impact of the deep economic recession that occurred during the study period, and they acknowledged that the particular economic risk factors for AHT might have evaded their analysis or that state-level economic factors could have been significantly different between North Carolina and states used for comparison [69].

AHT PREVENTION LEGISLATION

As of 2017, several states have enacted laws requiring or encouraging AHT prevention education to new parents, but there is no mandate on the federal level (***Table 2***) [6]. Ohio is one example of a state that, in 2007, took the further step of requiring all licensed child-care center staff and unlicensed home-based care workers (individuals who care for fewer than six children or fewer than four children younger than 2 years of age) be educated about AHT in addition to new parents. Several other states have enacted laws requiring AHT prevention and detection education for

STATES WITH HOSPITAL-BASED/BIRTHING AHT PREVENTION LEGISLATION		
State	**Bill or Statute**	**Requirement**
Arkansas	2011 AK Acts, SB 328, Acts 1128, 1208	Mothers must receive AHT education before discharge.
California	CA Health and Safety Code § 24520	Encourages healthcare-based education.
Hawaii	HI § 321-33	None, allows hospitals to provide approved educational materials.
Iowa	IA § 135.119	None, voluntary participation by parents and caretakers.
Kentucky	2010 KY Acts, HB 285, Chap. 171	Parents and healthcare workers must be trained in AHT detection and prevention.
Massachusetts	Title XVI Public Health, Chapter 111, § 24K	Parents shall receive education and materials before discharge.
Missouri	Chapter 191 Health and Welfare Section 191.748	Offer the mother and persons of her choosing the opportunity to watch an AHT video.
Montana	MT Annotated Code 2009 § 50-16-103	None, requires the distribution of SBS educational materials by the Department of Public Health.
Nebraska	NE Revised Statutes § 71-2101 et seq. sec. 149	Parents must view an educational video and/or sign a release indicating having done so or having refused.
New Jersey	AB 1654, Chapter 67	Hospital staff must include information on SBS and home visitation resources with discharge materials.
New York	NY Public Health Law § 2803-J NY Social Services Law § 390-A	Request that each maternity patient and father watch an instructional video and/or sign a form indicating having watched the video or refused.
Ohio	OH Revised Code 3701.63 and 3701.64	Materials must be given to parents and expectant parents. Pediatricians and "Help Me Grow" programs must also provide materials.
Oklahoma	HB 2920, Chapter 368	None (establishes taskforce)
Rhode Island	RI General Laws § 40-11-17	None (development stage)
Tennessee	Tennessee § 68-143-103	Information and instructional materials should be provided to parents or guardians by the hospital before discharge, or by a nurse midwife attending a home birth.
Texas	TX Health & Safety Code Title 2 Subtitle H Chapter 161 Subchapter T Sec. 161.501	Hospitals/care providers must provide SBS information to mothers (and fathers, if possible) or guardian(s) during gestation or at delivery.
Virginia	VA Code Ann. § 32.1-134.01	Every healthcare professional in contact with the mother, father, and other relevant caretaker(s) must provide information regarding postpartum depression and SBS awareness and prevention.
Wisconsin	WI Statutes § 253.15 (2)	None, materials about SBS are to be made available to hospitals, maternity homes, and nurse midwives.

Source: [6] *Table 2*

child-care employees. Kentucky, the state with the highest rate of AHT in the United States in 2009, adopted a law in 2010 (Kentucky House Bill 285) requiring parents, healthcare workers, child care workers, foster parents, social workers, and law enforcement officers to take part in AHT education [27; 66]. Kentucky also requires AHT education be made available to state inmates, and the law encourages high schools to include a lesson on AHT prevention for 12th grade students.

Bills have been proposed in both the U.S. Senate and House of Representatives to enact a national campaign to promote awareness and prevention of AHT; however, at both the state and federal levels, budget shortfalls have hindered the realization of AHT programs.

IMPLEMENTING AHT PREVENTION

Healthcare professionals practicing in hospitals, offices, or states without AHT prevention programs in place are encouraged to offer education to parents or to put educational programs in action. There are many sources of information, including written material and videos, listed in the resources section of this course.

Whether due to a state mandate or as a matter of personal concern, all healthcare professionals, especially those in maternity and pediatrics, should be aware of the most essential recommendations to stress upon parents about coping with an inconsolable child. One of the main points is that it is often not the infant that needs calming, but rather the parent. The AAP has very specific, simple advice that should be provided to all parents. Individuals who feel as if they are about to lose control while taking care of an infant should [46]:

- Take a deep breath and count to 10.
- Put the baby in the crib or another safe place, leave the room, and let him or her cry alone.
- Call a friend or relative for emotional support.
- Call the pediatrician. Perhaps there is a medical reason the baby is crying.

Caregivers must be made to understand that although it might seem like poor parenting to walk away from a crying infant, it is many times worse to take out frustrations on a child. Walking away from a child of any age who is causing emotions to become out of control is always a better choice than physical violence.

Preventing serious abusive head injuries to older children often involves intervening at the first sign of abuse at prior visits. Dentists are often the practitioners who have the most frequent interactions with children and therefore must be attentive to any signs of physical abuse, as often abusive injuries to children involve the face, jaw, mouth, teeth, and tongue [47]. One study found that orofacial trauma was concurrent with 16% of AHT cases [22]. During examination, injuries in various stages of healing and those that seem inappropriate for the child's developmental age should be noted [26]. Dentists also have a legal and ethical responsibility to report suspected child abuse to the proper authorities.

CONCLUSION

All healthcare professionals involved in pediatric care have an ethical duty to advocate for AHT prevention programs at their place of practice. Only through preventative educational measures and early recognition of the signs and symptoms of abuse can the incidence of AHT be significantly reduced. It is necessary to educate expectant and new parents about stress relief techniques, normal infant crying behavior, and the importance of only leaving their children in the care of individuals whom they trust implicitly and ideally who also have completed AHT prevention education. When abuse is suspected to have occurred while in the care of another individual, parents should be encouraged to report the individual to the proper authorities. This is especially important when the abuse is thought to have occurred at a child-care center or during unlicensed home-based care. It is also vital to remember that the significant amount of attention given to SBS should not detract from awareness of abuse in older pediatric patients, who are also at an increased risk for AHT due to the propensity of violence inflicted to the head and face.

RESOURCES

American Academy of Pediatrics
Abusive Head Trauma
https://www.healthychildren.org/English/safety-prevention/at-home/Pages/Abusive-Head-Trauma-Shaken-Baby-Syndrome.aspx

Centers for Disease Control and Prevention
https://www.cdc.gov/violenceprevention/childabuseandneglect/Abusive-Head-Trauma.html

Children's Hospital Colorado
Shaken Baby Syndrome Prevention
https://www.childrenscolorado.org/conditions-and-advice/calm-a-crying-baby

Nationwide Children's Hospital
Shaken Baby Syndrome: Helping Hand
https://www.nationwidechildrens.org/conditions/shaken-baby-syndrome

National Center on Shaken Baby Syndrome
https://www.dontshake.org

National Center for Prosecution of Child Abuse
https://ndaa.org/programs/child-abuse

Never Shake a Baby Arizona
https://pcaaz.org/never-shake-a-baby

The Period of PURPLE Crying
http://www.purplecrying.info

Shaken Baby Alliance
https://www.shakenbaby.org

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