Never
Never
Never Shake a Baby

The Challenges of Shaken Baby Syndrome

by

Jacy Showers, EdD
Director
SBS PREVENTION PLUS

for the

National Association of
Children's Hospitals
and Related Institutions

National Association of
Children's Hospitals
and Related Institutions

N A C H R I

401 Wythe Street
Alexandria, Virginia 22314
703/684-1355 fax: 703/684-1589
www.nachri.org

Table of Contents

Preface

The Second National Conference on Shaken Baby Syndrome was held at the Little America Hotel & Towers in Salt Lake City, UT, September 13-15, 1998. Conference directors were Jacy Showers, EdD, director, SBS PREVENTION PLUS, Florence, CO; Marilyn Sandberg, S.S.W., director, Child Abuse Prevention Center, Ogden, UT; and Helen Britton, M.D., Primary Children's Medical Center, Salt Lake City. Their respective agencies sponsored the conference. Major supporters of this event included:

- The National Exchange Club Foundation for the Prevention of Child Abuse
- The Matthew Eappen Fund of Children's Hospital, Boston
- Brain Injury Association/Violence and Brain Injury Institute
- Utah Department of Health, Division of Community and Family Health Services
- U.S. Department of Health and Human Services, Children's Bureau

Other supporters included:

- Utah State Division of Child and Family Services
- Intermountain Health Care
- Little America Hotel and Towers
- Terry Woodford, Audio-Therapy Innovation
- Dr. Leo and Roberta Hardy
- Castleview Hospital
- Bonneville Exchange Club
- American Academy of Pediatrics
- The Christmas Box Charitable Foundation
- National Center for Prosecution of Child Abuse
- American Prosecutors Research Institute
- Interagency Council on Child Abuse and Neglect
- National Association of Children's Hospitals and Related Institutions
- Ohio Chapter of the American College of Emergency Physicians
- Cindy Olbright, Charitable Gift Fund

In addition, the conference would not have been possible without the time and expertise shared by the presenters, many at their own expense or the expense of their agencies. The intent of the conference was to bring together leading experts on SBS, interested professionals, and families of children victimized by shaking in order to address the medical, investigative, legal, intervention, prevention, and family impact challenges created by this syndrome.

The purpose of this executive summary is to describe the main facts, concepts, ideas, and recommendations presented by the speakers. This document was prepared using audio cassettes made available to the author for 114 of the 122 presenters. A multi-disciplinary editorial board (members are listed in the Appendix) provided invaluable assistance in the preparation of the document. The section headings were selected for the ease of locating information and are not intended to be all-inclusive.

The information and recommendations provided herein do not necessarily reflect the opinions of the author or the National Association of Children's Hospitals and Related Institutions, but are intended to provide an accurate overview of the remarks of conference presenters (see Appendix for presenters' names and titles of presentations). For additional copies of this document, contact the National Clearinghouse on Child Abuse and Neglect Information at 1-800-FYI-3366.

Introduction

This conference brought together more than 850 people from the United States, Canada, Belgium, England, Australia, and Japan to share state-of-the-art information related to shaken baby syndrome (SBS). Although ongoing debate continues about whether this syndrome is more appropriately called abusive head trauma, inflicted head trauma, shaken impact syndrome, or some other name, the term shaken baby syndrome appears to be the most recognized designation by the public. Therefore, for the purposes of the conference and this summary, the acronym SBS is used to describe the form of child abuse that is caused by shaking with or without impact. Although there are no accurate statistics regarding the incidence of SBS, there is consensus that head trauma is the leading killer of abused children and that shaking is involved in many of these cases. The most common themes emerging from the conference are the need for communication, collaboration, and cross-training among professionals of varying disciplines; the value of listening to family members who have been victimized; and the critical need for research on SBS-related issues.

Victims

Demographic characteristics of SBS victims are reported to be relatively consistent with past studies. Victims of SBS are primarily children under the age of 1 year, with the majority under the age of 6 months. However, case descriptions include children as old as 5 years. The median age is 4-6 months, with a mean of 5-7 months. An analysis of deaths by age indicates that older children are more likely to die than younger victims.

Reports are consistent that boys are more likely to be shaken than girls. The percentages vary from 60% to 82% boys. The most commonly reported precipitating event for shaking is loss of anger control by a caregiver, often in response to inconsolable crying by a child. The reasons that boys are more often identified as victims of shaking are speculative and include the possibilities that boys cry more, that their crying is higher pitched, that they are harder to

soothe, and that the crying of boys is less tolerated than that of girls because of a cultural expectation that boys "aren't supposed to cry."

Common histories and presenting complaints

The most common initial histories given in SBS cases are that the baby fell or that the baby is shaken as a response to choking or sudden stoppage of breathing. One concern is that some physicians still readily accept these explanations without probing for details or without regard for the literature on falls, or on resuscitation, and the unlikelihood of resultant injury from either. The need to educate pediatricians, emergency responders, emergency department residents, and attending physicians, nurses, and others who have contact with babies and young children about signs and symptoms of SBS is reiterated often. Physicians may be unlikely to consider abuse in their differential diagnoses, and they are urged to elevate SBS to a high level of consideration when clinically evaluating young children with unexplained illnesses or injuries.

Presenting complaints for SBS often include subtle descriptions such as extreme irritability, lethargy, rigidity, vomiting, feeding difficulties, odd gaze, or gray complexion at one end of the spectrum to seizures, difficulty breathing, altered consciousness, cardiac arrest, or coma at the other. Many victims present with multiple symptoms.

Missed or Misdiagnosed Cases

One of the greatest concerns is the alarming number of abusive head trauma cases that are missed or misdiagnosed upon initial presentation. Researchers report that 26% to 45% of children diagnosed as victims of SBS had at least one, and up to eight, prior visits to a hospital emergency department or a physician's office before the correct diagnosis of inflicted head trauma is made. The actual number of cases missed remains unknown, and emphasis is placed on the need for a true incidence study on SBS. Researchers

indicate that at least one-fourth of children not correctly diagnosed at initial presentation are reinjured, and there is agreement that babies who have suffered trauma are more susceptible to a future episode. One recommendation for reducing the number of children missed on initial presentation is to conduct more research on biochemical markers to develop rapid screening diagnostic tests for brain injury.

The most commonly missed cases occur when presenting complaints are subtle, such as fussiness, pronounced and prolonged irritability, and vomiting. It is speculated that some children may be shaken or impacted, experience symptoms in the presence of only one person, revive over time, and are taken for medical attention. There may be many of these cases. When incorrect diagnoses are made, they are most frequently gastroenteritis, accidental injury, upper respiratory infection, presumed sepsis, seizure disorder, gastroesophageal reflux, apnea, hydrocephalus, and otitis media. Some cases of SBS are missed because of misinterpretation of radiologic images.

Predictive factors for misdiagnoses include: normal respiratory status, absence of seizures, and absence of facial injuries. Predictive demographic factors for missing the diagnosis are parents living together and white families. The histories given by adults in the missed cases are most often falls or cause of symptoms unknown.

The primary criterion for correctly identifying SBS in its earliest presentation is a high elevation of consideration in the differential diagnosis. One concern is that physicians do not recognize it if they do not consider it. This is confounded by the fact that pediatricians and emergency physicians have to rely heavily on the histories given by adult caregivers, and they are often false. When babies present with nonspecific complaints, doctors are encouraged to undress them completely, look carefully for bruising, and take a complete history including whether the baby has had another visit for medical attention within the past few days or weeks. Because flu-like symptoms are very common, it is often difficult to do a full work-up on all children who have these complaints. However, in very young children, symptoms such as persistent vomiting, especially in the absence of fever or diarrhea, should not be taken lightly. When there are no signs of infection, fever, diarrhea, exposure to viral illnesses, or evidence of metabolic disease, and white blood counts are normal, suspicion of SBS should rise. For neurological symptoms such as seizures and altered consciousness, physicians are advised to do a complete evaluation, including a computed

tomography (CT) scan. An additional concern is the cost of full work-ups on children with subtle symptoms. The cost of care for one child who is not diagnosed or is misdiagnosed upon initial presentation, however, far exceeds the cost of work-ups on 30-40 children.

Fundoscopy, preferably by a pediatric ophthalmologist, is recommended as crucial to the diagnosis of SBS. If a pediatric ophthalmologist is not available, the exam should be conducted by someone skilled in looking at the eye, including the periphery. Physicians agree that, as a preliminary screening measure, it is easier to obtain an eye exam than a CT. Some physicians recommend that all children who present to the ER with subclinical or neurologic symptoms have their eyes dilated and examined, unless contraindicated medically. When retinal hemorrhages are identified upon routine examination, the possibility of abusive head trauma should be considered. Because not all shaken babies have retinal hemorrhages, this procedure would not identify all cases, but it could result in earlier recognition of many.

Failure to examine the eyes when children present to a hospital emergency department and failure to remove and examine the eyes at autopsy are factors possibly contributing to missed diagnoses. Even in jurisdictions that mandate autopsies in all cases of unexplained or unexpected child deaths, such autopsies are not always performed by pathologists skilled in protocols for children. In this regard, the recommendation is that autopsies on children be conducted by pediatric forensic specialists.

Physicians indicate that, in cases of suspected SBS, there is no substitute for a comprehensive clinical assessment of children, including the child's birth and medical history and the family's medical and social history. Access to child abuse experts for consultation purposes on complicated cases is important, but particularly difficult in rural areas.

Parents of SBS victims express strong feelings that cases would be less often missed if medical personnel placed more emphasis on statements by family members that babies are not acting normally. They share stories of their infants having seizures and physicians responding that "all babies shiver;" of being told after repeated visits to the doctor for vomiting, that they should stop coming because "the baby just has the flu;" or of being told they are just "overreactive first-time parents."

Medical Findings

An objective medical diagnosis in SBS cases is important, both to the treatment and protection of the child, as well as to any potential criminal or social services investigation. The most commonly described features of SBS are retinal hemorrhages and intracranial bleeding, usually subdural, sometimes subarachnoid and sometimes both. Retinal hemorrhages are reported in 65% to 93% of SBS cases as contrasted with less than 3% of accidental head trauma cases. Emphasis is placed on the fact that retinal hemorrhages are not all equal. Those seen in accidental trauma, which are rare, are few in number and are generally confined to the posterior retina. Retinal hemorrhages that result from birth trauma, coagulopathies, severe hypertension or carbon monoxide poisoning are also characteristically different than those seen in SBS cases and generally can be attributed to these causes by age or history.

Although retinal hemorrhages in SBS cases can be focal and/or unilateral, they are more often reported as bilateral, numerous and diffuse. When documenting findings in a child, it is important to say how many retinal hemorrhages there are, where they are located on the retina, in what layers, as well as whether they are found near the optic disc or on the periphery. Ophthalmologists are encouraged to take high quality photographs of retinal hemorrhages and/or to draw pictures of them and count the hemorrhages for case interpretation. The identification of the specific number, pattern, and location of retinal hemorrhages often requires the expertise of a pediatric ophthalmologist. Because many cases of abusive head trauma have been missed or misdiagnosed in the past and an ophthalmologist is not always readily available, recommendations are to provide better training to pediatricians and emergency physicians in both direct and indirect ophthalmoscopy.

Retinal hemorrhages associated with SBS can be subretinal, intraretinal, and/or preretinal and can be dot/blot or flame in shape. Traumatic retinoschisis, as sometimes manifested by huge macular blood filled cysts, and optic nerve sheath hemorrhage are described as very uncommon in infants and young children, and most often associated with SBS. The pattern of blood in retinal hemorrhages combined with the constellation of other findings associated with SBS are reported as what make the diagnosis. Retinal hemorrhages caused by diseases generally do not have the same appearance as those caused by inflicted head trauma. In addition, diseases associated with retinal hemorrhages can be ruled out by taking a

careful medical history, performing a thorough physical examination, and ordering appropriate laboratory tests. The consensus is that retinal hemorrhages cannot be dated with precision. In cases when a child dies immediately after injury, however, iron stains of the retinas can assist in determining whether retinal hemorrhages are old or acute.

