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Contact Hours: **3**

# Pediatric Abusive Head Trauma

## Child Abuse Prevention: Shaken Baby Syndrome

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**LEARNING OUTCOME AND OBJECTIVES:** Upon completion of this course, you will be better prepared to recognize and help prevent pediatric abusive head trauma (AHT). Specific learning objectives to address knowledge gaps include:

- Define “pediatric abusive head trauma.”
- Identify the risk factors for head injuries resulting from abuse.
- Describe the mechanisms of injury, clinical presentation, history gathering, physical assessment, and diagnosis of pediatric AHT.
- Distinguish between accidental and abusive head trauma in the pediatric population.
- Identify immediate and long-term treatments and interventions for children presenting with pediatric AHT.
- Discuss resources for prevention of pediatric AHT.
- Summarize reporting requirements for suspected child abuse and neglect.

## INTRODUCTION

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Child abuse and neglect continue to pose serious threats to the health and well-being of children. In 2016, approximately 3.5 million children were the subjects of reports of child abuse and neglect across the country, with an estimated 676,000 children determined to be victims of abuse and/or neglect. Children in their first year of life had the highest rate of victimization at 24.8 per 1,000 children of the same age in the national population (USDHHS, 2018).

Pediatric abusive head trauma (AHT) is one of the most serious types of child abuse. AHT is a well-recognized constellation of brain injuries caused by the directed application of force to an

infant or young child, resulting in physical injury to the head and/or its contents. No single injury is diagnostic of AHT. Instead, a diagnosis of AHT is made by a multidisciplinary team based on multiple findings, including evidence of intracranial and spinal involvement, retinal hemorrhages, and rib and other fractures inconsistent with the reported mechanism of injury (Choudhary et al., 2018; AAP, 2015).

AHT is the leading cause of physical abuse–related death in children and the leading cause of death from injury in infants. The fatality rate is significant for AHT and has been estimated to exceed 20%, with significant disability for nearly two thirds of the survivors. Deaths due to abusive head trauma peak at 1 to 2 months of age, most likely due to higher physiologic vulnerability (CDC, 2018a & b).

For children in the first year of life, the majority of serious head injuries result from abuse, and this peak incidence and rapid decrease with age are thought to be related to episodes of prolonged, inconsolable, and unpredictable crying that are developmentally normal for infants (Parks et al., 2012). Thus, it is important to aim prevention strategies toward supporting parents and caregivers in dealing with crying.

Although there has been tremendous focus on AHT, many challenges remain both in gaining accurate statistics and in overcoming misconceptions related to AHT that may defer caregivers from seeking medical services for infants and children. The good news is that much more is now known about recognizing and preventing AHT. Likewise, with support services and appropriate supervision, the majority of potentially abusive and neglectful parents can learn to safely care for their children.

## TERMINOLOGY

### **Pediatric Abusive Head Trauma (PAHT or AHT)**

An injury to the skull or intracranial contents of an infant or young child (<5 years of age) due to inflicted blunt impact and/or violent shaking. The Centers for Disease Control and Prevention and the American Academy of Pediatrics (2015) recommend use of the term *abusive head trauma* for injuries from these conditions, including shaking, blunt impact, suffocation, strangulation, and others. (In the past, other terms have also been used, including those listed below.)

### **Shaken Baby Syndrome (SBS)**

One form of abusive head trauma with a characteristic pattern of injuries that may include retinal hemorrhages, certain fractures (in particular, ribs and the ends of long bones), and recognizable patterns of brain injury, often including thin subdural hemorrhages and sometimes diffuse axonal injury.

### **Pediatric Acquired/Traumatic Brain Injury (PA/TBI)**

Includes traumatic causes such as those sustained as a result of motor vehicle accidents, sports-related injuries, blast injuries from war, assaults/child abuse, gunshot wounds, and falls.



**Triad of SBS**

This term refers to a supposedly diagnostic “triad” of encephalopathy (hypoxic-ischemic injury) with subdural hematoma and retinal hemorrhage. In fact, the diagnosis of pediatric AHT can only be made following “detailed medical examinations and testing and is not made automatically on the basis of the presence of these three findings, nor can it be excluded if one or more of these elements is missing” (AAP, 2015). (See also below under “Mechanism of Injury.”)

Other less common terminology includes:

- Nonaccidental head injury (NAHI)
- Shaken impact syndrome (SIS)
- Whiplash shaken infant syndrome
- Inflicted neurotrauma
- Inflicted traumatic brain injury (iTBI)
- Nonaccidental head trauma (NAHT)

**“ABUSIVE HEAD TRAUMA” OR “SHAKEN BABY SYNDROME”?**

The American Academy of Pediatrics recommends the term *abusive head trauma* rather than a term that implies a single injury mechanism (such as *shaken baby syndrome*) in their diagnosis and medical communications. AAP (2015) also reinforces the fact that shaking is an important contributor to abusive head injuries and that shaken baby syndrome is a subset of AHT. However, there is continued support for using the term *shaken baby syndrome* for parental education and community preventative efforts to caution against the detrimental effects of infant shaking (Howes & Mellar, 2017).

## RISK FACTORS FOR PAHT

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**Risk Due to Infant Anatomy/Physiology**

The combination of a disproportionately larger head, soft and rapidly growing brain, thin skull wall, and lack of mobility and control of the head and neck makes infants extremely vulnerable to injury from shaking actions.

Because the brain grows rapidly during infancy, infants have proportionally larger heads than adults in relation to their body size. (The relation between head and body size continuously declines with increasing age.) Therefore, the head is relatively heavy compared to the rest of the body, which results in different dynamics of head acceleration due to the external forces, making the infant head more vulnerable to trauma (Araki et al., 2017).



Additionally, the infant's brain has higher water content and less myelination than an adult brain, is more gelatinous, and is easily compressed and distorted within the skull during a shaking episode. The infant's blood vessels around the brain are more susceptible to shearing, and tearing can lead to brain hemorrhages. Because of their minimally developed anatomy, infants are also at increased risk for death and permanent disability.

Gilles (2018) further identified these factors that place infants at higher risk for shear strains with significant angular acceleration:

- Larger head-to-body ratio
- Less-developed neck and shoulder girdle musculature
- More easily disrupted respiratory drive
- Decreased synaptic density
- Decreased ischemic and seizure thresholds to trauma
- Higher brain water content
- Incomplete myelination

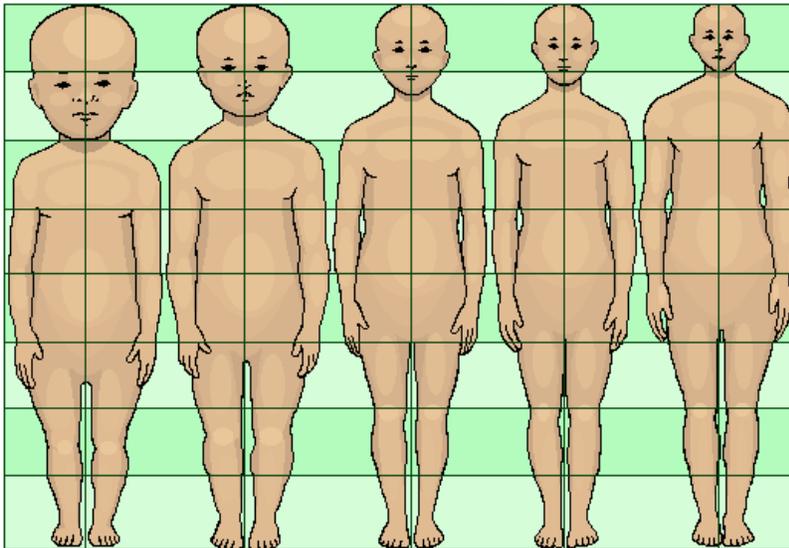


Diagram showing the proportionally larger head of an infant relative to an adult.  
(Source: Journal of Heredity, 1921.)

## Household Risk Factors and Perpetrator Characteristics

Understanding the AHT risks from various caregivers may help to inform current prevention strategies. A critical risk factor is the occurrence of shaking used either to attempt to calm infants and children or as a means of discipline. Less consistent risk factors include socioeconomic

status, societal and family stress, prematurity, multiple births, developmental delay, prior military service, and childhood history of abuse in the perpetrator (Joyce & Huecker, 2018).

There are few statistics looking specifically at risk as it relates to perpetrators of pediatric AHT. Among the limited studies, perpetrators of pediatric AHT have been found most likely to be related males, followed by boyfriends or stepfathers, mothers, temporary caregivers, and others (Barr, 2012). A retrospective review of AHT cases diagnosed at four children's hospitals found that the alleged perpetrators were 53% fathers, 8% mothers, and 39% nonparental perpetrators (parent partner, babysitter, other adult caregiver). However, among children  $\geq 1$  year, nonparental perpetrators were more likely to cause AHT compared to parents (77% vs. 23%) (Scribano et al., 2013).

A recent study showed that injuries that children suffer at the hands of their parent's male partner, babysitter, or daycare worker are likely to be more severe. Ahmed (2017) reported that "by far, parents were more likely to be perpetrators of the confirmed or suspected child abuse. However, children injured by a parent's partner—a group that was overwhelmingly male—were more likely to be more severely injured, to experience severe head injuries, and to require intubation compared with children who were abused by a parent."

Children who have younger or single parents or parents with a history of mental illness or substance abuse and children living with an unrelated adult in the home are also at increased risk (Pierce & Fingarson, 2012).

According to the CDC (2018c), factors that increase the caregiver's risk for child abuse in general include:

### **Individual Risk Factors**

- Parents' lack of understanding of children's needs, child development, and parenting skills
- Parental history of child abuse and/or neglect
- Substance abuse and/or mental health issues, including depression in the family
- Parental characteristics such as young age, low education, single parenthood, large number of dependent children, and low income
- Nonbiological, transient caregivers in the home (e.g., mother's male partner)
- Parental thoughts and emotions that tend to support or justify maltreatment behaviors

### **Family Risk Factors**

- Social isolation
- Family disorganization, dissolution, and violence, including intimate partner violence
- Parenting stress, poor parent-child relationships, and negative interactions



## Community Risk Factors

- Community violence
- Concentrated neighborhood disadvantage (e.g., high poverty, residential instability, high unemployment rates, and high density of alcohol outlets), and poor social connections

## Child Risk Factors

Children with special needs—including those born prematurely and/or having developmental delays and/or disabilities—are at higher risk for AHT. A lack of understanding of premature infant development may lead to additional frustration, stress, decreased tolerance, and resentment among caregivers. Since premature infants have a higher rate of disabilities than full-term infants, their risk is even greater.

Infants experiencing neonatal abstinence syndrome (NAS) (i.e., babies in withdrawal) are at particular risk for child abuse, including abusive head trauma, due to the irritability and excessive crying that result from withdrawal from substance addiction. This can last for weeks and months, making such babies difficult to care for (KY CHFS, 2018a).

Additionally, the CDC (2018c) reports that the following characteristics also increase an infant's risk for being shaken, particularly when combined with a parent or caregiver who is not prepared to cope with caring for a baby:

- A history of previous child abuse
- Infant prematurity or disability
- Being one of a multiple birth
- Being less than 6 months of age
- Being perceived as inconsolable and/or crying frequently

Barr (2014) reports that, although for nearly four decades pediatric AHT and infant crying were generally not studied together, the curve of incidence for AHT can be shown to be parallel to the curve of age-related crying in infants. This finding suggests a “tighter and more interwoven relationship” between the two.

### CASE

Jasper is 3-1/2 months old and was born prematurely at a gestational age of 34 weeks. He was admitted to the ED after his father called 911 because Jasper turned blue while being bottle-fed. Emergency personnel had started CPR because Jasper was not breathing and they were unable to get a pulse. Jasper had been seen by his primary care physician three times since his discharge from the neonatal intensive care unit and has been diagnosed with colic, feeding difficulties, and possible gastro-esophageal reflux.



Jasper was initially resuscitated in the ED, and once he was stable, an evaluation revealed multiple injuries consistent with pediatric AHT. Jasper was transferred to a regional pediatric intensive care unit and was removed from life support three days later because he had irreversible brain stem dysfunction.

Jasper's father later reported that Jasper's mother had just returned to work after six weeks of parental leave. He had agreed to look after the infant, but he lost his temper and shook Jasper because he kept on crying and refusing the bottle.

## ASSESSMENT AND DIAGNOSIS OF PEDIATRIC ABUSIVE HEAD TRAUMA

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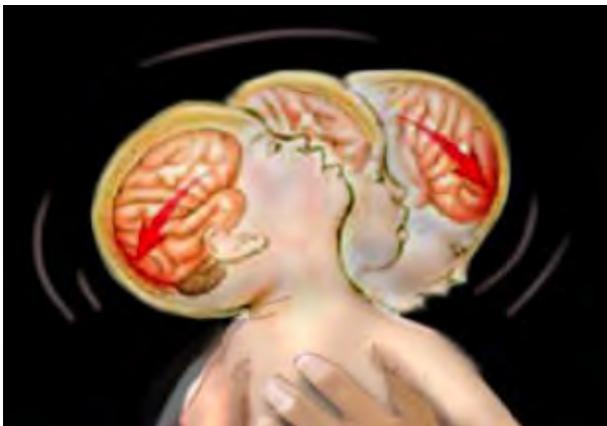
### Mechanism of Injury

Abusive head trauma encompasses many mechanisms of injury. Children who present with AHT may have been injured in a number of ways, including shaking, blunt impact, suffocation, strangulation, and others. It is important to remember that **no single injury is diagnostic of AHT** (Choudhary et al., 2018).

Each type of imposed stress produces a characteristic pattern of injury:

- Acceleration and deceleration through an arc (shaking) produce thin subdural hemorrhage and, commonly, retinal hemorrhages.
- Impact is associated with skull fractures, contra-coup bruising, and unilateral subdural hemorrhage.
- Strangulation causes hypoxia and hypoxic ischemic encephalopathy.

These stresses may occur separately or in any combination.



When a baby is shaken, the neck snaps back and forth and the brain rotates, causing shearing stresses on the vessels and membranes between the brain and skull. (Source: Radiologyassistant.nl.)



## Clinical Presentations

Healthcare professionals may first encounter young children with AHT in a range of clinical settings, including primary care, urgent care, and emergency departments. Since there are significant variations in the clinical presentation of children with AHT, it is important that professionals are trained to identify potentially life-threatening situations.

**Less severely injured** infants and young children may present with symptoms that are quite nonspecific and without a history of trauma provided by a caregiver. These symptoms may be transient and improve if the trauma is not repeated. They include irritability, vomiting, and apnea.

These and other symptoms of AHT are also seen in other minor medical conditions and can easily lead to a mistaken diagnosis of those conditions instead. Healthcare providers may have difficulty recognizing that such symptoms are the result of abuse, and the infant may return to an abusive environment (see also “Differential Diagnoses” below).

While there is an increased awareness now about PAHT and how it may present, it is still important to realize that AHT may present with more subtle signs and symptoms. Jenny and colleagues (1999) reported that 31% of infants who ultimately were found to have AHT had symptoms that in retrospect were “missed” upon initial presentation. These infants were often diagnosed with viral syndromes, colic, and gastro-esophageal reflux. The more clearly the symptoms were neurological in nature (seizures and alterations in consciousness), the more likely that cranial imaging would be requested and a diagnosis of intracranial bleed made.

**More seriously injured** children have symptoms that should lead to rapid diagnosis of intracranial trauma. The caregiver may report a dramatic change in level of consciousness, as in acute collapse, such as unconsciousness, apnea, or seizures. An episode of minor trauma may be given as an explanation for the injury. Examples include falls off beds, being dropped by caregivers, or other minor contact injuries to the head.

However, a history of trauma is rarely provided in the initial stages. An initial examination may not reveal any external injuries such as bruises, leading to concerns about medical rather than traumatic causes (Frasier, 2009). Likewise, perpetrators of abuse do not frequently admit to their actions; child victims are often preverbal and may be too severely injured or too frightened to disclose their abuse; and injuries can be nonspecific (Christian, 2015).

Besides the presentations described above, Hymel & Deye (2011) give examples of clinical presentations that should create a reasonable suspicion of AHT, including clinical presentations involving soft tissue trauma to the face, scalp, or ears (especially in a nonmobile infant); intraoral trauma or bleeding (e.g., torn frenum or gingival laceration); and/or skull fractures that are multiple, complex, or attributed to a short-distance fall (usually less than six feet).



## Presenting History

Any reported history or statements made by the caregiver regarding the injury should be documented accurately and completely. It is best to include the specific questions asked as well as the responses. Information should be gathered in a nonaccusatory but detailed manner.

There are two general portions of the presenting history that are important to document. The first is the history of the injury event and the second is how the child responded or behaved after the injury.

Questions asked when taking a presenting history should include:

- What happened?
- Who was there when it happened?
- Where did it happen?
- When did it happen?
- What happened afterwards?
- When was the child noticed to be ill or injured? How did the child respond? When did symptoms start? How did you respond?
- What made you bring your child to the doctor (or hospital)?
- When was the last time your child was totally normal or well?