The question is raised as to whether intracranial pressure can cause retinal hemorrhages. Research is lacking in this area, but empirical data suggests it is rare and such hemorrhages would be few and confined to the posterior aspect of the retina. They would also be associated with papilledema.

Subdural hemorrhages are reported in as many as 86% of SBS cases. Most subarachnoid bleeds are found in conjunction with subdural hemorrhages. It is noted that there are many reasons children can have subarachnoid bleeds that are not related to abuse, so it is important to look at all findings on the child. Epidural hemorrhages are described as not commonly associated with abuse, but are more often found in children who suffer accidental falls and skull fractures.

The recommendation is made that, when a subdural hemorrhage is identified in a young child without a history of a severe accidental event, inflicted head trauma should be high in the differential diagnosis, although not all subdurals are due to child abuse. Other possible causes, such as birth trauma, accidental injury, hemophilia or other etiologies must be ruled out. There is no evidence that traumatic acute subdural hemorrhages, particularly those leading to death, occur in otherwise healthy infants in an occult or subclinical manner. A better understanding of chronic subdurals and their progression would assist in the diagnosis of SBS. There is evidence that shaking an infant can lead to tearing of the arachnoid membrane causing cerebrospinal fluid from the subarachnoid space to leak into the subdural space. This finding can be falsely interpreted as a chronic subdural effusion when, in fact, all the bleeding is acute.

There is some indication that children with unusually large extraaxial spaces, whether due to external hydrocephalus, benign macrocranium, prior trauma or other reasons, may be more susceptible to intracranial bleeds. This is also noted in children with cerebral atrophy, bleeding disorders, and vitamin K deficiency. These children, however, may also be shaken, and it is the overall

constellation of findings, combined with relevant histories, that helps make the correct diagnosis.

Findings associated with SBS often include skull and rib fractures; bruising, primarily facial or on the thorax; and fractures of the long bones. These associated findings are reported in up to 50% of cases. When rib fractures, clavicle fractures, or long bone fractures are found in very young infants, birth trauma must be ruled out. Classic metaphyseal lesions are rarely caused by birth trauma. Rib fractures associated with SBS are reported as frequently multiple and usually posterior or lateral, resulting from gripping and squeezing, which can accompany shaking. Metaphyseal fractures of the long bones, specifically bucket handle or corner fractures, are attributed to the shearing strains put on them by twisting, pulling, and squeezing. In combination with retinal and subdural hemorrhages, metaphyseal fractures are reported as strongly suggestive of SBS.

Lack of external findings on a child does not exclude the possibility of impact, as evidence of a contact injury may be occult. In cases of shaking with impact, it is noted that soft tissue swelling may not be evident on external exam. However, in a child who dies, a subgaleal hemorrhage, with or without associated skull fracture, may be seen on autopsy when the scalp is retracted. In survivors, soft tissue swelling may not be evident on initial CT, but may show up on a subsequent scan or exam within a few days.

An increase in head size is a possible indicator of head trauma inflicted by shaking or impact. For this reason, clinicians should regularly document head circumference during pediatric visits and visits to hospital emergency departments. Diffuse parenchymal brain damage is reported in more than 40% of SBS victims and is often associated with brain swelling. Cerebral edema and hypoxia resulting from the body's response to closed head injury are described as the most life threatening findings. Cerebral edema can push the brain stem into the spinal canal, thus adversely affecting respiration. It is estimated to peak at 48-72 hours. During brain swelling, toxins are produced by brain tissue and cause ongoing damage to the brain. Reports suggest that this can happen over days. Hypoxic brain injury can occur in SBS to the point of apnea, which results in immediate loss of oxygen supply to the brain. The resulting hypoxic ischemic injury can happen quickly and may be manifested in a grossly swollen brain without a lot of bleeding. If present, a laceration of the posterior corpus callosum, the part of the brain that connects the two hemispheres, is also described as a hallmark of severe forces such as shaking.

According to reports, when children die, diffuse axonal injury (DAI) is being increasingly identified at autopsy in traumatically brain injured babies. A histologic or microscopic diagnosis, DAI results from shearing forces on nerve fibers and white matter. The resulting damage compares to interruption of an electrical circuit that controls the body. In DAI, the axons, or nerve fibers, are actually torn off the nerve root bodies, often in scattered locations. DAI leads to diffuse swelling and widespread dysfunction and indicates that severe symptoms would have been immediate. Reports suggest that DAI is attributable to severe inertial, acceleration or deceleration forces and is not a secondary effect of other lesions, cerebral edema or intracranial pressure. DAI and the subsequent swelling of the brain with increased intracranial pressure, not intracranial bleeding, contribute most to the neurologic devastation or death of SBS victims. At autopsy, silver stain on brain tissue can be useful in identifying DAI or axonal retraction balls, also called axonal spheroids. DAI on autopsy is reported as an important element of proof that onset of symptoms occurred immediately after shaking since DAI is associated with immediate loss of consciousness.

Spinal cord injuries in SBS victims are reportedly uncommon, in part because the spinal column in babies is very soft and flexible. The mechanisms described as damaging to the spine during shaking are hyperextension/flexion, which can occur in shaking when a baby is held by the chest, and traction/distraction, which can occur when a baby is grasped by the head and shaken. When babies are held by the head and shaken, they are less likely to have retinal and intracranial hemorrhages because the head is stabilized, and more likely to have spinal injury because this mechanism pulls and elongates the spinal cord. It is possible in these cases for a contusion in the upper cervical cord extending into the lower medulla to cause death. Because of the nature of a child's spine, it is possible to have injury to the cord with no bone or cartilage deformity showing up on a radiograph. However, both anterior-posterior and lateral radiographs of the spine are recommended in order to rule out spinal injury. An MRI can demonstrate edema and hemorrhage in the cord better than a CT scan, but it is not always ordered.

If a child presents with injuries that include retinal hemorrhage, subdural hemorrhage, subarachnoid hemorrhage, interhemispheric hemorrhage, parenchymal brain injury, cerebral edema, hypoxia, external bruising, fractures, and DAI, there is virtually no other

cause than SBS. The availability of pediatric specialists and child abuse experts to identify and confirm findings in each of these areas can be crucial. In this regard, consistent concerns are voiced about access to these specialists in rural areas since misdiagnosis or delayed care can result when SBS occurs in geographically remote areas.

Physicians and nurses are urged to carefully document all findings on injured or ill children. They are encouraged to include detailed notes of their interviews with adults, including the time a child became symptomatic and who was present. Medical staff who see children at the hospital are advised to include notes and times of all conversations with family members and other adults. Notes should be very detailed, both about the medical condition and progress of the patient, and about interactions among family members and visitors and with hospital staff. Instead of putting in the chart, "family says," physicians are urged to write in the record the individual's name to whom statements are attributed. Nurses' notes are consistently described as rich sources of information in SBS cases, and their testimony in court can be valuable.

Doctors are advised not to suggest to families or visitors that shaking is a possible mechanism of injury, as this can alert perpetrators, allow them to create or change stories, and complicate the investigation. Doctors are advised to tell family members that their child has a brain injury, that they are trying to determine how the injury happened, and that in order to provide the best treatment to the child, they need to be given an accurate history of everything leading up to the baby being brought for medical attention. They can say something such as, "We don't generally see this level of injury with a fall or roll off a sofa, so is there anything else that could have happened?"

Diagnostic Imaging

Diagnostic imaging to identify intracranial alterations and associated findings in SBS cases is emphasized as crucial. Diagnostic imaging can be more effective when correlated with clinical history and physical findings. Neuroimaging studies can identify problems early, assist in dating injuries, and identify changes to the brain and

skeleton. Neither CT scans, magnetic resonance imaging (MRI) nor bone surveys can pin down timing exactly, although injuries can often be diagnosed as acute or chronic. Histories of bleeding due to birth trauma, genetic disorders or coagulopathy must be considered and ruled out.

With the advent of cross sectional imaging by the CT scan in the 1970s, the diagnosis of abusive head trauma became easier. CTs are described as good for initial evaluations because they can be done on very ill children. Intracranial hemorrhages are best seen acutely on CT, then subacutely and chronically on MRI. Blood should be looked for in both the extra-axial compartments as well as within the brain itself. The salient findings on CT that point to SBS as the possible mechanism of injury include subdural hematomas extending into the interhemispheric fissure region as well as blood overlying the convexities of the brain. Large subdural hematomas require or reflect cranial rotational acceleration or deceleration, which may be due to violent shaking or severe impact. Subdural hemorrhages are noted to appear often as high density compared to the normal or low density of the brain, although on initial CT, blood density may be indistinguishable from the brain. CT can be used to identify acute subarachnoid blood and is considered more sensitive to it than MRI. Care should be taken to look for infarctions, which may occur as a result of vascular injury in the neck or inside the head and are reported in as many as one-fifth of SBS cases.

CT scans should be conducted as soon as possible after a child presents to the hospital with signs of head injury, then repeated within two weeks. If poor images result because, for instance, the child is combative, the CT should be repeated. It is noted that there are no concrete guidelines as to how quickly cerebral edema shows up on a CT scan. The original CT may look normal, but neurologic insult may be present. The opinion is that, because young children have large extra-axial spaces, the original CT may not reveal interhemispheric subdural hematoma, whereas a follow-up CT might. The speculation is that this might occur because blood originally over the convexities may migrate to the interhemispheric fissure region as a result of gravity when children are kept on their backs. Subdural blood becomes more evident as the blood clots and has higher attenuation. Within a month, the brain can undergo severe atrophy and can have almost the same attenuation as the surrounding fluid, a finding that reflects dramatic insult.

On an original CT scan of a baby who is possibly a victim of shaking or accidental injury, the radiologist should also look for soft tissue

swelling. Such swelling is described as more common in accidental than inflicted closed head injuries and, in the latter, may indicate that the injury is several days old. Soft tissue swelling can be more often expected with shaking and impact, sometimes resulting in a skull fracture, although the fracture and swelling may not occur at the same time.

MRI is also recommended for children with serious head injuries, although if it is performed too early some findings may be missed. Generally, MRIs are recommended several days after the injury occurs. Follow-up CTs and MRIs both may show intracranial alterations that may have been absent or inconspicuous on early imaging. The MRI is noted as better than CT at showing small subdural hemorrhages and parenchymal contusions. Since MRI is not influenced by the presence of bone, as contrasted with CT, it is more useful in revealing areas of blood adjacent to bone and over the convexities. Images in multiple planes are recommended. Coronal CT scans are reported as particularly useful to demonstrate collections over the frontal parietal convexities, which can be missed by axial CT.

The main MRI sequences suggested for imaging in suspected SBS cases are T1 and T2 weighted images in multiple planes, and gradient echo imaging. Gradient echo imaging is noted as helpful for showing blood of different ages. MRI may reveal parenchymal abnormalities, hemorrhages, contusions, and signs of DAI that will not be seen on CT. It is also reported as better at showing tears in the white matter, especially those involving the frontal white matter, which are often missed on CT.

The potential for using perfusion and diffusion imaging for research and clinical purposes with children is discussed. This type of imaging is currently utilized for adults with strokes. Diffusion weighted imaging available on new MRI systems can help detect infarction within 24 hours. This is especially important since infarction has been identified as a predictor of poor outcomes for children who are victims of SBS.

Documentation of injuries to the entire skeleton is important, as it often provides evidence that brain injuries are the result of abuse and can be informative on the mechanism of injury. Full skeletal surveys, including a skull X-ray, are recommended when there is any suspicion of SBS. Skull fractures are reported as better seen on skull radiographs than CT, and far better than on MRI. A babygram, or radiograph of the total body, is deemed inadequate in these cases to

identify important features of SBS, because it fails to adequately document subtle injuries that may point strongly to abuse.

If original skeletal surveys are negative, but ancillary findings indicate that fractures may be present, surveys should be repeated two weeks later. Rib fractures, in particular, are often missed on initial images because callous does not appear for at least five to seven days. If there is a question as to whether suspicious findings on the initial survey are normal variants or bone fractures, follow-up images are important. Normal variants will not change, whereas fractures will. The thickness of the callous becomes an indicator of the age at which a fracture occurred. In cases in which children die immediately after arriving at a hospital, pre-mortem skeletal surveys are recommended to document that fractures found were present before the child died and not artifacts of the autopsy. It is also possible that fractures not identified on images may be seen on autopsy. It is strongly advised that pediatric radiologic specialists should conduct and interpret all radiologic imaging tests associated with suspected SBS.

Conflicting views are expressed about the use of ultrasonography to look at intracranial injuries. There is concern that it does not show thin acute blood collections over the cerebral convexities or does not identify subarachnoid blood. Another view suggests that it can be valuable in detecting white matter tears not seen on CT, and at a time when MRI is not feasible.

Implications of Research in Biomechanics

Most of the past work on cranial injury mechanisms has been done on adults rather than children, usually in motor vehicle accident studies. However, the possibility that biomechanical research can contribute to the understanding of the mechanisms of injury in SBS is significant, especially since independent, reliable witnesses in abusive head trauma cases are rare and histories are often fabricated or absent.

The two primary categories of cranial injuries are contact and non-contact. Contact injuries occur as a result of tissue deformation and are not dependent on the head moving, rotating, accelerating or decelerating, for example, a baseball bat striking the top of the

forehead of someone lying supine on the floor. Non-contact head injuries result from cranial acceleration, regardless of whether or not that acceleration is induced by impact. Non-contact injuries are reported as more likely to result in large bilateral or interhemispheric subdural hematomas, concussion, and DAI. In studies of adults, non-contact injuries are reported as much more likely than contact injuries to be fatal.

In SBS, forces to the head are generally angular, that is, a combination of translational (i.e., straight line) and rotational acceleration. The disparity between the size of the shaker and the victim is considered a crucial element in the forces involved. If impact-deformation forces are added, as in shaking and slamming, the overall forces are increased dramatically.

Two of the most common findings in SBS, large subdural hemorrhages and DAI are reported as not known to be caused by contact alone, but rather require the head rotating about its center of gravity on the neck, known as cranial rotational acceleration. This mechanism is characteristic of SBS and can result in intracranial hemorrhaging and DAI. In the literature on adults, the causes of large subdural hemorrhages and DAI appear to be distinctly different, a finding that may eventually lead to more clarity about the specific biomechanical circumstances of SBS. The current literature indicates that, whereas subdural bleeds from ruptured bridging blood vessels result from strains that are of short duration and high magnitude, DAI is caused by head motion of prolonged duration and lower magnitude. This question is deemed especially relevant when considering the few cases in which children have been observed as shaken and medically evaluated with negative findings. One issue is whether these children are then considered shaken babies. Related issues include questions of whether these babies are especially resilient to hard shaking, whether extraordinary forces are necessary, and whether impact significantly increases findings. A case definition of SBS may need to be developed.

Conducting research on children and comparing and correlating clinical experience and research on biomechanics of head injury is crucial in expanding scientific knowledge about inflicted head trauma. Ultimately, the question is: Can biomechanical models predict injuries from violent shaking without impact and what are the thresholds for shaking in terms of duration or intensity? The consensus is that biomechanical research cannot provide all of the answers about the energies required to cause intracranial injury in

children, but it is one potential source of clarity. Clinicians express frustration that, currently, tools are not available to measure these energies so they can be useful in a clinical situation.

Forces Involved and Timing

Based upon biomechanical research and confessions of perpetrators, the consensus is that shaking injuries can occur within seconds, and that at least several oscillations of the head are needed to produce the medical findings generally associated with SBS. There is no knowledge in medicine to say one child may be more resistant or more vulnerable to shaking injuries, or how long it takes to shake a child before injury or death occurs. In less severe shaking, it is not known how long it takes for symptoms to appear and then resolve, or how little shaking it might take to cause any learning disabilities, behavior problems, or cognitive deficits. In sum, it remains unknown how much force or how many shakes, for what length of time, are necessary to cause what degree of injury.

No one knows, or probably will ever know, the threshold of safe shaking for an individual child before head injury occurs. Neither playful activity nor short falls, however, have been implicated as a mechanism leading to SBS. There is strong agreement that research clearly shows that children do not normally suffer severe injuries from falls less than 20 feet, or as a result of falling from the arms of an adult. They generally do not die from falling down stairs, although rare cases of fatalities have been reported from infants tumbling down the stairs in walkers.

The most common mechanism described as causing brain and eye injuries in SBS is acceleration-deceleration. Severe shaking can cause bridging veins from the brain to the dura to tear and bleed. Concurrently, as the brain deforms and/or strikes the inner surface of the skull, direct trauma to the brain substance can result, and axons may be sheared, causing DAI. While a baby is being shaken, the oxygen supply to the brain can be cut off and lead to irreversible damage to the brain substance and the nerve cells. The accumulative effect of this trauma can be massive destruction of brain tissue leading to brain swelling and increased intracranial pressure, which further reduces the oxygen supply to the brain.

Intracranial pressure is reported to be a harbinger of poor outcomes. Cerebral edema and cerebral herniation are likely to result. With swelling, the differentiation between grey and white matter of the brain tissue diminishes and can result in the brain liquifying and atrophying. The bilateral hypodensity seen on imaging, sometimes referred to as "big black brain" is described as portending a horrible outcome for the child despite everyone's best efforts. If a child survives, severe brain atrophy can occur over months and chronic fluid can accumulate to fill up what no longer is normal brain tissue. While some controversy remains about whether this pathophysiology can result from shaking alone or requires an impact, there is growing consensus that it can result from either.

The susceptibility of young children to brain injuries from shaking is attributed to the following: large head size, underdeveloped ligaments and muscles that control the head, soft bony constituency of the skull, larger subarachnoid space and higher water content in the brain than adults. The infant brain is described as not fully myelinated. Myelin, a tough protein in the white matter makes the brain firm as it increases. Poor myelination in the brain decreases the protection of the brain tissue. These factors place babies at high risk for brain injury when the head is subjected to uncontrolled angular and rotational forces. When the head is shaken, speculation is that it deforms or bounces against the skull cavity, and because babies brains are more like gelatin than adult brains, delicate bridging veins and brain tissue are more readily torn and damaged.

The susceptibility of the eye to injury during shaking is described as similar to the brain. The eye, too, sits inside a bony cavity. During shaking, it rotates back and forth and can impact against the bone, causing blood vessels in the eye to rupture. Sometimes it also causes irritation, swelling and damage to the nerve sheath that connects the eye to the brain.

Timing the onset of injuries after shaking continues to be a confounding problem. There is general consensus that, in life threatening or lethal injuries, the onset of symptoms is immediate, that is, within minutes. However, some physicians expand the window of time to 2-3 hours, and rarely, 12-48 hours or more. The consensus is that babies are not normal for hours, then suddenly collapse. However, since neither subdural nor retinal hemorrhages can be dated to the exact minute, timing injuries can be complex. The ability to date these is reported as limited to "new," "not very new," and "old." Physicians report that, in some cases, blood

originally thought to be of different ages is ultimately determined to be all acute. Because in only a few cases has a child been in the sole care of one person, narrowing the time frame to identify a suspect can be difficult.

In less severe cases, there is no definitive research about the interval between shaking and symptomatology. When babies present with seizures, but not in arrest, some neurologists suggest that the injuries could have been inflicted several hours prior to onset of seizures. The difficulty of dating bruising and fractures as well as intracranial bleeds complicates the timing issue. When children have normal childhood illnesses, such as the flu or otitis media, questions of symptom onset are very complex, especially if the SBS symptoms are at the less severe end of the spectrum. The question often becomes: Are irritability or vomiting due to illness and a frustrated adult shook the baby, or are the symptoms caused or exacerbated by shaking?

Conference participants discussed the issue of "second impact syndrome." This phenomenon has been reported in adults and adolescents participating in contact sports such as hockey, boxing, and football. Cases have been reported when an athlete sustains a significant concussive injury resulting in altered consciousness and symptoms of persistent headaches, dizziness, nausea or vomiting. When followed within days by a second impact, it can lead to uncontrolled cerebral congestion and edema and, ultimately, death. The postulated mechanism of the severe effect of the "second impact" is a loss of cerebral autoregulation of blood flow. This syndrome has never been documented in infants and very young children. The episodes preceding the cerebral edema and death have only occurred in rough contact sports. There is no evidence that trivial impacts to the head can cause "second impact syndrome."

Another reinjury phenomenon is rebleeding of old subdural hemorrhages. Rebleeds occur frequently in healing subdural hematomas. They can be caused by minor bumps to the head. These rebleeds, however, seldom involve more than a small amount of bleeding around the existing subdural. There is no evidence that a rebleed from a minor injury can cause serious brain injury. Children are not likely to show a change in their neurologic status after a minor rebleed around a healing subdural hematoma.

Neurodevelopmental Consequences

Little data has been generated on the outcome for victims of abusive head trauma, although conference participants agree that any brain injury early in life can have a significant impact on neurological development and cognitive processing. Presenters emphasize the need for large multi-site studies to examine neurodevelopmental outcomes longitudinally and to study treatment modalities that might result in the best outcomes for these children. The limited data available suggest that victims of abusive head trauma have more significant, diffuse injuries than victims of accidental head trauma.

Documented longitudinal consequences for shaken children, although limited, range from death to remarkably good outcomes. Deaths in cases of SBS are reported to range from 13% to 28% of victims studied. Those children who die tend to present to the hospital with very low Glascow Coma Scores, retinal hemorrhages, hypoxia, and hypotension. Limited research is reported on clinical predictors of outcomes at discharge and two years post-injury. At the time of hospital discharge, children most adversely affected by the episode of head trauma are more likely to have presented with lower Glascow Coma Scores, more severe hypoxia, seizures, and hypotension. They are also more likely to have brain infarctions noted on CT. Clinical predictors of the poorest outcomes two years post-injury are a low Glascow Coma Score, hypotension, infarction on initial CT scan, and seizures. No child with early infarction is reported as achieving normal development at two years post-injury.

For children who do not die within days of injury, the morbidity rates are reported as very high. Some children survive only to linger for months or years in a vegetative state, requiring constant physical and nutritional support. Others survive with technologic dependency on shunts, tracheostomies and/or gastrostomies. Common neurologic outcomes include seizure disorders, cerebral palsy, and hydrocephalus.

The question arises whether there is a small group of SBS children who have devastating injuries on presentation, but have normal neurological findings at the time of hospital discharge or several years post-injury. The prevailing view is that, even if such cases exist, no one really knows if these children will be symptom-free over their lifetimes. On the other hand, since there is so little research on long-term outcomes, SBS family members emphasize that physicians

should not prematurely destroy parental hopes, as there have been children who have done remarkably well despite life threatening injuries. Parents report being told that their children would be "vegetables," or that their children would never walk or talk, for example, and those prognoses turned out to be false. Their suggestions to professionals, when asked about prognosis, are to respond that, at this child's age, professionals just do not know what parents can expect. Therapists who work with children who survive SBS say they are very reluctant to give parents false hopes, as it is their experience that some children never improve.

The most common explanation as to why some victims appear initially devastated, but appear to do well several months or years post-injury is related to early brain development. When victims are very young, not all areas of the brain have developed, and certain networks in the brain are not yet committed developmentally. One area adapts to injury by taking over functions generally assumed by other parts of the brain. This phenomenon is commonly referred to as plasticity of the infant brain. Often the areas of the brain affected by SBS are the frontal and occipital areas, which are associated with higher order reasoning and problem solving. The long term consequence of early adaptation is that brain connectors cannot later switch back to assume their usual functions. Thus, a child may seem to rebound in the first months and years after the critical event, but may manifest signs of traumatic brain injury in later childhood or early adolescence. One of the complicating factors mentioned frequently in SBS cases is that these children often look normal and can be socially engaging, so their neurologic injuries are overlooked or understated.