## Medical, Developmental, and Social History

Information that may be useful in the medical assessment of suspected physical abuse include:

- Past medical history (trauma, hospitalizations, congenital conditions, chronic illnesses)
- Nutrition history
- Seizure history
- Medications and immunizations
- Family history (especially of bleeding, bone disorders, and metabolic or genetic disorders, which often appear as a history of early deaths)
- Pregnancy history (wanted/unwanted, planned/unplanned, prenatal care, postnatal complications, postpartum depression, delivery in nonhospital settings)
- Familial patterns of discipline
- Child temperament (easy to care for vs. fussy)



- History of past abuse to child, siblings, or parents, including history of Child Protective Services or police involvement
- Developmental history of child (language, gross motor, fine motor, psychosocial milestones)
- Substance abuse by any caregivers or people living in the home
- Social and financial stressors and resources (unemployment, divorce/separation, etc.)
- Violent interactions among other family members  
(Christian, 2015; Pierce & Fingarson, 2012; Jackson & Jackson, 2011)

The social history is a critical component of the evaluation. Asking parents about the household composition, other caregivers, siblings, substance abuse, mental illness, and social stressors can provide valuable information. It is preferable to interview caregivers separately; thorough and accurate documentation, including the use of quotes, is critical.

Explanations that are of concern for AHT include:

- Any infant or young child whose history is not plausible or consistent with the presenting signs and symptoms (i.e., explanation that is inconsistent with the pattern, age, or severity of the injury or injuries)
- History of behavior that is inconsistent with the child's physical and/or developmental capabilities
- Presence of a new adult partner in the home
- History of delay in seeking medical attention
- History or suspicion of previous abuse
- Absence of a primary caregiver at the onset of injury or illness
- Physical evidence of multiple injuries at varying stages of healing
- Unexplained changes in neurologic status, unexplained shock, and/or cardiovascular collapse  
(CDC, 2018c)

## Physical Assessment

There are various signs and symptoms of AHT that can be recognized in a physical assessment of the child. Depending on the severity of the clinical presentation, initial assessment is often focused on identifying and treating life-threatening issues. This initial assessment focuses on the airway, breathing, circulation, and neurologic status.

As noted above, the consequences of less severe cases may not be brought to the attention of healthcare professionals and may never be diagnosed. In the most severe cases, which usually



result in death or severe neurological consequences, the child usually becomes immediately unconscious and suffers rapidly escalating, life-threatening central nervous system dysfunction.

Common presenting **signs and symptoms of AHT** are:

- Lethargy/decreased muscle tone
- Extreme irritability
- Decreased appetite, poor feeding, or vomiting for no apparent reason
- Grab-type bruises on arms or chest (rare)
- No smiling or vocalization
- Poor sucking or swallowing
- Rigidity or posturing
- Difficulty breathing
- Seizures
- Head or forehead appears larger than usual (disproportional growth may be demonstrated on a growth chart if data are available) or soft-spot on head appears to be bulging
- Inability to lift head in an age-appropriate manner
- Inability of eyes to focus or track movement or unequal size of pupils (NCSBS, 2018)

Complete **physical exam** for any young child with suspected AHT includes:

- Inspection of all body parts, scalp, ears, and hair
- Inspection of the mouth (lip, tongue, buccal) to look for frenula tears or dental injuries
- Palpation of legs, arms, hands, feet, and ribs to feel for crepitus or deformities

**Nursing neurologic assessment** of the child with head trauma includes evaluation of:

- Eye opening
- Arousability level or irritability/consolability
- Symmetry of facial expressions
- Movement of upper and lower extremities
- Increased weakness or pitch in cry/vocalizations
- Fontanels



- Each pupil separately for size, shape, equality of reaction to light
- Ability to track objects
- Muscle tone for rigid extension or flexion of extremities, flaccidity, and/or unusual posturing

Several specific types of injuries are associated in some of the literature with AHT. These include the “triad” of retinal hemorrhage, subdural hematoma, and hypoxic-ischemic injury/encephalopathy. The presence of seizures and electrographic status epilepticus are also common in children with abusive head trauma (Hasbani et al., 2013). (See also “Mechanism of Injury” above.)

### **RETINAL HEMORRHAGE (RH)**

Retinal hemorrhage is bleeding in the back wall of the eye. Retinal hemorrhages are a common but not universal finding in AHT. Clinical and pathological studies have shown strong associations of severe RH and AHT, especially in infants. It is important to understand, however, that RHs can result from other causes, including medical disease (coagulopathy or leukemia) or accidental or birth trauma.

Retinal hemorrhages can vary in size, number, and location within the retina itself. An examination by using indirect ophthalmoscopy is required in the evaluation of AHT, preferably by an ophthalmologist with pediatric or retinal experience. Distinguishing the number, type, location, and pattern of RHs is important in evaluating a differential diagnosis (Christian, 2015; Christian & Levin 2018). Hemorrhages that extend to the ora serrata and involve multiple layers of the retina are strongly associated with AHT.

### **SUBDURAL HEMATOMA (SDH)**

Subdural hematoma is bleeding inside the skull but outside the brain. SDH is found in the majority of victims of pediatric AHT, and the majority of neurologically symptomatic SDHs identified in infants and toddlers are the result of child abuse. The extent, location, and size of SDHs are variable, and SDHs can result from accidental or abusive trauma or be secondary to disease. Although SDHs are not exclusive to abusive trauma, a number of studies have demonstrated a significant and strong association of SDH with abuse compared with accidental injury (AAP, 2015).

### **HYPOXIC-ISCHEMIC ENCEPHALOPATHY (HIE)**

Hypoxic ischemic encephalopathy (HIE) is caused by lack of oxygen and/or blood flow to the brain. HIE is a common feature of AHT and the biggest contributor to the poor developmental outcomes in survivors of AHT. The pathophysiology for HIE in victims of AHT is multifactorial and includes traumatic axonal injury to the brainstem and spinal cord, apnea (inadequate breathing) attributable to injury, seizures, alterations in blood flow to the brain after trauma, unmet metabolic demands of the injured brain, secondary cerebral edema (brain swelling), and others. Other potential causes of HIE in infants and children include birth asphyxia, accidental or



intentional trauma or suffocation, infection, metabolic disease, congenital anomalies, drowning, and choking (AAP, 2015).

## FRACTURES

The possibility of concurrent fractures is important to consider in children presenting with possible AHT. Fractures are the second most common injury in physical abuse and are detected in 30% to 55% of abused children (Baz & Wang, 2012). Studies have estimated that up to 1 in 5 children with abuse-related fractures are missed during the initial medical visit. As will be discussed below, understanding the unique physiology of children's skeletal injuries is crucial for correctly differentiating between injuries incurred from normal childhood trauma and those from abusive trauma.

Fractures in children due to inflicted injury can be divided into the following three categories based on the relative likelihood of accidental vs. abusive origin:

- **Highly specific** injuries include metaphyseal fractures (such as classic metaphyseal lesions [CMLs]), rib fractures, scapular fractures, spinous process fractures, and sternal fractures.
- **Moderate-specificity** fractures include multiple fractures (especially if bilateral), fractures of different ages, epiphyseal separations, vertebral body fractures, digital fractures, and complex skull fractures.
- **Common but low-specificity** fractures include clavicle fractures, long-bone shaft fractures, and linear skull fractures. Moderate- and low-specificity fractures become highly specific when a credible history of accidental trauma is absent, particularly in infants.

(Baz & Wang, 2012)

## ORAL INJURIES

The mouth should be fully examined and any missing or abnormal teeth recorded. It is also very important to be aware of normal dentition in a child and to be alert to subtle changes (e.g., the most common oral injuries described are bruising or lacerations to the lips). Other possible oral injuries include unexplained bruising to the cheeks, ears, neck, or trunk in association with a torn frenum. A torn frenum may occur with force-feeding an infant (Baz & Wang, 2012).

## ABDOMINAL INJURIES

Liver lacerations and other abdominal organ injuries are often seen in AHT cases but are commonly missed because the internal injuries are not visible to the naked eye. Blood tests (liver transaminase levels, pancreatic amylase and lipase) can immediately alert clinicians to the possibility of an occult abdominal injury (Lindberg et al., 2015; Kempe Center, 2015).



## Diagnostic Procedures

All infants and children with suspected AHT require cranial CT, MRI, or both.

### CT SCAN

A CT scan is usually the first modality of choice diagnostically in symptomatic children due to its availability, rapidity, and ability to look at brain parenchyma, vascular structures, bone, and scalp. The CT in AHT, usually performed without contrast media, may demonstrate intracranial bleeding, both parenchymal or extra-axial (between the brain and skull). A CT of the head will identify abnormalities that require immediate surgical intervention and is preferred over MRI for identifying acute hemorrhage and skull fractures and scalp swelling from blunt injury. 3D image reconstruction is better than plain films in identifying and delineating skull fracture.

Abdominal CT scan is the most sensitive imaging mode and is recommended when abdominal injury is suspected.

### MRI

MRI is the optimal modality for assessing intracranial injury, including cerebral hypoxia and ischemia, and is used for all children with abnormal CT scans, asymptomatic infants with noncranial abusive injuries, and for follow-up of identified trauma (Christian, 2015).

### SKELETAL SURVEY

Skeletal surveys are recommended as the “universal screening/examination” in suspected physical abuse and in serious head trauma in children younger than 2 years of age because they can help detect otherwise occult trauma to the bones. The diagnosis of abuse may be made or supported if unsuspected or occult traumatic injuries are found in other parts of the body. Such accompanying skeletal fractures are seen in roughly half of the cases of abusive head injury. Rib fractures may be the only abnormality in about 30% of the children. A repeat limited skeletal survey after two weeks can detect additional fractures and can provide fracture dating information (Christian, 2015; Wooten-Gorges et al., 2017).

While bony injuries are rarely life threatening, they can provide important evidence for the diagnosis of physical abuse. Skeletal surveys can help to identify characteristic injury patterns such as the classic metaphyseal lesion in long bones, sometimes referred to as “bucket-handle” and “corner” fractures according to their appearance, or posterior rib fractures, both of which are rarely accidental and thus strongly suggestive of abuse even when clinical information is lacking (Jain, 2015).

Per the American College of Radiology parameters, skeletal surveys in cases of known or suspected child abuse should include:

- Radiographs of the axial skeleton obtained in two projections, anteroposterior/frontal and lateral



- Right and left posterior oblique views of the entire rib cage
  - Additional views as needed to fully document suspected abnormalities, which may include:
    - Lateral views of the long bones
    - Towne view of the skull
    - Anteroposterior and lateral views of selected joints
    - Additional obliquities of the ribs or other areas of concern
- (ACR, 2016)

## LAB TESTING

Laboratory testing, including a CBC (complete blood count) and a coagulation panel, are also important in assessing AHT.

## NEUROLOGIC ASSESSMENT TOOLS

Pediatric neurologic assessment tools include a variety of scales healthcare professionals can use to assess and monitor level of consciousness in young children. The Glasgow Coma Scale continues to be one of the most widely used to evaluate injury severity of young children presenting with altered level of consciousness. Any combined score of less than 8 suggests severe brain injury and represents a significant risk of mortality (see table below).

PEDIATRIC GLASGOW COMA SCALE		
Behavior	Response	Score
<b>Eye opening</b>	Does not open eyes	1
	Opens eyes in response to painful stimuli	2
	Opens eyes in response to speech	3
	Opens eyes spontaneously	4
<b>Verbal response</b>	No verbal response	1
	Inconsolable, agitated	2
	Inconsistently inconsolable, moaning	3
	Cries but consolable, inappropriate interactions	4
	Smiles, orients to sounds, follow objects, interacts	5
<b>Motor response</b>	No motor response	1
	Extension to pain (decerebrate response)	2
	Abnormal flexion to pain for an infant (decorticate response)	3
	Infant withdraws from pain	4
	Infant withdraws from touch	5
	Infant moves spontaneously or purposefully	6



<b>Total score:</b>		_____
	Best response	15
	Comatose client	8 or less
	Totally unresponsive	3
Source: Brainline.org, n.d.		

## SCREENING TOOLS

There are few clinical decision rules in the child protection field, and the evidence is weak for the diagnostic value of screening tools based on physical examination of children without previous suspicion of child maltreatment (Cowley et al., 2015). However, some research tools have been developed that show high prediction for AHT. While none are aimed to diagnose AHT, they may prompt clinicians to seek further clinical, social, or forensic information (Pfeiffer et al., 2018). Three examples include:

### ***PediBIRN***

Hymel and colleagues (2014) derived the PediBIRN four-variable clinical rule for predicting AHT. The objective of this tool is to detect AHT among acutely head-injured children admitted to the pediatric intensive care unit. The four variables include:

- Any clinically significant respiratory compromise before admission
- Bruising of the torso, ears, or neck
- Bilateral or interhemispheric subdural hemorrhages or collections
- Any skull fractures other than an isolated, unilateral, nondiastatic, linear, or parietal fracture

### ***PIBIS***

The PIBIS (Pittsburg Infant Brain Injury Score) assists in determining which high-risk infants in the emergency department should undergo CT to rule out abnormalities including AHT. This tool has the objective of detection of abnormal neuroimaging in well-appearing children with nonspecific symptoms. The scoring includes four criteria, and a child with a score of 2 or more points should undergo neuroimaging to check for abnormal findings. Criteria include:

- Abnormality on dermatological examination (2 points)
- Age at or above 3.0 months (1 point)
- Head circumference over 85th percentile (1 point)
- Hemoglobin below 11.2 g/dl (1 point)  
(Berger et al., 2016)



### ***PredAHT***

Predicting Abusive Head Trauma (PredAHT) was developed to help healthcare providers differentiate accidental head trauma from AHT. This tool estimates the probability of AHT in young children presenting with intracranial injuries and specific combinations of six features:

- Head or neck bruising
- Seizures
- Apnea
- Rib fracture
- Long-bone fracture
- Retinal hemorrhage

The estimated probability of AHT varies from 4% when none of the features are present, to >81.5% when three or more of these six features are present, to nearly 100% when all six features are present (Pfeiffer et al., 2018; Cowley et al., 2015).

### **Distinguishing between Accidental and Abusive Head Trauma**

There are several challenges to differentiating between accidental (nonabusive/noninflicted) trauma or age-appropriate injuries and child abuse in infants and young children. This is especially true in children who are not yet verbal enough to explain what happened to them (i.e., infants, toddlers, and children with developmental delay and/or altered levels of consciousness).

Because of this, knowledge of typical developmental patterns of injury is helpful. That is, how does the presenting pattern(s) of injury and the child's age and developmental level match up with the reported mechanism of injury?

#### **DEVELOPMENTAL PATTERNS OF INJURY**

Developmental patterns of injury seen in the 0- to 3-year-old range (the age range most frequently seen with AHT) include:

- Trauma from falls from furniture, down stairs, or being dropped by another person
- Traumatic delivery (e.g., forceps, vacuum extraction, and/or breech)
- Motor vehicle accidents

Head injury is frequently involved with these traumas because of several factors, including the larger head-to-body ratio and the inability to shield oneself during a fall.



Developmentally, this age range is at risk for accidental injury because the child's developmental milestones include increasing motor skills and curiosity, allowing them a greater range and access to potential hazards. The advancing physical abilities of young children often precede their ability to understand the consequences of their actions. Thus, parent/caregiver knowledge of growth and developmental milestones may reduce the likelihood that they will misjudge the ability of the child and utilize an inappropriate supervision strategy. The mechanisms seen in accidental (noninflicted) injuries are generally different in these types of injuries as compared to AHT, as discussed below.

### RED FLAGS FOR INFLICTED INJURY IN A CHILD WITH BRUISING

Healthcare providers can differentiate between accidental trauma and inflicted injury by watching for these “red flags” in children with bruising.

- Any bruises in babies who are not yet cruising
- Bruises on the ears, neck, feet, buttocks, or torso (torso includes chest, back, abdomen, genitalia) in toddlers
- Bruises not on the front of the body and/or that overlie bone
- Bruises that are unusually large or numerous
- Bruises that are clustered or patterned (patterns may include handprints, loop or belt marks, bite marks)
- Bruises that do not fit with the causal mechanism described  
(Ward et al., 2013)

### ASSESSMENT QUESTIONS

Because this situation is highly charged for both the family and all the healthcare providers involved, it is a good idea to have a mental checklist in place to both pose questions and evaluate responses in relation to the specific patient in question. Providers should further objectively and clearly document the history as described by the parents and/or caregivers present.

The following are questions a clinician can ask oneself to help separate the unintentional from the inflicted injury:

- What is the **age of the child**?
  - What are the normal behaviors of a child at that age? Developmental stages of childhood determine what kinds of injuries are likely to be seen. The motor skills of the child determine what the child could have done to incur injury.
  - Based on the child's age, is the presenting injury plausible?



- Is the **history plausible**? Could this injury have been sustained in the manner described? Does the history change with changing information supplied to the caretaker? Adjustments in the account of the injury may be made by caretakers to fit the evolving information, indicating the tailoring of the history to fit new information. Does the history change when related in subsequent accounts by other family members?
- Was the injury **witnessed**? The lack of information as to how a serious injury has occurred should raise the index of suspicion for an abusive origin.
- Is the **social situation** in which the injury occurred a high-risk environment? The presence of community or intrafamilial violence, substance abuse, chaotic living arrangements, poverty, social isolation, transient lifestyles, mental health issues, or conflict among family members are red flags.
- Can the **described mechanism of injury** account for the observed injury? What else could produce the clinical picture?