Common outcomes resulting from inflicted head trauma include sensory deficits, particularly visual and auditory, and sensation deficits related to victims' perceptions of their surroundings and oversensitivity or undersensitivity to stimuli. Specific concerns are behavioral difficulties, which can occur as children grow older if damage occurs to the frontal lobes, which control mood, emotion, and self-regulation. Sensory modulation disorders impact all areas of behavior and may manifest in lack of attachment, rage attacks, oppositional and defiant behaviors, poor impulse control, autistic behavior, self-destructive actions, hyperactivity, excessive fears, oral motor disorders, inattentiveness, diminished drive or initiative, and excessive frustration reactions. Children who survive shaking induced injuries may have problems with disinhibition and the control of impulsivity, which may negatively affect their interactions

with peers and adults. Other characteristics of survivors of SBS include sleep disorders, coordination problems, general irritability, manipulative behaviors, and depression. As these children grow older, their processes of memory and learning are sometimes greatly altered. For example, they may be able to read, but cannot understand what they read, and their ability to organize information rapidly and to access complex reasoning may be impaired.

The minimal information available on SBS victims who are now adolescents reveals that, while some of them function relatively well in special education programs, others have severe emotional impairment. Therapists describe case examples of teenagers who require enormous amount of therapy and intervention, which leaves both families and professionals challenged and sometimes exhausted. They emphasize that there is no way to predict how the consequences of inflicted brain injuries will play out over the long term. When children become school age, academic measures and IQ scores are described as not very good predictors of overall, long-term neurodevelopmental progress.

Intervention protocols and predictors of success are described as scarce for babies who survive abusive head trauma. A problem often identified is that these children "look normal" and, therefore, the response of school personnel and others is often to deny or overlook the impairments in auditory processing. Rather, their behaviors are attributed to "acting out" and are often dealt with in a disciplinary rather than therapeutic fashion. Even with a comprehensive approach of medication, physical, oral motor, speech, occupational, recreational, psychological, and psychiatric therapy and/or psychotropic medicine, fluctuations in progress and relapse are described frequently. Medication is recommended only to help children attain an optimal level of self-control, especially for moods and emotions, attention and concentration, and handling stress.

The primary goal expressed by professionals for helping survivors of SBS is to assist them over the long term to achieve conceptual integration, that is, to teach a child to process concepts in a way that, without brain injury, would have been automatic. Related, but more specific goals are to help these children move from external to self-regulation, to improve their problem solving skills, and to get them into the least restrictive, safe environments possible as they become young adults. When impressive outcomes are achieved, they are often attributable to family members or foster parents who provide ongoing developmental support. Great importance is

placed on early intervention, with families and professionals systematically providing as much developmental support as possible for language development, motor development, acquisition of social skills, and problem solving.

One of the main problems for survivors is the challenge of finding, accessing, and affording needed services. Neuropsychologists indicate that sometimes certain diagnoses, such as cerebral palsy and attention deficit disorder, while not necessarily the most accurate descriptions of neurologic findings, help families access needed services. As more and more identified victims of SBS approach school age, emphasis is given to the need to prepare schools to accommodate the physical, cognitive, and behavioral challenges associated with the sequelae of SBS. A key problem identified in these cases is that families have great difficulty finding professionals, including school personnel, who are willing to take on children with extraordinarily complicated problems. The combination of time, expertise, and compassion is described as very elusive to families of SBS victims.

Finally, strong recommendations are made for research to examine the continuum of outcomes for victims of abusive head trauma and to assess whether outcomes are predictable by age at injury, delay in care, chronicity, degree of force, presence of impact, disparity in size of perpetrator to victim, or other variables.

Family Impact

The participation of family members in the conference added greatly to understanding by professionals of the scope of impact SBS has on mothers, fathers, grandparents, siblings, and other family members. Many professionals in attendance indicated that it is the only national conference they attend that embraces family members and includes them in the overall program. Seeing this as an extraordinary part of the program, they recommend that families be included in future conferences and in trainings on SBS for both professionals and the public.

Family members consistently describe SBS as an event in their lives that profoundly changes them. SBS is not just what happens at the hospital, but what happens every day of their lives afterward. One

mother sums up the aftermath eloquently by saying, "Shaken baby syndrome affects every aspect of your life and your dreams. It affects your very being. It affects your belief in humanity, your belief in God, your trust in others including yourself. You begin to doubt your existence and your role as an adequate parent. You ask yourself how could this have happened. You blame yourself. You failed your child; you failed your spouse; you failed your family; and you failed yourself. The guilt is very thick. Guilt and sorrow invade your days and your nights."

Prior to their children's injuries, many parents, grandparents, and other family members say they had never heard of SBS. Many family members are distraught that their children are taken for medical attention within a few days to weeks of the ultimate diagnosis of SBS, and that subtle signs and symptoms are not correctly associated with SBS at an earlier time. Their first reaction when told of the mechanism of injury to their child is most frequently denial. This denial is rooted in their lack of knowledge that shaking can be so dangerous, their lack of understanding of the specific injuries that can be caused by shaking, and their disbelief that people they trusted to care for their children had injured them. Often, long-term denial is most prevalent when the perpetrator is a spouse or live-in boyfriend or girlfriend. In these cases, the impact on family members often involves coping with issues of loyalty to the offending adult rather than to the child. The initial shock experienced by parents is often exacerbated by the investigative process and their inability to readily obtain information about SBS, general prognoses, services for their children, and victim's assistance in cases of death. A number of family members report being treated curtly by hospital staff and/or investigators and feeling pre-judged as responsible for their child's injuries. Physicians are encouraged to share with parents as much medical information as they have and feel the family can handle. Although families of survivors often experience relief after their child has stabilized, it does not take long to realize their lives are changed dramatically.

To some extent, the stories of families whose children survive vary from those whose children die. Living with a surviving child who is disabled is described as painful every day. The burden of care giving is overwhelming. Most days are consumed by monitoring, administering medicine, transporting, keeping medical and therapy appointments, coordinating care, waiting, managing insurance and finances, seeking services and support, and advocating for their children. Shopping and accomplishing household tasks become

unmanageable. Many parents are sleep deprived, become exhausted and feel defeated, blamed, and depressed. An injured child means an injured family. In cases in which children die, parents live with the loss daily, and often re-experience grief on anniversaries of the injury, of the death, of the funeral, and of subsequent events related to criminal and civil litigation.

Fathers and mothers often describe their experiences differently. In general, during the first hours and days when their children are in the hospital in critical condition, fathers say they fall apart emotionally. They describe this as like no other time in their lives. In some instances, it is the first time even their wives have seen them cry. Fathers describe the guilt they feel because they were not able to protect their children. Mothers talk about the guilt they feel because they did not know what was going on, but feel they should have known.

From the time their children are injured, men note sharp differences in how they coped with these experiences, compared to their wives. During the hospital stay, mothers are almost always described as the ones interacting with professionals and making decisions. After the death of a child or discharge of a survivor, parents describe a reversal of roles. While most men describe their desire to normalize their lives again fairly quickly, women begin to experience great emotional trauma as a result of what happened. Fathers, for the most part, want very much not to talk about what happened. They describe their desire to put their feelings about the child in a box to be opened only during times that feel safe to them. Wives, according to their husbands, often seem to need to tell their stories over and over, perhaps trying to find meaning in what happened. Mothers and grandmothers are more likely than their spouses to become involved in prevention efforts and to become outspoken advocates for justice. Some women who have become activists reveal that, over time, they have grown to believe that early activism sometimes interfered with, or delayed, their grieving process.

Fathers, in general, are not as interested in participating in support groups as their wives. They describe this as not wanting to re-visit the event or the pain and not wanting to waste energy thinking about the perpetrator. On the other hand, they say that attending the conference and being with other parents, especially other men, is in some ways healing for them. The theme of SBS as a strain on marriages is pervasive. In addition, non-offending parents whose

spouses had shaken their child speak often of the judgmental attitudes they encounter and of their need for support.

Post traumatic stress disorder (PTSD) is commonly reflected in experiences related by family members. While individual lives typically have inherent stresses and some unpredictability, SBS far exceeds any "normal" trauma. It shatters assumptions about the world, destroys trust, and leaves families feeling as if their lives have been turned upside down. SBS leaves parents feeling overwhelmed and psychologically scarred. The grieving process is debilitating. When children survive, parents are often left physically and financially devastated. Sleep for parents and other care-givers becomes a luxury. Mothers in particular worry about what will happen when a child becomes too heavy to lift in order to transport or bathe him or her. Some parents emphasize the need for competent, specialized facilities to provide respite care for these children, if only while parents work.

Characteristics of PTSD commonly reported by SBS families include nightmares, flashbacks, numbness to emotion, avoidance of activities that are reminders of life prior to SBS, estrangement from others, feeling stuck, irritability, outbursts of anger, difficulty falling asleep or staying asleep, hypervigilance, and depression. A sense of predictability of life, a basic trust in justice, and a sense of personal and family safety are often destroyed.

Family members speak of their child's injuries or death as the worst event of their lives. Mothers, fathers, grandparents, and other family members indicate that retraumatization is frequent and long-term. False allegations that parents are guilty have been devastating. Families express feelings of isolation and a sense of constant scrutiny by others as if they had done something wrong. SBS has often taken a toll on relationships between parents, among relatives and with friends. It is not unusual for relatives and friends eventually to tell parents they should "get over it," or "just get on with their lives," or that having another baby would help. Such remarks are not perceived as helpful by parents and have often left them feeling a pervasive lack of support and an abiding sense of loneliness.

Mothers of babies shaken by child care providers often feel the added trauma of being vilified as working mothers for putting their children in someone else's care. In some cases, health insurance runs out quickly, leaving families financially devastated. Delays in

the investigative and prosecution processes and plea bargaining issues, if they arise, are also described as retraumatizing.

Families are advised that recovery is different for everyone, and interventions that may be helpful include individual and family therapy, medication, and physical exercise. A relatively new approach, eye movement desensitization and reprocessing (EMDR) may be a promising new intervention. Families themselves say one of the most healing steps is connecting with other families of SBS victims. Families are advised that there is no one map for recovery, but that indicators of steps on the way to recovery may be seen in times when the trauma no longer dictates how one lives from moment to moment, when anger, fear, hopelessness and/or a sense of loss are no longer constant. A pervasive theme is that shattered assumptions and broken dreams are difficult perceptions from which to recover.

Great concern is expressed about the well-being of siblings of victims. There is speculation that siblings may be the most traumatized survivors of these events. Occasionally, brothers and sisters feel partly responsible for not protecting a younger sibling. It is possible that they witnessed the shaking. In some cases, siblings are blamed by the adult perpetrator. Parents talk about the pain of having siblings ask why the perpetrator did this to their brother or sister. Children want their siblings to be alive and, if alive, to be normal. They do not want their brothers and sisters to be ridiculed because they are different. In some cases, parents speak about the pain of knowing siblings feel that they get less time from parents because of the demands of taking care of a survivor of SBS. Therapy for siblings may or may not be needed. Helpful interventions can include play therapy, talk therapy, and EMDR. Symptoms to look for when deciding whether therapy may be indicated include regressive behaviors and sleep problems.

Family members indicate that the negative impact is diminished if there is productive cooperation among professionals, information and support available to them, and speedy justice. In many cases, however, families experience none of these. Most families feel that their healing came faster, or would have come faster, if the perpetrator admitted what he or she did and was remorseful. This, too, is not a common experience.

Concerning activism by family members in prevention efforts, one question posed is whether focusing on one particular case or one child, surviving or deceased, constitutes exploitation. Families and

professionals agree that the public often pays more attention when prevention programs include surviving children or photographs of children who are killed. The consensus is that exploitation exists when there is an uninvited invasion of privacy and when no informed consent is given by families. When families understand and knowingly accept the parameters of the media or prevention programs focusing on their child, consensus is that this does not constitute exploitation, can be part of the healing process, and can be valuable in preventing other cases. In addition, participation by families in media interviews and prevention activities should be an individual, informed choice.

Finally, emphasis is placed on how often the child victim gets lost in the legal maneuvering and in the media attention to the case. The importance of memorializing SBS victims, of keeping their lives vivid in people's minds, is crucial. To that end, parents have formed the Shaken Baby Alliance with a mission of support for families, prevention, and justice. A primary theme expressed by all families is the value of networking with other families who have similar experiences. Professionals are encouraged to facilitate such networking. Families have experienced a dramatic increase in inter-communication and support with the establishment in 1998 of their own electronic mailing list on the Internet, consisting of both SBS family members and professionals. This list allows messages to be sent to several hundred people at the same time, as well as assists families in identifying and then communicating privately with other individuals.

Web sites on SBS are increasing dramatically for the purpose of disseminating information, promoting advocacy for children, supporting families, pursuing justice, and increasing prevention. The most common problem associated with the proliferation of Internet use is the promulgation of false information associated with selected sites or individuals. Just as the Internet has the potential to provide support and networking for families, so does it provide the opportunity for the promotion of misinformation or the solicitation of support for defendants in SBS cases.

Investigation

A successful investigation is described as depending upon non-medical personnel, such as law enforcement officers and prosecutors, knowing basic medical findings associated with SBS, normal child development, and common discrepant histories. In addition, cooperation and collaboration among all disciplines greatly facilitates justice in these cases. While it is the job of other professionals to gather and document findings related to the case, it is law enforcement's role to determine the who, what, where, when, how, and why in these cases. Having the same investigators assigned to the case from initial response through prosecution is deemed tremendously helpful. All investigators, experienced or inexperienced with SBS cases, are encouraged to ask clarifying questions in each case in order to better understand the overall facts of the case. Emphasis is placed on the need for openmindedness and compassion toward families throughout the investigative process.

Although the primary responsibility for identifying suspects in SBS cases belongs to law enforcement officers, they must rely heavily on statements made by household members and medical evidence provided by treating physicians and pathologists. The main goal of law enforcement is to conduct an investigation that is objective and thorough. Investigators are urged not to narrow the suspect list rapidly, but rather to be open minded about how the events could have occurred and who could have been involved. Rapport with those questioned should be established through interviews before beginning an interrogation. Officers are advised to gather statements made by all individuals who had contact with the victim. This includes statements by parents, grandparents, siblings, live-in boyfriends or girlfriends, childcare providers, and neighbors to emergency medical technicians, life flight personnel, nurses, physicians, social workers, friends, and co-workers.

In typical investigative protocols, investigators are advised counseled to gather statements from family members as soon as possible, as that may be their only chance to obtain a description of what happened. However, they are also cautioned by SBS families that interviewing parents whose child is severely injured, including separating them at the very time they need one another's support and want to be with their child, can be very traumatizing for them. When asked how to best deal with family members in the hospital emergency department or pediatric intensive care unit (PICU),

parents say the best approach is nonjudgmental, private, and compassionate. The worst approach, they feel, is one that conveys the attitude: "We know what happened, and we think you did it." They express the view that interviewing parents in the PICU is inappropriate. They also caution investigators not to accuse parents in the hospital, as it is an extreme error if wrong.

History gathering about the victim should go back at least 48 hours. One of the primary goals of the investigation is to determine when the baby is last acting normally, that is, doing such things as eating or playing. If a baby is reported as taking a bottle, it is important to determine whether the baby actually swallowed any of the liquid or is just sucking, which is a reflexive response and could occur after shaking. Whether historical information is gathered by a physician, nurse, social worker or law enforcement officer, professionals are encouraged by family members to be caring and empathic about the emotional trauma they are experiencing.

Investigators are advised to do a complete scene investigation, including measuring heights of cribs, beds, couches, high chairs and stairs, and noting the thickness of carpeting or the nature of the floor covering and underlying surface. This information, as well as the actual furniture, may be used in courtroom testimony and may be helpful in dispelling falls as a mechanism of injury. Videotaping of the entire home is strongly recommended, as is the use of a crime scene checklist, diagrams, and Polaroid pictures. Evidence gathered should include burp rags, used diapers, baby bottles, and food containers if applicable. Transport records should be obtained, as should all medical records for the child from the time of birth. Records from children's protective services and law enforcement agencies should be gathered on the family and/or childcare provider, including both substantiated and unsubstantiated reports. If possible suspects have recently relocated, records from agencies in prior locales should be gathered. Evidence should be obtained regarding any life insurance policies on the child. Investigators should ask physicians about time estimates for the injuries given their severity, what the early symptoms would have been, and how the injuries could and could not have happened.

Any individuals identified as suspects in the case should be given several opportunities to tell the story of what happened to the child. Investigators are advised to ask each person to tell, in his or her own words, what happened. Let each talk without interruption by simply saying: "Tell me what happened." Go back in time a few days and, using a timeline, document all histories provided. A

confrontational approach is not recommended until at least the third interview, which, in child death cases, should be conducted after autopsy findings are available, if they are obtainable quickly. If the child dies, investigators are urged to attend the autopsy, as post-mortem findings can be helpful in analyzing and probing a suspect's story.

If histories are inconsistent with the child's injuries, the child's development, or the science of abusive head trauma, suspects should be provided with refuting medical evidence piece by piece and told that the injuries do not possibly match the history given. Investigators are advised to verify what they hear by using clarifying statements such as: "So as I understand it, you are saying that..." All histories and evolving stories should be noted, preferably, in the suspect's own words. The goal is to have a suspect lock himself or herself into a story, gather medical evidence and, if appropriate, tell the suspect that the doctors and medical evidence indicate the story cannot be true. Frequently, in SBS cases, the first history given is false. Often the history is reversed; a suspect says that the baby became unresponsive so he/she shook the baby. In fact, the baby was shaken, then became unresponsive, and may have been shaken again. To obtain the true story, investigators are encouraged to be empathic, to use phrases such as: "You gave us this story. I was at the autopsy. The doc said it just couldn't have happened this way. I know you didn't mean to do this. I know accidents happen. I know there are two sides to every story. I know you're not a bad person. There's a lot of stress involved in taking care of a child. Why don't you just tell me what happened." Sometimes it helps to seek the seeds of frustration, such as crying, toileting issues, feeding problems, or difficulties in getting a child to sleep.

If someone admits to shaking a child, whether out of anger or reportedly for choking or resuscitation purposes, it is recommended that he or she be asked to demonstrate with a doll what the actions are. Again, videotaping the demonstration is recommended. Because a re-enactment in court may be impossible, a videotaped demonstration is strongly advised as part of the investigation process. In addition, once there is any disclosure of shaking, follow-up questions should be asked to obtain more complete details of what happened during the time(s) the child was injured, as perpetrators often minimize their actions. Details may include specifics about force and number of shakes as well as the possibility of impact as a concurrent mechanism.

To obtain confessions, investigators are encouraged to have full control of the interrogation environment, including such details as having the suspect sit in a chair affixed to the floor, offering a lot to drink, and determining when suspects smoke and when they use the restroom. They are advised to confront the suspect with photographs of the child when he or she was healthy. Presenters say that, when confronted with pictures and subjected to recommended interrogation techniques, suspects often confess to injuring the child. Investigators should be patient, let suspects tell lies or evolving stories, express empathy, and, if possible, get them to demonstrate with a doll or body silhouettes what they say happened.

In a case when the child was in the care of more than one person when the injuries could have occurred, guidelines to identify the most likely perpetrator include: who was with the child when the child became symptomatic; who told stories that are clearly false or changed over time; who told histories incompatible with the child's development; who referred to the child as "it" rather than by name; who had a motive that might include not wanting the baby or having insurance on the child; who was jealous of the child; who had a history of prior maltreatment against children, spouses or animals; who was overwhelmed by the stresses of child care; who described the victim as difficult to care for or negatively characterized the child; who had a history of interpersonal violence; who had a history of anger control problems; who blamed the injuries on the victim's siblings; and who delayed seeking care for the child. None of these variables is alone sufficient to identify the perpetrator, and the information collected may not be useable in court. However, using these guidelines may be helpful, especially if collectively characteristic of one suspect.

Although SBS is a often a private crime with no witnesses, siblings witness at least some cases of inflicted head trauma, and, when that occurs, they are usually the only witnesses. If present at the crime scene, they should be handled separately, preferably by an investigator assigned specifically to them. Children can be very accurate reporters of what happened. If they are potential witnesses, they should be subsequently interviewed, preferably within 12-24 hours, by a child interview specialist in a child friendly environment. When there are delays, children can forget details, hear other stories, or be coached. Although immediacy is important, so is recognizing that siblings are traumatized by these events and need to be handled compassionately. A single interview is advised. The

interviewer needs to build rapport and assess the developmental level of the child, including memory skills, whether the child can sequence events, and the child's ability to tell truths from lies. Children should not be asked leading or suggestive questions, but simply asked to tell who is in the house and what happened. The statements of children should be documented in their own words. Videotaping interviews, if possible, is highly recommended, as children may recant later when they realize a parent might go to jail. No contact orders may be important in order to protect siblings and preserve the truth. If videotapes are made, they should be adopted by the children as their testimony if used in court. Play activities and art may help the child tell his or her story. If the victim dies, children can be encouraged to make cards or pictures to put in the baby's casket. The interview should close with an opportunity for the child to ask any questions and receive honest answers.

Perpetrators

In describing demographics of perpetrators, males outnumber females in every study. The percentages of men vary by study, from 64% to 85%. A precaution is offered, however, that perhaps women are perpetrators of SBS in many of the missed or misdiagnosed cases and that "profiles" should be regarded with skepticism. Perpetrators cover a broad spectrum by age, relationship to the child, employment status, and socioeconomic status, as well as gender. In addition, perpetrators are described as ranging from skilled liars who make up stories with great detail, to people who say nothing happened to the child or claim not to remember anything.

According to studies, the most common perpetrator is the biological father, a finding reported to range from 37% to 47%. The second most common perpetrator is a boyfriend of the mother, reportedly constituting 21% to 41% of perpetrators, followed by female child care providers. Mothers are identified as perpetrators in less than 12% of cases. In many instances, males are caring for a baby for the first time and call 911 within minutes or several hours of the mother leaving to run errands or go to work. These are often men with no experience caring for young children. Both female and male

perpetrators are more likely to injure boy babies and equally likely to injure children fatally.

Theories about SBS as a pattern range from speculation that it is an isolated one time event by a frustrated caregiver to reports that as many as 50% of babies have medical findings that suggest repetitive injury. Dichotomous views about chronic shaking are expressed; that is, some presenters suggest that recurrent SBS indicates malice, while others believe that more than one episode of shaking may have occurred because the shaker believed his or her actions successfully quieted a crying baby the first time, and the subsequent shaking is harder.

Although the limited research available indicates that the perpetrator of SBS is usually with the baby when the child becomes symptomatic, this is not always the case. One illustration given is when a parent picks up a bundled, "sleeping" baby from a child care provider and does not notice until minutes or hours later that the baby is not just sleeping, but acting abnormally. When the parent takes the baby for medical attention, he or she is then considered to have been with the child when the symptoms occurred. Tracing the history back in time to determine when the baby is last normal is crucial to identify who actually inflicted the injuries. Sometimes, this is not possible. In addition, an ill baby may show symptoms similar to SBS, change caregivers, be injured, and show more symptoms thereafter. In this scenario, the true onset in symptomatology is difficult to identify.