Explanations that are concerning for intentional trauma include:

- No explanation or vague explanation for a significant injury
  - An important detail of the explanation that changes dramatically
  - An explanation that is inconsistent with the pattern, age, or severity of the injury or injuries
  - An explanation that is inconsistent with the child's physical and/or developmental capabilities
  - Different witnesses who provide markedly different explanations for the injury or injuries
- (Christian, 2015)

#### WHAT TO DO WHEN CONSIDERING A DIAGNOSIS OF AHT

- **Call social services.** They can assist with interview of family and discussion with CPS.
- **Call Child Protective Services.** They will take a report and decide whether to pursue an investigation. Often, CPS is involved in assisting with the disposition of the child if not admitted (they will make a safety plan) or when child goes home from the hospital. CPS may also contact law enforcement.
- **Call a child abuse consultant.** These professionals are key in suggesting studies for workup as well as discussing appropriate disposition. Regional child abuse centers often have a consultant on call if there is not one available in one's own system.



- **General rule for disposition.** If there is any question of the child’s safety at home (e.g., unexplained injury, uncertain perpetrator) and/or further workup is required (e.g., skeletal survey), the child should be admitted to the hospital for observation and protection until the workup can be completed and safe disposition decided between admitting provider, child abuse consultant, social services, and CPS.  
(Baz & Wang, 2012)

(See also “Reporting Child Abuse and Neglect” below for information on when a healthcare provider may be mandated to report suspected AHT.)

## CASE

Anthony is an 11-month-old admitted to the ED with a history of altered level of consciousness and multiple facial, skull, and body soft tissue injuries after a reported “fall down the stairs while in a baby walker.” This occurred while he was at a family childcare home. He regained consciousness but was very irritable.

On arrival to the ED, the triage nurse assessed his airway, breathing, circulation, and level of consciousness. He received a prompt evaluation by the ED physician for head trauma because of the history. In this case, the details of the event and injury patterns seemed to match up. Anthony had a CT of the head and ophthalmologic evaluation, and both were found to be negative.

Anthony was discharged home from the ED after observation. The family childcare home was cited for a health and safety violation.

## Differential Diagnoses

It is also important to rule out underlying conditions that may cause some of the same signs or symptoms associated with AHT or other abuse. Where indicated, medical professionals should inquire about the presence of any of the following conditions or practices:

- Congenital, metabolic, or neoplastic conditions (e.g., aneurysm, arteriovenous malformation, brain tumor, leukemia)
- Connective tissue disease or osteogenesis imperfecta, which may lead to fragile bones that fracture with less force than would be expected
- Acquired causes (e.g., meningitis, obstructive hydrocephalus)
- Undetected bleeding disorders that can lead to abnormal bleeding patterns (e.g., hemophilia, Von Willebrand’s disease, liver disease)
- Traditional or alternative healing practices, which may lead to unusual bruising and scarring patterns (e.g., coin rubbing, cupping, or burning herbs on the skin over acupuncture points)  
(Hymel & Deye, 2011)



## INTERVENTION FOR PEDIATRIC AHT PATIENTS

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Resuscitation (attention to airway, breathing, and circulation) and stabilization efforts for patients with traumatic brain injury take priority because of the often life-threatening presentation of the child with AHT. Intervention then focuses on detection of primary injury (as discussed above), treatment of that injury, and prevention or treatment of secondary brain injury.

### **Acute Management of Traumatic Brain Injury**

In 2012, the “Guidelines for the Acute Medical Management of Severe Traumatic Brain Injury in Infants, Children, and Adolescents” were updated to focus on therapies for improvements in outcomes. Management of traumatic brain injury is divided into first-, second-, and third-tier therapy. As described by Geyer and colleagues (2013), the goal of all therapies is to maintain a low and stable intracranial pressure and adequate blood pressure (Kochanek et al., 2012).

#### **FIRST-TIER THERAPY**

The initial management (first-tier therapy) of a child with a traumatic brain injury begins with strict attention to the maintenance of the patient’s airway, breathing, and circulation (blood pressure).

Children with normal blood pressure and no alterations of consciousness may be managed with supportive care. Hypotension should be treated with fluid boluses.

Those with decreased consciousness (GCS <9), marked respiratory distress, or hemodynamic instability require advanced airway management to enhance oxygenation and ventilation and prevent aspiration of gastric contents. Cervical spine immobilization, when needed, must be maintained during advanced airway procedures.

As discussed about concepts in the treatment of traumatic brain injuries, consider both the immediate or primary brain injury results from the initial forces generated following trauma and also equally important the two forms of secondary brain injury that can occur. The first form of secondary brain injury includes hypoxemia, hypotension, intracranial hypertension, hypercarbia, hyper- or hypoglycemia, electrolyte abnormalities, enlarging hematomas, coagulopathy, seizures, and hyperthermia.

The primary goal in the acute management of the severely head-injured pediatric patient is to prevent or ameliorate the factors that promote secondary brain injury. Secondary brain injury involves an endogenous cascade of cellular and biochemical events in the brain that occurs within minutes and continues for months after the primary brain injury and that leads to ongoing or “secondary” traumatic axonal injury (TAI) and neuronal cell damage (delayed brain injury) and, ultimately, neuronal cell death.



The following treatable conditions can exacerbate secondary brain injury:

- Hypoxemia
  - Hypotension
  - Elevated intracranial pressure leading to intracranial hypertension
  - Hypercarbia or hypocarbia
  - Hyperglycemia or hypoglycemia
  - Electrolyte abnormalities
  - Enlarging hematomas
  - Coagulopathy
  - Seizures
  - Hyperthermia
- (Su, 2015)

Oxygenation is best monitored using pulse oximetry, with supplemental oxygen administered when necessary to ensure adequate oxygenation. For initial monitoring of ventilation of children with traumatic brain injury, capnography is recommended to monitor end-tidal CO<sub>2</sub> in order to avoid excessive hyperventilation and resultant hypocapnia, thereby leading to vasoconstriction and decreased cerebral perfusion. In order to prevent secondary brain injury, intracranial pressure management is crucial. Raising the head of patients to 30° optimizes cerebral perfusion pressure and leads to a decrease of intracranial pressure by improving venous drainage without affecting cerebral blood flow.

## **SECOND-TIER THERAPY**

Some children with severe traumatic brain injury may develop intracranial hypertension that is resistant to first-tier medical management. These patients may require second-tier treatments, including increased levels of sedation, possibly with barbiturates. High-dose barbiturate therapy lowers intracranial pressure by decreasing cerebral metabolism, thus decreasing cerebral blood flow (Kochanek et al., 2012).

Another second-tier treatment is moderate hypothermia. Therapeutic hypothermia may reduce cerebral metabolic demands, inflammation, lipid peroxidation, excitotoxicity, cell death, and acute seizures. Hypothermia is defined as temperatures <35 °C. If hypothermia is used, it may be necessary to use a neuromuscular blockade to prevent shivering (Kochanek et al., 2012).

## **THIRD-TIER THERAPY**

Third-tier therapy includes decompressive craniectomy for patients showing early signs of neurologic deterioration or herniation or for those not responding to first- or second-tier therapy. This surgical treatment involves removing part of the skull, which allows for swelling to occur more freely while limiting secondary injury (Kochanek et al., 2012).



## Nursing Care Planning

Nursing care planning for children with AHT and their families may be very complex and includes addressing the following diagnoses and issues:

- Risk for altered parenting (defined as inability of the primary caregiver to create, maintain, or regain an environment that promotes the optimum growth and development of the child)
- Risk for violence related to history of family violence
- Risk for injury related to physical or psychological conditions in the environment
- Hopelessness related to long-term family stress
- Post-trauma response related to physical or psychosocial abuse

Nursing care will generally involve significant discharge planning and referral to appropriate healthcare and social services. The treatment of child abuse is complex and often involves long-term psychotherapy for the parents or other perpetrators as well as the child. Most states require some kind of counseling for the parents (see also below under “Prevention Strategies”).

## Rehabilitation and Recovery

Because the brains of infants and young children are still developing, AHT can result in widespread impairment and dysfunction. AHT can impact the trajectory in all developmental domains. The long-term outcomes of AHT often include impairments in a child’s sensory-motor, cognitive, behavioral, and emotional functioning. Together, these problems can cause long-term consequences in everyday functioning, social and academic areas, and participation in society and community integration (Lind et al., 2016). The recovery process is influenced by the child’s pre-injury status, the acute care, and the responses of the patient’s family, school, and community.

### HEALTH AND DEVELOPMENT CONDITIONS RELATED TO AHT

- Learning disabilities
- Physical disabilities
- Visual disabilities or blindness
- Hearing impairment
- Speech disabilities
- Cerebral palsy
- Seizures
- Behavior disorders



- Cognitive impairment
  - Death
- (NCSBS, 2018)

Rehabilitation includes teaching strategies and providing supports to both the child and family to compensate for impaired or lost functions and to optimize abilities. Partnering with a child's school is vital to making sure the child receives the services needed to achieve academically in a safe and appropriate manner.

A multidisciplinary approach to both the inpatient and outpatient phases of rehabilitation care is essential. Interventions might include, but are not limited to: pharmacologic, physical, occupational, vision, hearing, speech-language, psychological, behavioral, and/or educational therapies. Rehabilitation continues as long as it results in improvements in function.

When interventions no longer yield improvements in function, the child transitions into a period of "habilitation." Professionals must now understand that recovery may be a lifelong process for the child's entire circle of family, friends, and healthcare providers.

Researchers have found that higher-quality early and later home environments and family functioning predict better outcomes for children with traumatic brain injury, including AHT. The overall quality of the home environment was measured according to eight different factors:

- Learning materials, provision of appropriate play materials
  - Language stimulation
  - Physical environment, including regularity and predictability of the environment
  - Parental responsiveness
  - Learning stimulation
  - Modeling of social maturity
  - Variety in experience
  - Acceptance of child (i.e., parental acceptance of suboptimal behavior and avoidance of restriction and punishment)
- (Durber et al., 2017)

#### CASE

Nina is now a 6-year-old female who suffered a traumatic brain injury due to AHT as an infant. Per court records, her mother came home from her second day back at work and found Nina, then a 3-month-old, with her arms twitching. Nina was being cared for by her father, the mother's boyfriend. Her mother took Nina to the emergency department of the local hospital, however by the time they arrived, the twitching had stopped. After several hours of observation, they were sent home.



That evening Nina ate poorly and vomited. The next morning Nina's mom found her unresponsive, with abnormal posturing. Her mother called 911. Nina was stabilized in the ED and transferred to a tertiary care pediatric medical center. She was in the intensive care unit for two weeks and the pediatric rehabilitative unit for three weeks. Nina was discharged to a foster home.

The father reported that he had accidentally dropped Nina the day before, but the history and clinical presentation did not match up, and the father was arrested for child abuse. He was later convicted for child abuse because of the physical findings associated with Nina's case.

Nina's mother was able to regain custody of her after three months and a lengthy police and child welfare investigation. To regain custody of Nina, her mother was required to take parenting classes and was referred to Public Health Nursing, Early Head Start, and early intervention services. The Maternal-Child Health, Public Health Nurse and Early Intervention Service Coordinator helped Nina's mother learn ways to organize Nina's daily medical care and walked her through how to access and advocate for the variety of services and supports that the family was going to need to support Nina's special needs.

Nina was diagnosed with cerebral palsy, neurologic (cortical) vision impairment, seizure disorder, and global developmental delay. She is technologically dependent on a gastrostomy tube for her nutrition needs. Nina continues to have severe developmental disabilities and delays (she is both nonambulatory and nonverbal) and receives special education and physical, occupational, and speech therapy services. The school nurse, county health department Public Health Nurse, IFSP (Individualized Family Service Plan), and IEP (Individualized Education Plan) team members work regularly with Nina's family to ensure that her educational, therapeutic, and medical needs are met. Nina also has a home care nurse who provides respite care. Nina will need care for all of her activities of daily living for the rest of her life.

## PREVENTION STRATEGIES

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Research has shown that certain protective factors are linked to a lower incidence of child abuse and neglect in general. They are attributes that serve as buffers, helping parents who might otherwise be at risk of abusing their children to find resources, supports, or coping strategies that allow them to parent effectively, even under stress. These protective factors include:

- Nurturing and attachment
- Knowledge of parenting and child development
- Parental resilience
- Social connections
- Concrete supports for parents
- Social and emotional competence of children  
(Child Trends, 2018)



Many states have enacted programs aimed at preventing child abuse, including pediatric abusive head trauma in particular, through a public health primary universal prevention strategy aimed at changing knowledge and behaviors of caregivers and society in general concerning normal development of infants and the significance of early increased infant crying (Barr, 2012). By increasing parental understanding of infant development, with a focus on infant crying and coping strategies to address it, such programs are thought to offer a “window of opportunity” for the prevention of AHT and, potentially, other forms of infant abuse.

Nevertheless, in one comparative study of a statewide abusive head trauma intervention, researchers found no associated significant reduction in the overall hospitalization rates for abusive head trauma among infants, although parents did report significant knowledge gains from the intervention (Dias et al., 2017).

There are several types of prevention education programs and supports currently being utilized and evaluated. These include:

- Hospital-based (inpatient parent training) education programs
- Home visiting programs
- General parenting education classes
- Parent support groups
- Family resource centers
- Crisis intervention services such as hotlines and crisis nurseries

Primary prevention efforts address a broad segment of the population, such as all new parents. Secondary prevention efforts target a specific subset of the population considered to be at higher risk for child maltreatment. Tertiary prevention efforts target perpetrators of child maltreatment and seek primarily to prevent recidivism.

### **Primary Efforts: General Public and Parent Education**

Primary prevention activities are directed at the general population and attempt to stop maltreatment before it occurs. All members of the community have access to and may benefit from these services. Primary prevention activities with a universal focus seek to raise the awareness of the general public, service providers, and decision makers about the scope and problems associated with child maltreatment. Universal approaches to primary prevention might include:

- Public service announcements that encourage positive parenting
- Parent education programs and support groups that focus on child development, age-appropriate expectations, and the roles and responsibilities of parenting



- Family support and family strengthening programs that enhance the ability of families to access existing services and resources to support positive interactions among family members
- Public awareness campaigns that provide information on how and where to report suspected child abuse and neglect

Parent education and support programs typically focus on educating parents on child development and parenting strategies and also have the goal of decreasing parenting practices and behaviors associated with child abuse and neglect. Although parent education programs may serve the general community, many are also directed at populations determined to be at risk for child maltreatment. Parent education about infant crying and the risks of shaking a baby continues to stand out for its empirical evidence (Lopes & Williams, 2016).

Parent education and support programs can address:

- Developing and practicing positive discipline techniques
- Learning age-appropriate child development skills and milestones
- Promoting positive play and interaction between parents and children
- Locating and accessing community services and supports

Healthcare professionals can provide the following messages to parents and caregivers during their everyday encounters:

- Remind parents and caregivers that crying is normal for babies.
- Explain to parents that excessive crying is a normal phase of infant development.
- Ask parents how they are coping with parenthood and their feelings of stress.
- Assure parents that it is normal to feel frustrated at long bouts of crying and a sudden decrease in sleep, but that things will get better.
- Give parents the number to a local helpline or other resource for help.
- Talk with parents about the steps they can take when feeling frustrated with a crying baby, such as putting the baby safely in a crib on his or her back, checking on the baby's safety every 5 to 10 minutes, and calling for help or a friend.
- Let parents know what to check for when their baby is crying: signs of illness, fever, or other behavior that is unusual; discomfort like a dirty diaper, diaper rash, teething, or tight clothing; or whether the baby is hungry or needs to be burped. (CDC, 2018b)



The **Period of PURPLE Crying** is an example of a primary-level program specifically geared to the prevention of AHT. The **target population** is all parents of new infants and society in general, with the goal of increasing their understanding of early infant crying and shaken baby syndrome. Barr and colleagues (2009) demonstrated that the use of the PURPLE education materials seems to lead to higher scores in knowledge about early infant crying and the dangers of shaking, and in sharing of information on behaviors considered to be important for the prevention of shaking.

PERIOD OF PURPLE CRYING PROGRAM		
<b>P</b>	Peak of crying	Your baby may cry more each week, peaking at 2 months, then less at 3 to 5 months.
<b>U</b>	Unexpected	Crying can come and go and you do not know why.
<b>R</b>	Resists soothing	Your baby may not stop crying no matter what you try.
<b>P</b>	Pain-like face	Your crying baby may look to be in pain even when he or she is not.
<b>L</b>	Long lasting	Crying can last as much as 5 hours a day or more.
<b>E</b>	Evening	Your baby may cry more in the late afternoon or evening.
Source: NCSBS, 2018.		

The PURPLE program also contains a public media component aimed at changing cultural attitudes about crying, especially inconsolable crying. The approach includes educating parents and the community about normal infant development, specifically crying in normal infants, rather than being limited to warnings of the negative consequences of shaking.

The PURPLE program uses a DVD and booklet (translated into nine languages) to take home to review and share with others. It includes three 5- to 10-minute “doses”:

- In the maternity ward, given separately from other materials
- Either pre- or post-birth as a second “dose” (e.g., in prenatal classes and in the first pediatric office visit)
- Via media campaign

Through the three contacts, the duration of the program is at least a week and can last much longer since a key element of the program is that each parent receives a copy of the DVD and booklet to take home with them. This way they can refer to the DVD again when the infant is crying and show it to other temporary caregivers.

*(See also “Resources” at the end of this course for links to other prevention efforts.)*

## Secondary Efforts: Home Visitation Programs

Secondary prevention efforts, such as home visitation programs, target a specific subset of the population considered to be at higher risk for child maltreatment. Researchers have identified five common co-occurring parental risk factors—substance abuse, mental illness, domestic



violence, child conduct problems, and poverty—that lead to child maltreatment (Barth, 2009). Secondary prevention programs have had the greatest demonstrated success in reducing child maltreatment but often require considerable resources and funding.