Reports are that the perpetrator most likely to confess to shaking a baby is the biological father. The person least likely to confess is a child care provider. Although most confessions are considered a minimization of what actually occurred, they have been valuable in identifying shaking as a major cause of injury and death to young children. When people confess, it is difficult to know if they are telling the whole truth. Many confessions include partial truths or are total falsehoods. Once shaking is admitted, investigators are encouraged to push for more details, including how many shakes, for how long, on how many occasions, with what amount of force, and if the baby is thrown, slammed or impacted during or at the end of the episode. Presenters consistently say that more research is needed regarding these variables, and perpetrators can be one source of information. Consistent themes in confessions are that adults feel stressed by the responsibilities of life in general and child care specifically, that they feel helpless and frustrated about a baby's crying, and that they feel isolated and tired. Some social scientists

recommend research is needed on gender, power, acculturation, and violence issues related to SBS.

The question is raised as to whether perpetrators should ever be reunited with a surviving victim, sibling or other children. This query is difficult to answer. Absolutes such as never and always should be weighed carefully because as perpetrators are not all alike. They include, for instance, first-time fathers with no prior record of any interpersonal violence, and licensed childcare providers with prior records of violence against other adults and/or children.

Prosecution

A thorough and complete initial investigation can be instrumental in obtaining convictions. To this end, the recommendation is that prosecutors become involved as soon as possible after a child suffers a severe or lethal injury. Prosecutors are encouraged to visit the crime scene, talk to the doctors, and attend the autopsy if the child dies, because the child's body often tells the most important part of the story. The protocol for approaching criminal aspects of SBS cases should include vertical prosecution; that is, the same prosecutor should follow the case from time of presentation to the hospital, to verdict or plea agreement, and to sentencing.

The need for, and benefit of, both child death investigation teams and child fatality review boards to review these cases is discussed. The death investigation team is described as a 24 hour, specially trained, multi-disciplinary team composed of a medical examiner, law enforcement officer, children's protective services worker, pathologist, and prosecutor. This team investigates cases of serious or fatal injury to children when they occur. In one jurisdiction, successful prosecution reportedly skyrocketed as a result of implementing a death investigation team. Team members also often participate on child fatality review boards, which typically review cases in their locales or states on a periodic rather than immediate basis.

The consensus is that cases in which children die are generally easier to prosecute because jurors are more easily convinced that severe forces had to be involved. In addition, non-fatal cases with a

combination of medical findings, including intracranial and retinal hemorrhaging as well as external bruising and fractures, are generally easier to prosecute. Since medical science is less exact about forces involved in less severe injuries, cases in which there are fewer medical findings and children survive can be more difficult to prove as abuse.

Investigators and prosecutors are cautioned that they cannot build a case solely on medical testimony. Although medical findings are important, so is the baby's history, the family's background, the scene investigation, and statements provided by various people over time. As a rule, prosecutors are advised not to charge someone unless there is a reasonable chance of conviction.

Prosecution of SBS cases is complicated by issues of denial. Jurors and judges are sometimes described as not wanting to believe, or having difficulty accepting that people would seriously injure or kill young children, or that such severe outcomes could be caused by shaking. If a defendant looks sympathetic or "nice," jurors may not want to believe he or she could have injured or killed a child. Jurors may want to blame the non-offending parent(s). Prosecutors are advised that they may have to portray the defendant as two different people, the one defense witnesses describe as an ideal citizen, and the other as someone who committed a crime against a child. In some jurisdictions, cases are being heard by a judge rather than a jury, and consistently, recommendations are made to increase the training judges receive on SBS. In this regard, one of the methods of educating judges is through charging documents and motions that clearly explain SBS as child abuse, as a crime involving violent forces, and as a crime in which false histories and denial are common. Emphasizing that these injuries would have been very painful to the child can be compelling. Proof that a defendant delayed care for the child or gave a false history may support consciousness of guilt or knowledge that the actions were dangerous.

The most confounding problems in prosecution relate to timing the injuries, narrowing multiple suspects to one person, addressing pre-existing medical conditions in the victim, dealing with conflicting medical testimony, and proving an element of mens rea, or "guilty mind." Often, issues of timing between infliction of injury and onset of symptoms are the most difficult to prove. The most complex of these are cases that involve the changeover of child care from one adult to another, followed by a 911 call within minutes. Unless there is agreement on when the child last acted normally, these cases are

extremely difficult to prosecute. In some cases, when the parents were the only caretakers, both parents can be charged because of their legal duty to the child.

Prosecution in these cases is also made difficult or impossible when there are multiple suspects. Sometimes it is critical to educate the non-offending parent about SBS in order to get them beyond the denial that a spouse or paramour injured the child. This can take months or years. Cases can also be made more challenging when one adult is covering up for another. When fathers or mothers' boyfriends are the perpetrators, cover-ups sometimes happen because mothers of the victims are in denial that a loved one could have hurt their children, or are protecting their own judgments about people in whom they entrusted the care of their children.

Charging these cases has been inconsistent, in part because the standard of proof for charging and successful prosecution often include meeting what the law requires as the mens rea element. In many states, proving mens rea means establishing that the defendant recklessly, knowingly, intentionally or negligently caused the injuries or death. In some states, "knowingly" means a reasonable person would know his or her actions are likely to result in injury or death. In other states, the standard of proof extends to the individual defendant having known this. To some, the belief that people know about the dangers of shaking differs from the belief that they know about burning children or beating them with instruments, for instance. Prosecutors need to look at case law and jury instructions that apply to adjudicating specific cases. Often, proving knowledge is the difference between a manslaughter or a murder charge or conviction.

In deliberations, jurors often ask whether the case resulted from a momentary loss of control, was a violent act, or both. The 911 tape is described as crucial in court to establish the initial history and state of mind of the adults with the child. Sometimes it is the only history ever provided in a case. Documentation about prevention education provided to individual defendants, especially a statement signed by the defendant that he or she received such information, can be also be important evidence when knowledge is a standard of proof. Under current laws, it is easier to get a conviction based on negligence than on intent and knowledge.

To address the problem of proving knowledge or intent, the recommendation is made that all states should have a felony child abuse statute that stipulates intent is irrelevant in these cases and

harming a child is a felony. More than half of states currently have specialized laws or felony murder statutes. Under such statutes, fatal SBS cases can be charged as felony murder. Prosecutors are urged to exercise creative charging decisions and include the most serious as well as lesser charges.

Charges brought in the past have frequently been reckless injury or reckless homicide lacking intent, based on the belief that caregivers rarely meant to kill the victims. Manslaughter, often defined as an unintentional killing, has also been a more common plea or conviction than murder in SBS cases. Proving premeditation, which is required for some first degree murder counts, is described as virtually impossible. Establishing malice and intent is also difficult. In some jurisdictions, first degree charges do not require proof of premeditation but rather proof of extreme atrocity or cruelty, which may be easier to prove. Although murder charges have not been commonplace in the past, there is a trend to file more severe charges, including murder, and to file multiple charges so judges or juries have options in their decision making about guilt and sentencing.

Several prosecutors indicate that, under the belief that the actions causing the injuries are such that any reasonable person observing would know there is a risk, they now file murder charges. Sometimes proving guilt is easy, but the degree of culpability is harder to prove. There are major differences by state, and decisions in individual cases are affected by what prosecutors think they can prove to a jury or judge.

In cases that are adjudicated, the prosecutor's role is to present the facts, which often include complicated medical evidence, in ways a judge or jury can understand. If prosecutors do not have the skills necessary to interpret the facts, the outcome may be acquittal. Contrasted with common forms of homicide or serious injury involving adult victims, prosecutors must be much more knowledgeable about the medical science of SBS when analyzing the strength of the case. In order to do this, prosecutors need the cooperation and assistance of multi-disciplinary personnel including, but not limited to, 911 staff and emergency responders, emergency physicians, nurses, neurologists, radiologists, ophthalmologists, pediatricians, social workers, and pathologists. Trial planning includes deciding on expert witnesses, making motions and responses, analyzing the medical findings, and preparing for the defense's theory and responses. In jurisdictions

that do not have child abuse homicide statutes, planning also involves preparing a strategy to deal with the issue of intent.

Prosecutors are encouraged to prepare experts and to use the testimony of pediatric ophthalmologists, pediatric radiologists, pediatric neuroradiologists, emergency physicians, child abuse experts, and when appropriate, gynecologists, obstetricians, and pediatricians involved in the child's delivery and care. In unusual cases where children survive for months or years before dying of SBS injuries, neuroradiologists and forensic pathologists are cited as important witnesses. Neuroradiologists are in a better position to talk about all of the findings in the case and the significance in causing death. It is noted that expert testimony is the main reason child abuse verdicts are reversed in this country, and experts should be used carefully. Prosecution witnesses should be advised to stick to their own expertise, be conservative, and not overstate their opinions.

Prosecutors note that not all doctors will be equal in the strength of their statements, especially about timing of injuries. Prosecutors must present the case to juries using common sense, as well as expert testimony. Some concern is expressed about using residents as opposed to attending physicians in court. The consensus is that, if a resident is the first physician to see the child, his or her testimony is relevant and could be valuable. When being prepared for court, residents can be counseled that, if asked questions beyond their expertise, they should defer to experts in the field. A trend with expert witnesses is to move away from asking hypothetical questions to permitting narrative testimony. Instead of posing the hypothetical, "Assume you have a 5 month old baby with subdural and retinal hemorrhages and cerebral edema who fell out of a high chair...is that consistent?" the more common approach may become, "Explain why it is your opinion that the injuries on this child could not have occurred from falling out of a high chair."

When siblings of victims are expected to be called to testify, they must be prepared for the courtroom experience either through a court school or through one-on-one counseling. This should include informing them about the roles of the judge, the bailiff, the court reporter, the jury and where people will sit, including witnesses. A victim advocate can be assigned to the child for support. One goal is to protect siblings from further trauma. Children's testimony before a grand jury or preliminary hearing can serve to record the facts prior to trial and is sometimes less intimidating than a criminal trial. The possibility of a child testifying

may facilitate plea bargaining by a defendant in order to spare children further trauma.

Plea bargaining is seen both as a desirable outcome in some cases and as an issue for retraumatization of SBS families in others. Determinations about plea bargains should consider the strength of the case, what defense experts are expected to say, and what the victim's family wants. In some cases, families feel spared additional trauma if plea negotiations are successful, especially if there is admission of guilt. In other cases, families feel cheated if a full trial is not held with the possibility of a verdict on the most serious charge.

In order to make successful plea negotiations, prosecutors must make it clear that they believe in their theory of a case and are prepared to go to trial. A history of successful prosecution can be instrumental in securing future plea bargains. The opinion expressed is that strong cases should be taken to trial, and that plea bargains should be reserved for cases in which defendants accept full responsibility for their actions.

Prosecutors are advised to find out who the defense witnesses will be and, if possible, to discover what the defense experts will say at trial. They should be prepared to challenge witnesses and to move to limit or exclude their testimony if appropriate. Often, a complicating factor in these cases is conflicting opinions from medical experts. The degree to which prosecutors are able to cross examine well, and to bring defense experts over to their theory even on minor points, is crucial. If prosecutors are aware of what theories defense witnesses will put forth, they are advised to address these theories with their own witnesses. When defense attorneys are aware that prosecutors are skilled at discrediting the testimony of witnesses, they are often more likely to plea bargain or not to call certain witnesses. Physicians emphasize the need to respond when gross misrepresentation of medical facts is provided as expert testimony and/or reported by the media to the general public.

When the case is taken to trial, prosecutors are urged to reconstruct the case in court to give the jury the best possible picture of what happened. They are encouraged to use large diagrams; timelines, including who was with the child and what he or she was doing; enlarged photos; and technological animations or videotapes as demonstrative evidence to help judges and juries better understand the medical information. Pre-trial motions to admit demonstrative

evidence are recommended. For surviving victims who are impaired, diagrams illustrating normal developmental milestones compared to the impaired progress of the victim can be used to educate juries about the consequences of shaking. Successful prosecution often lies with an objective, simple and understandable presentation of the evidence.