Approaches to prevention programs that focus on high-risk populations might include:

- Parent education programs located in high schools and focusing on teen parents or located within substance abuse treatment programs for mothers and families with young children
- Parent support groups that help parents deal with their everyday stresses and meet the challenges and responsibilities of parenting
- Respite care for families who have children with special needs
- Family resource centers that offer information and referral services to families living in low-income neighborhoods
- Home visiting programs that provide support and assistance to expecting and new mothers in their homes

Home visiting is a mechanism to provide direct support and coordination of services for families, beginning prenatally or at birth. Visits are conducted by a nurse, social worker, or trained paraprofessional. Programs vary, but components may include:

- Education in effective parenting and childcare techniques
- Education on child development, health, safety, and nutrition
- Assistance in gaining access to social support networks
- Assistance in obtaining education, employment, and access to community services

Two examples of such programs are listed below:

Kentucky has a home-visiting program targeted to first-time parents called **Health Access Nurturing Development Services (HANDS)**. HANDS is designed to assist overburdened first-time parents at critical development points. Frequent pre- and post-natal home visits by trained professionals are provided to first-time parents. These appointments assist new parents by sharing important information, problem solving, and helping them to meet basic needs such as housing, food, healthcare, and other required services. All of Kentucky's 120 counties offer the HANDS program. Enrollment must be during pregnancy or when the infant is less than 3 months old, and referral to HANDS is made through the County Health Department.

Although there is currently no data to support the HANDS program's effectiveness as it relates to AHT prevention, there is supporting data that demonstrates this program has resulted in less preterm births, fewer children with developmental delay, fewer emergency department visits, increased family self-sufficiency, and lower infant mortality rates (PEW, 2012).



The **Nurse-Family Partnership (NFP)** program provides home visits by registered nurses to first-time, low-income mothers, beginning during pregnancy and continuing through the child's second birthday. It operates nationwide. The program has three primary goals: 1) to improve pregnancy outcomes by promoting health-related behaviors; 2) to improve child health, development, and safety by promoting competent caregiving; and 3) to enhance parent life-course development by promoting pregnancy planning, educational achievement, and employment. The program also has two secondary goals: to enhance families' material support by providing links with needed health and social services and to promote supportive relationships among family and friends.

### CASE

Martha is a 19-year-old who is currently 6 months pregnant and who wants to keep her new baby. Her history is significant in that she was removed from her biological mother at 12 years of age because her mother was addicted to methamphetamine and Martha had been physically and sexually abused by her mother's boyfriend. Martha has lived with two foster families and dropped out of high school at age 16. The father of her unborn baby is not involved, and Martha is currently living with her new 26-year-old boyfriend, who has a history of substance abuse but is now "clean and sober."

Martha is receiving prenatal care at Planned Parenthood, is signed up for WIC (Women, Infants, and Children), and is getting ready to take her GED exam so she can work once the baby can be safely cared for. Because of her risk factors, the nurse at Planned Parenthood gave Martha written information and a DVD on the Period of PURPLE Crying program and a referral to the Nurse-Family Partnership program, where a public health nurse was assigned to her case.

### OTHER CHILD ABUSE PREVENTION PROGRAMS

The Child Welfare Information Gateway and the California Evidence-Based Clearinghouse for Child Welfare (CEBC) both provide databases on other evidence-based practices. Several child-abuse prevention and home-visiting programs have been reviewed and rated by the CEBC. To be rated in this area, a program must either have goals or objectives directly related to the prevention of child abuse and/or neglect or have published peer-reviewed research measuring outcomes directly related to the prevention of child abuse and/or neglect, such as data on reports of abuse or neglect behaviors through a standardized measure.

The following programs have been reviewed by the CEBC and received their top scientific rating of **1 (Well-Supported by Research)**:

- Nurse-Family Partnership
- SEEK (Safe Environment for Every Kid)
- Incredible Years



These programs have a rating of **2 (Supported by Research)**:

- SafeCare
- Triple P Positive Parenting

These programs have received a rating of **3 (Promising Research)**:

- ACT Raising Safe Kids
- Circle of Security Home Visiting
- Exchange Parent Aide
- Parents as Teachers
- Period of PURPLE Crying
- Upstate New York Shaken Baby Syndrome Education Program

These programs may serve as useful resources and models for healthcare professionals.

(CEBC, 2018a, 2018b, 2018c)

## **EFFICACY**

The efficacy of home visiting programs continues to be challenging to evaluate, especially as they relate to child abuse prevention. Multiple studies have concluded that the strategy, when well implemented, does produce significant and meaningful reduction in child-abuse risk and improves child and family functioning. Other studies are more limited in their conclusions (CWIG, 2015a).

While there is mixed evidence that home-visiting programs directly prevent child abuse and neglect, it has been found that home visits can impart positive benefits to families by way of influencing maternal parenting practices, the quality of the child's home environment, and children's development.

Some studies have linked parenting quality with child maltreatment, as improved parenting skills would likely be associated with improved child well-being and corresponding decreases in maltreatment, even if these effects remain difficult to document. According to the American Academy of Pediatrics, "Vigorous national outcome evaluations substantiate that home-visiting programs are effective in the promotion of healthy family relationships, improvement of overall child development, prevention of child maltreatment, advancement of school readiness, and improvement of maternal physical and mental health" (Duffee et al., 2017).



## Tertiary Efforts: Recidivism Prevention

Tertiary prevention activities focus on families where maltreatment has already occurred and seek to reduce the negative consequences of the maltreatment and to prevent its recurrence. These prevention programs may include services such as:

- Intensive family preservation services with trained mental health counselors that are available to families 24 hours per day for a short period of time (e.g., 6 to 8 weeks)
- Parent mentor programs with stable, nonabusive families acting as role models and providing support to families in crisis
- Parent support groups that help parents transform negative practices and beliefs into positive parenting behaviors and attitudes
- Mental health services for children and families affected by maltreatment to improve family communication and functioning  
(CWIG, 2018)

**SafeCare** is an evidence-based training curriculum for parents who are at-risk or have been reported for child maltreatment. Parents receive weekly home visits to improve skills in several areas, including home safety, healthcare, and parent-child interaction (CWIG, 2018).

### STATES' EFFORTS TO REDUCE AHT

Many states have enacted legislation intended to reduce the incidence of AHT. For instance, states may require that, prior to discharge, each woman who gives birth in a hospital or a free-standing birthing clinic receive information or watch a presentation describing the nature of, dangers of, and methods for the prevention of AHT. Several states require childcare personnel to be trained in recognizing and preventing AHT and understanding early childhood brain development. Several states have established a statewide shaken baby syndrome prevention program that involves a multiyear, collaborative approach.

## REPORTING CHILD ABUSE AND NEGLECT

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Pediatric abusive head trauma is a form of child abuse, and all fifty states have statutes that mandate reporting of suspected child abuse and neglect for certain professionals. Familiarity with state laws will ensure that providers 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 is provided by the Children's Bureau of the Administration for Children and Families, U.S. Department of Health and Human Services.

*(For state-by-state information on mandated reporting, see "Child Welfare Information Gateway" in the "Resources" section at the end of this course.)*



## Who Must Report Abuse?

Anyone may report suspected child abuse at any time and is encouraged to do so. Such reports are typically confidential and may be made anonymously by members of the public.

Nearly all states designate certain professions whose members are **mandated by law** to report child maltreatment. Typically, these individuals have frequent contact with children. Such persons may include:

- Social workers
- Teachers and other school personnel
- Physicians, nurses, and other healthcare workers
- Mental health professionals
- Child care providers
- Medical examiners or coroners
- Law enforcement officers

In more than one third of states, **any person** who suspects child abuse or neglect is required to report it.

It is important that all professionals be informed of the laws that pertain to the jurisdiction of their own practice (CWIG, 2015b).

## What Situations Require That a Report Be Made?

Although the circumstances under which a mandatory reporter must make a report vary from state to state, typically a report must be made when the reporter has reasonable cause to suspect that a child whom the reporter sees in his or her professional capacity is abused or maltreated. In some states, the mandatory reporter must report even if the information is third-hand or is not obtained in his or her professional capacity. If the professional has knowledge of or observes a child being subjected to conditions that would reasonably result in harm to the child, a report must also be made (CWIG, 2015b).

### REASONABLE CAUSE

There can be “reasonable cause” to suspect that a child is abused or maltreated if, considering the physical evidence observed or told about, and based on the reporter’s own training and experience, it is possible that the injury or condition was caused by neglect or by nonaccidental means.

**Certainty is not required.** The reporter need not be certain that the injury or condition was caused by neglect or by nonaccidental means. The reporter need only be able to entertain the possibility that it could have been neglect or nonaccidental in order to possess the necessary



“reasonable cause.” It is enough for the mandated reporter to distrust or doubt what is personally observed or told about the injury or condition.

In child abuse cases, many factors can and should be considered in the formation of that doubt or distrust. Physical and behavioral indicators may also help form a reasonable basis of suspicion. Although these indicators are not diagnostic criteria of child abuse, neglect, or maltreatment, they illustrate important patterns that may be recorded in the written report when relevant.

## How Is a Report Made?

In most jurisdictions, a telephone report should be made as soon as possible and then should be followed by a written report. States provide standardized forms for this purpose.

Most healthcare facilities also have policies and procedures in place regarding the reporting of suspected child abuse. Healthcare professionals must know what guidelines are in place at their place of employment as well as state mandates.

At the time of an oral telephone report, frequently to a state-subsidized 800 number, a CPS specialist will typically request the following information:

- The condition of the child
- Names and addresses of the child and parents or other person responsible for care
- Location of the child at the time of the report
- Child’s age, gender, and race
- Nature and extent of the child’s injuries, abuse, or maltreatment, including any evidence of prior injuries, abuse, or maltreatment to the child or its siblings
- Name of the person or persons suspected to be responsible for causing the injury, abuse, or maltreatment (“subject of the report”)
- Family composition
- Any special needs or medications
- Whether an interpreter is needed
- Source of the report
- Person making the report and where reachable
- Actions taken by the reporting source, including taking of photographs or X-rays, removal or keeping of the child, or notifying the medical examiner or coroner



- Any additional information that may be helpful

A reporter is not required to know all of the above information in making a report; therefore, lack of complete information does not prohibit a person from reporting. However, information necessary to locate a child is crucial.

## Consequences for Failing to Report

Nearly every state enacts penalties, in the form of a fine or imprisonment, for mandatory reporters who fail to report suspected child abuse or neglect. In addition, mandated reporters can be held liable by civil systems for intentionally failing to make a report of suspected abuse that was encountered while acting in their professional capacity (CWIG, 2015b).

Failure to report also leads to more serious consequences for the child and family. CPS cannot act until child abuse is identified and reported—that is, services cannot be offered to the family nor can the child be protected from further suffering.

## CONCLUSION

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Child abuse and neglect remains a serious problem across the country. Pediatric abusive head trauma is one of the most serious types of such abuse and the leading cause of death from injury in infants.

It is important for all healthcare professionals to be aware of the risk factors and signs and symptoms of AHT in the patients they care for, since a diagnosis depends on input from a multidisciplinary team. Any person suspecting this form of child abuse is required to report it immediately to the appropriate authorities.

Prevention education by healthcare professionals serves the important goal of reducing all child abuse and neglect, including abusive head trauma. Patients can be further directed to various resources to help prevent the behaviors that lead to AHT.



## RESOURCES

Brain injury in children (Brain Injury Association of America)  
<http://www.biausa.org/brain-injury-children.htm>

CEBC (California Evidence-Based Clearinghouse for Child Welfare)  
<http://www.cebc4cw.org>



Child abuse evaluation and treatment for medical providers  
<http://childabusemd.com>

Childhelp  
<https://www.childhelp.org>

Child Welfare Information Gateway  
<http://www.childwelfare.gov>

FRIENDS National Resource Center for Community-Based Child Abuse Prevention  
<http://www.friendsnrc.org>

Maternal, Infant, and Early Childhood Home Visiting Program  
<https://mchb.hrsa.gov/maternal-child-health-initiatives/home-visiting-overview>

National Center on Shaken Baby Syndrome  
<http://www.dontshake.org>

Prevent Child Abuse America  
<http://www.preventchildabuse.org>

Shaken Baby Alliance  
<http://www.shakenbaby.org>

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1. “Pediatric abusive head trauma” is defined by the Centers for Disease Control and Prevention as an injury to the:
  - a. Skull of an infant or young child (<3 years of age) due to neglect or violence, including gunshot wounds, stab wounds, or penetrating trauma.
  - b. Skull or intracranial contents of an infant or young child (<5 years of age) due to inflicted blunt impact and/or violent shaking.
  - c. Scalp of an infant or young child (<2 years of age) due to an open or closed head fracture.
  - d. White brain matter of an infant or young child (<4 years of age) due to causes of unknown etiology.
  
2. Infants are at greater risk than adults to head trauma because their:
  - a. Brains have a higher water content and less myelination and are easily compressed within the skull during a shaking episode.
  - b. Skulls are thick and rigid, with open fontanelles that swell and bleed with excessive shaking.
  - c. Heads are smaller in relation to their body size, and their blood vessels are stiff and dilate when shaking occurs.
  - d. Brains have less water content and contain more brain cells than an adult brain.
  
3. According to study findings, a clinician who assesses families for risk of pediatric abusive head trauma finds which situation to present the highest risk?
  - a. A mother states she is going back to work, leaving her 3-month-old infant with a neighbor who provides licensed in-home care for her own 6-month-old infant.
  - b. A single mother states that her live-in boyfriend, who is currently unemployed, will be caring for her 4-month-old infant while she attends a job-training program.
  - c. A new mother states that she is experiencing mild postpartum depression.
  - d. A husband brings his 1-month-old infant to the family’s doctor appointment, stating that his wife is being treated for postpartum anemia.
  
4. Which is the **most** accurate statement regarding clinical presentation and history in cases of possible pediatric abusive head trauma (PAHT)?
  - a. No one injury is diagnostic of PAHT.
  - b. The symptoms characteristic of PAHT are almost never missed upon initial presentation.
  - c. Where a child’s injury occurred is not an important element of the presenting history.
  - d. Asking about the parents’ employment and marital status is not appropriate.



- 5.** Which question is **not** part of a nursing neurological assessment of a child suspected of having an abusive head injury?
- Are facial movements symmetrical?
  - Is each pupil the same size, shape, and able to react to light equally?
  - Does the child appear well-nourished?
  - Does the child show unusual flaccidity or posturing?
- 6.** A 6-week-old infant is admitted to the emergency department with an altered level of consciousness secondary to “rolling off the bed.” Initial diagnostic studies for ruling out pediatric abusive head trauma will most likely include a head computed tomography scan (CT), a complete blood count, and:
- A lumbar puncture.
  - An electrolyte panel.
  - A skeletal survey.
  - A lipoprotein panel.
- 7.** Which injury describes normal developmental patterns of accidental injury in the 0- to 3-year-old age range?
- Fractured long bones and ribs
  - Trauma from falls down stairs or being dropped
  - Retinal hemorrhage and bilateral, hypoxic-ischemic brain injury
  - Bruises with patterns such as handprints, loop or belt marks, or bite marks
- 8.** Which is **not** an evidence-based question to ask oneself in order to distinguish between accidental and abusive injuries when assessing an injured child?
- What are normal behaviors of a child of the same age?
  - Is the caretaker’s story of how the injury happened plausible?
  - Do different witnesses provide the same description of what happened?
  - Have there been similar injury stories in the media recently?
- 9.** Which is a developmental consequence often seen in children with abusive head trauma?
- Obstructive sleep apnea
  - Childhood obesity
  - Hearing impairment
  - Blood disorders



- 10.** Which intervention by a healthcare professional is the best example of a **primary** child abuse prevention strategy?
- Offering a parenting course to teen mothers at risk for child abuse
  - Referring parents with “mental health” issues to a community mental health agency
  - Providing all new parents with information on normal newborn crying and steps to take if they become frustrated
  - Referring parents convicted of child abuse to a home-visiting program that teaches parenting skills
- 11.** The Period of PURPLE Crying program’s target population is:
- All families at risk of child abuse and neglect.
  - Parents identified as child abuse perpetrators.
  - All parents of new infants and society in general.
  - Parents with co-occurring risk factors for child maltreatment.
- 12.** Which is an example of a **secondary** prevention service for child maltreatment that is commonly provided by a home-visiting program?
- Advice on car seat safety
  - Information on where to report child abuse
  - A media campaign aimed at changing cultural attitudes about crying
  - Education on child health and development
- 13.** Which is a **true** statement about the reporting of child abuse?
- Coroners are typically not required to report suspected child abuse or neglect.
  - In more than one third of states, any person who suspects child abuse or neglect must report it.
  - Healthcare professionals are the only group typically mandated to report child abuse or neglect.
  - Reports of suspected child abuse or neglect may not be made anonymously.
- 14.** “Reasonable cause” to suspect child abuse or maltreatment requires:
- Certainty that an injury was nonaccidental.
  - Doubting what is personally observed or stated about an injury.
  - Believing what a parent says happened to an injured child.
  - Believing it possible that an injury occurred because of abuse or neglect.



- 15.** When a mandated reporter fails to report suspected child abuse or maltreatment, it is important to know that:
- a. There are moral but no legal consequences for failing to report.
  - b. CPS can act even though the suspected abuse has not been identified and reported.
  - c. Mandated reporters can be held legally liable by civil systems.
  - d. Penalties for failing to report cannot include imprisonment.