Sometimes the standard of reasonable doubt is established in jurors' minds when defense experts testify that theories at odds with the prosecution's are probable, possible, or likely. There often is no exact understanding as to what "to a reasonable degree of medical certainty" means. Prosecutors need to be well-schooled in the science of SBS to attack and impeach questionable expert testimony in court. Although prosecutors need to caution their own experts to stay within their area of expertise and be conservative in their testimony so their opinions cannot be impeached, they can address the issue of "possible." When being questioned about other possible theories in an SBS case, a prosecution witness can say, "Anything is possible, but I have never seen it in my practice," or that the defense's theory is "possible, just like it is possible that a meteor could fall through this ceiling." Because prosecutors may rely on physicians who have previously missed or misdiagnosed SBS cases, their testimony is open to question on cross examination, and may compromise the prosecution's case.

Having a physician demonstrate with a doll the amount and force of shaking involved has been used in some courts in the past. A U.S. Supreme Court decision overturned a case on the basis that such a demonstration is irrelevant and prejudicial. Because of this, some prosecutors recommend alternative means of describing the amount of force involved in shaking, including using computer graphics or asking experts to draw on their own experiences of children with similar injuries caused by motor vehicle accidents or falls from significant heights. Testimony about the number and force of shakes is arbitrary, since no one really knows the exact amount of force or number of repetitions it takes to severely injure or kill an individual child. Because of this, videotaped demonstrations obtained during the interrogation process can be crucial in court.

Prosecutors are advised to introduce any available evidence of prior battering of the victim or another child to show that new injuries, in concert with old injuries, are not accidental, but part of a pattern of battered child syndrome. Such evidence has been deemed appropriate in a U.S. Supreme Court decision as long as the child has been diagnosed as a battered child. A compelling feature in an

SBS case can be pointing out the disparity between the size of the defendant and the victim.

Although sometimes criticized for not moving forward with cases, prosecutors must consider whether they think they have the guilty party and the likelihood of conviction. The prosecution must be able to present enough evidence for the jury to make an informed decision. Prosecutors admit that one of their hardest tasks is telling parents they cannot move forward with a case because they cannot narrow the suspects to one person.

Prosecutors from rural communities in particular express concern about inexperience in these cases, about lack of time to prepare, and about inaccessibility to expert witnesses to testify in court. Communities are encouraged to find a local physician willing to become an expert on SBS and to facilitate that. Prosecutors handling SBS cases are advised to contact the National Center for Prosecution of Child Abuse to obtain training and technical assistance, transcripts from experts, and a manual on investigation and prosecution of these cases.

Common Defenses

The judicial system entitles defendants to fair trials, and defense attorneys have a legal obligation to defend clients. It is possible that a defendant on trial in an SBS case is not the guilty party. However, several common defense theories are inconsistent with current scientific evidence.

Common defenses in SBS cases are that the victim suffered an accidental fall, that injuries are inflicted by chest compressions from cardiopulmonary resuscitation (CPR), or that injuries are manifestations of glutaric aciduria Type I (GA-1), osteogenesis imperfecta (OI), coagulation problems, meningitis, poisoning, bleeding disorders, or seizure disorders. Other defense theories are that another child inflicted the injuries, that the symptoms are a cumulative result of several accidental injuries, or that the child's injuries are the result of rough play.

The literature on accidental falls is cited repeatedly, with consensus that short indoor falls are false histories in SBS cases. It is

impossible to know with absolute certainty that accidental indoor falls never cause severe or fatal injuries; however, it is accurate to say that serious injury or death would be an extraordinarily unlikely result and to point out that many young children fall frequently without suffering any injuries. Research shows that falls less than 20 feet, unless possibly downstairs in a baby walker, do not cause life threatening or lethal injuries. Injuries more likely to occur from short falls are bruises and simple skull fractures with no intracranial or retinal hemorrhages. The literature reveals no convincing reports of CPR induced retinal hemorrhages. In very rare cases, any vestiges of retinal hemorrhages subsequent to CPR are extremely small, occur in the presence of abnormal coagulopathy, and resolve in four to five days. In regard to the defense that rib fractures are caused by CPR, since rib fractures are rarely the only injury in a child, especially a child who required CPR, the prosecution can focus on the constellation of findings rather than this one feature. In addition, even when rib fractures are present and CPR has been performed, the rib fractures could have resulted from abuse, which preceded the CPR. The view of many professionals is that any shaking associated with CPR efforts or arousal of a child would not be of the force used to cause SBS injuries.

While OI, or brittle bone disease, may be considered in an infant or young child who presents with fractures, it is not associated with retinal hemorrhages and can be ruled out by a thorough clinical assessment, family history, and appropriate laboratory tests. Furthermore, fractures due to OI are usually diaphyseal rather than metaphyseal. Temporary brittle bone disease, a theory occasionally used by the defense in SBS cases, is predicated on a concept of transient or temporary fragility of bones and is described as having no scientific merit.

More in-depth information is available about GA-1, which is first identified approximately 20 years ago, but has only recently been raised as a defense in SBS cases. Although some of its manifestations can be mistaken for SBS, GA-1 may be detected early in pregnancy in amniotic fluid or through urine organic acid screening. It is a rare, inherited metabolic disorder, most common in families where parents are related. Children with GA-1 usually have big heads from birth, with atrophied frontal and temporal lobes. The child may seem normal but have an abnormal CT scan. Children with GA-1 are reported as developing normally for about six months, at which time they may have a viral infection that leads to hypotonia and encephalopathy. In the acute state, these children have large

amounts of glutaric acid in the blood, urine, and cerebrospinal fluid. Within a matter of 24-48 hours, the basal ganglia are damaged. The child may have chronic subdural and retinal hemorrhages. These may raise the suspicion of SBS. The reasons for retinal hemorrhages in GA-1 are unclear. Subdural hematomas may occur because of enlarged spaces associated with abnormally large heads. Although the clinical presentation and long term outcomes for GA-1 may be similar to SBS, inexpensive screens for urine organic acids can assist in its diagnosis. In addition, costly enzyme mutation analysis tests can identify GA-1. An important notation is that the diagnosis of GA-1 or any other metabolic disease does not rule out that the child may also have been intentionally injured. Infants and children with metabolic disease may be irritable, difficult to care for, and at risk for maltreatment.

In cases when there is admission of shaking, the defense position sometimes is that the defendant did not know of the potential consequences of his or her actions. A number of presenters, referencing the position paper of the American Academy of Pediatrics, say that any reasonable person observing the action of shaking would know that it is dangerous. Others state that, while observers would recognize the danger, many people have not been educated about the dangers of shaking babies or the specific injuries that can be caused. Some professionals say they do not think most perpetrators set out purposely to injure or kill a child. Others postulate that perpetrators have time to stop their actions, but do not. In several cases when confessions are obtained, perpetrators said the shaking episode lasted only a few seconds and they stopped when they realized they were out of control. Professionals agree that a few careless seconds of violent behavior can have severe and long lasting consequences. Education of the public about the dangers of shaking babies is a way to decrease the problem of proving knowledge.

In sum, the strategy of the defense in SBS cases has often been to establish other causes or conditions that could have resulted in the injuries and are not eliminated. The defense might say that shaking is a response to choking or apnea, or expand the time frame and implicate others as suspects, or introduce lack of knowledge and intent as mitigating factors. Prosecutors are advised to anticipate all of these defenses and to prepare to dispute each one. They are cautioned that there is sometimes disparity in the testimony of expert witnesses, and even with a lot of evidence, in some cases, defense attorneys are able to call experts who will refute the

prosecution's theory. These defense theories, when reported in the media, can also affect the public's perception of the issues.

Sentencing

Sentencing in SBS cases reflects great inconsistency. Punishment ranges from probation to the death penalty. Contrary to homicides involving adult victims, perpetrators in SBS cases are described as much less likely to serve prison time. One concern is that juries often do not know in advance what penalties are associated with which charges, a factor that might influence their decision making. This sometimes works in favor of longer sentences, and sometimes lesser sentences.

Opinions about sentencing in SBS cases are diverse. When fathers are the perpetrators and the children survive, some mothers and grandmothers of the victims oppose jail time but support the concept of holding dads financially accountable for their child's care. They believe that prison time would not serve a rehabilitative purpose, and instead would harden these fathers. They believe their children's needs could be better met if the fathers continue to be employed and bear the brunt of the financial burden. One concern is that, if the offending father goes to jail, the SBS victim would lose his or her insurance. In some cases, it is recommended that offending fathers be sentenced to community service to include observing therapy with their child or other disabled children or adults in order to see the consequences of their actions. Other mothers whose babies have been injured by the children's fathers want long prison terms and, if possible in the case of survivors and/or siblings, termination of parental rights.

Families whose children have been injured by child care providers are much more vocal about wanting the maximum prison terms available to the court. More than anything, however, parents want perpetrators to admit to what they did and to show remorse. Unfortunately, that does not happen in many cases. In arguing for severe sentences, prosecutors are advised to point out to the court that every violent shaking or impact incident is potentially lethal, that these are horrible crimes against helpless children, that these are violent crimes, that the prognosis for survivors is not good, that

the impact of deaths on families is devastating, and that long prison sentences send messages to society that children's lives are valued. Although often traumatic, victim impact statements are considered a must in court, when allowed. The statements of siblings are very powerful. Photographs of the victim and family, poems, and specific memories can affect sentencing in some cases. When sentences are determinate, opportunities for victim impact statements can still be therapeutic for the family.

Prevention

Professionals and SBS family members agree the ideal goal is to prevent all of these incidents. Those people who believe that SBS is not preventable generally purport that people who injure babies or young children act out of rage or anger, and/or should know that severe shaking or impact can cause brain damage or death. These people do not believe, or are skeptical, that prevention can make a difference. Many others subscribe to the philosophy that SBS episodes are preventable by teaching people about the dangers of shaking young children and about the specific damage that can be caused. This group expresses the view that ignorance may be a contributing factor. Many SBS family members believe that more education about SBS might have prevented their children from being injured, and that information for the general public about specific risk factors for, and early symptoms of SBS, may have resulted in earlier diagnosis.

In the past, most prevention programs have focused on educating specific populations, such as parents of newborns, about the dangers of shaking and how to cope with crying infants. In recent years, efforts have been expanded to more fully address anger management, stress reduction, appropriate expectations of children, and specific reasons why shaking or impact can interrupt early brain development. Because of growing research identifying the majority of perpetrators as males, emphasis has increasingly been placed on programs that target boys and men. This has been done by implementing programs in schools, at youth-serving organizations such as the YMCA and Scouts, in church youth groups, and in detention centers and correctional facilities.

Prevention presentations are tailored to time allowances, with some as brief as 20-30 minutes and others integrated into multi-week school or parenting programs. Middle school programs have been targeted by a number of prevention initiatives to reach both males and females, preteens and teens with younger siblings, and youngsters who are beginning to baby-sit. This population is described as an ideal audience because they become good messengers of the information provided. Some prevention specialists describe the growing use of trained high school students to provide education to middle schoolers.

The importance of introducing SBS information in birthing hospitals prior to discharge of a newborn and in home visitation programs to parents of infants and young children is emphasized. Less often discussed, but recommended, are proposals to include SBS information in baby-sitting classes, childbirth or other prenatal classes, in "Boot Camp for Dads" and responsible fatherhood programs, in health departments, during visits to pediatricians' offices, in early intervention programs, and in work places. Great importance is placed on getting prevention information to all household members including fathers, mothers' boyfriends and fathers' girlfriends when relevant, as well as extended family members. The need for ongoing support for civilian and military families with newborns, and the importance of each individual developing skills and a plan for coping with frustration, anger and stress when caring for a baby are constant themes.

Several presenters and many family members emphasize the importance of incorporating SBS information in training and licensing requirements for child care providers. Currently, there are few if any systematic efforts to provide such education. In addition, more education of the general public about SBS and as its early symptoms would assist families in educating their child care providers and withdrawing their children from care immediately if they have any suspicion that shaking may have occurred. Several presenters recommended that SBS prevention include guidelines for parents about how to select a child care provider. Trained childcare providers can also help educate parents about SBS.

A broad array of prevention materials is described by presenters. Several groups relatively new to prevention emphasize the importance of not "reinventing the wheel," but instead, increasing dissemination of quality materials that are already available. Prevention programs currently use print materials, videotapes, posters, public service announcements, billboards, bumper stickers,

bus signs, bus stop signs, T-shirts, and rattles. Videotapes are consistently reported by target audiences as most effective in communicating information about SBS and how to cope with crying babies. With prisoners especially, video clips and interactive activities are reported to be more effective than pamphlets. In general, a combination of strategies is described as the most valued approach to disseminate information about SBS.

Other recommendations for future use in prevention are magnets, bookmarks, notepads, bibs, door hangers, danglers for rear view mirrors, stickers, lapel buttons, pencils, newsletters, portable and permanent displays, tote bags, ribbons, and screen savers for computers. Another strategy is the availability of warmlines or hotlines for caretakers to call when they are feeling frustrated with a baby.

Efforts to evaluate prevention programs are increasing. However, the key standard for measuring prevention efforts is a reduction in the number of cases of SBS; however no accurate statistics are available. In addition, many conference attendees acknowledged that the incidence of SBS, especially if it includes mild and moderate cases that may never come to medical attention, will probably never be known.

Several prevention groups report evaluation findings using a pre-test and post-test model with an interceding prevention program. They report that pre-test knowledge is consistently lowest for non-whites and young males, although the strongest predictor of low pre-test scores is no previous knowledge of SBS. Post-test scores show increases in knowledge as a result of education, and participants overwhelmingly rate prevention programs as helpful. A second method of evaluation, reported by several groups, is systematic follow-up with people receiving SBS information. In these studies, common reports were that more than 50% of respondents had not previously been given a brochure or watched a video about SBS. Whether the feedback is collected by random sampling or as one component of a prevention program, consistently, 90% or more respondents believe that SBS prevention is important.

A third, more recent approach to evaluation is the use of focus groups to gather feedback from men about specific messages and materials used in prevention. Results reveal that males think words and video images that strike an emotional chord and convey a strong message are most effective. They report that messages using

the phrase, "Never Shake a Baby" impact them more than a phrase using the words, "Please Don't Shake a Baby." Prevention specialists recommend more studies with focus groups of varying ages and both genders to help shape effective strategies.

Those conducting evaluation suggest there is growing knowledge among the public about the dangers of shaking babies, but repetition of the message through various methods remains critical. Furthermore, while many people have heard about the dangers of shaking babies, they are not aware of the specific injuries or potential catastrophic nature of SBS; this information also needs to be integrated into prevention.

Consistently, presenters emphasize the importance of communicating to all generations of caregivers that shaking a baby or child is never okay. Several presenters indicated that the general public does not intuitively know that shaking a baby is dangerous, but that knowledge is growing primarily through school programs and television. The goal is that 100% of people be educated about SBS.

One of the most prevalent problems described in SBS prevention is financial support. Most prevention specialists rely on very little money to conduct their efforts. The most commonly reported source of support is Children's Trust and Prevention Funds. Other sources of funding include private foundations and local benefit organizations such as Exchange Clubs, Junior Leagues, Kiwanis, Rotary, and Lion's Clubs. Joint partnerships to begin, implement, and maintain SBS prevention programs are fundamental to success, as is community involvement. SBS prevention is both a community health problem and an important issue in preventive medicine. Unfortunately, prevention efforts are not often highlighted or promoted until cases of SBS occur locally or receive significant national attention.

While funding for prevention is often scarce, prevention is much less costly than intervention. The combined expense of medical care, respite care, rehabilitative therapy, special education, technologic support, prosecution, protective services, incarceration, and lost productivity is astronomical, and much of this cost is born by the public. It can cost more than $1 million dollars to care for one severely disabled child in the first few years of life; by contrast, prevention can be done for a few dollars or less per person. A key issue is not so much what it will cost to prevent SBS, but how much it will cost the children, families, and society not to prevent it.

In some states, legislation mandates that SBS information be provided to parents of newborns; in at least one other state, legislation is being sought to mandate such education at the middle school level. Legislation, however, has not always been accompanied by the funding needed for such programs. Public policy and financial support for prevention are far overdue.

Although there is consensus that prevention is important, prevention specialists are cautioned by physicians and prosecutors to make sure that the information they disseminate is accurate lest it misinform the public or serve as a defense in court. Because potential jurors are excused from hearing a case if they know the parties involved, know the facts of the case, have been victimized themselves, or know someone who has been, their only source of prior education tends to be what they have learned through prevention programs and the media. Admonitions are given to avoid saying in brochures, for instance, that bouncing a baby on the knee or rough play can cause SBS. Such misinformation may make it difficult to achieve justice, in part because false messages may have been communicated to jury members before they are called to hear an SBS case and may predispose their thinking. Great care must be taken to make information as accurate as science allows, and prevention specialists are advised to have materials periodically reviewed and approved by medical experts.

Many professionals of various disciplines agree that setting a goal of zero tolerance toward shaking or cranial impact could be helpful in educating the public, including judges and potential jurors, and eliminating the issue of intent in criminal cases. Prevention professionals stress the importance of documenting SBS programs, including gathering signed statements from individuals who have received information about the dangers of shaking babies and young children. Such documents are potentially powerful aids in the prosecution of these cases.

Glossary

Anterior-posterior	Front to back
Apnea	Short-term cessation of breathing
Arachnoid	A delicate membrane attached to the innermost layer around the brain by web-like fibers that allow for movement of cerebrospinal fluid
Artifact	A feature or finding that is artificial and not related to actual disease or injury process
Axonal retraction balls	Bulb-like structure at torn edges of axonal process, a histological manifestation of diffuse axonal injury seen in abusive head injuries
Babygram	Lay term to describe a skeletal survey of every bone in an infant's body
Bucket handle or corner fracture	Fracture of the metaphyseal or corner region of an extremity
Cerebral edema	Swelling of the brain
Cerebrospinal	Relating to the brain and spine axis
Cerebral herniation	Movement of parts of the brain from one area to another, forming a brain protrusion which may put pressure on vascular or nervous tissue

Coagulopathy	An abnormality of blood clotting
Coronal	Dividing the body into anterior and posterior portions; cross section of brain or tissue
Corpus callosum	A large collection of nerve fibers connecting the two halves of the brain
Diaphyseal	Relating to the center or middle of long bone extremities
Differential diagnosis	Sorting out possible diseases or injuries that could explain clinical findings in order to identify the correct condition or problem
Diffuse axonal injury	Shearing of the nerve fibers in the white matter of the brain secondary to severe head trauma
Dura	Tough fibrous membrane that surrounds the brain and is attached to the inner surface of the skull
Encephalopathy	A disease of the brain
Epidural hemorrhage	Bleeding between the dura and the skull
Etiology	Study of the cause of disease

Extraaxial	In brain injury, particularly refers to the area outside the brain but inside the skull
Flame retinal hemorrhage	Flame-shaped hemorrhages that occur in the superficial nerve fiber layer of the retina
Focal	Concentrated in one area; localized
Forensic	Of legal interest or importance; applying medical facts to legal issues
Fundoscopic	Looking at the back or fundus of the eye
Gastroenteritis	Inflammation of the lining membrane of the stomach and/or intestines
Gastrostomy	An operation to make opening into the stomach to permit insertion of a tube for assisted feeding
Glascow Coma Scale	Scale which grades level of consciousness based on alertness, response to command, and response to painful stimulus
Glutaric aciduria Type I	Metabolic disease, inherited deficiency of an enzyme that metabolizes amino acid glutamate, causing brain matter damage
Grand jury	A group of citizens brought together by the state to determine whether probable

	cause exists that the defendant committed the crime
Hematoma	A localized collection of blood
Hemophilia	Inherited/genetic disorder, a deficiency of a blood clotting factor causing prolonged bleeding and abnormal clotting
Hydrocephalus	Abnormal increase in head size due to fluid accumulation in the channels in or around the brain
Hypertension	High blood pressure
Hypotension	Low blood pressure
Hypotonia	Reduced muscle tension
Hypoxia	Lack of oxygenation of tissues
Infarction	Death of tissues caused by lack of blood flow
Interhemispheric fissure region	Between the hemispheres of the brain
Intracranial pressure	Pressure inside the cranial cavity (head)
Ischemia	Localized tissue injury due to obstruction of the inflow of arterial blood (loss of oxygen supply) caused by spasm, disease or trauma

Macrocranium	Enlarged size of the cranium (skull)
Macular	Having small spots or colored areas
Meningitis	Inflammation of the membranes of the brain or spinal cord, usually due to bacterial infection
Metaphyseal	Pertaining to the transitional areas between the shaft and end of a long bone
Neuroimaging	Radiology studies of the brain and/or spine
Occult	Hidden or unseen
Optic sheath injury	Damage to the connection between the retina and the brain
Ophthalmologist	Physician specializing in diseases and defects of the eye
Otitis media	Infection, usually bacterial, of the middle ear canal
Papilledema	Swelling of the optic disc of the retina; may be due to raised intracranial pressure
Parenchymal	Related to the essential parts of an organ which are concerned with its function, such as brain tissue

Pathognomonic	Distinctively characteristic of a particular disease
Preliminary hearing	A judge sit and listens to the evidence to determine whether probable cause exists that the defendant committed the crime
Preretinal	In front of the retina
Radiograph	Standard X-ray films
Retinoschisis	Splitting of the retina
Sepsis	The presence of harmful microorganisms in blood
Subarachnoid Hemorrhage	Bleeding below the arachnoid membrane
Subgaleal	Under the scalp and on top of the skull
Tracheostomy	An operation to make an opening into the trachea to permit insertion of a tube for assisted ventilation
Ultrasonography	X-rays using sound waves transmitted through the body or organ to produce an image

Contact Information

Sponsor

National Association of
Children's Hospitals
and Related Institutions
401 Wythe Street
Alexandria, VA 22314
703-684-1355
Fax 703-684-1589

Author

Jacy Showers, EdD
SBS PREVENTION PLUS
217 County Road 119
Florence, CO 81226
719-784-3330
Fax 719-784-4040

Conference faculty, location and presentation titles

Acworth, Kim (717-846-5414 - York, Pennsylvania), Troy De La Rosa (719-635-7982 - Colorado Springs, Colorado), Debbie Eappen, MD (Weston, Massachusetts), Lisa Gaskell (757-489-3503 - Norfolk, Virginia) and Janet Goree (727-539-7954 - Clearwater, Florida). *SBS Families: How the System Affects Us, How We Effect Change.*

Becker, Kevin, PsyD (617-731-3200 - Brookline, Massachusetts). *Post Traumatic Stress Disorder: Beyond Survival and Memories, Memorials and Missions: Where Do We Go From Here?*

Bernier, Jetta M., MA (617-742-8555 - Boston, Massachusetts). *How to Use High Visibility Cases to Promote SBS Prevention.*

Bodel, Mary-Garrett, MEd, MSW (703-236-6000 - Alexandria, Virginia). *Brain Building Basics: A Violence and Brain Injury Program.*

Britton, Helen, MD (801-588-3650 - Salt Lake City, Utah). *A Medical Primer: Anatomy, Pathophysiology, and Clinical Course of A Shaken Baby.*

Britton, Helen, MD (801-588-3650 - Salt Lake City, Utah), Rich Boyer, MD (801-588-2470 - Salt Lake City, Utah) and William Nixon, MD (801-588-2470 - Salt Lake City, Utah). *Medical Imaging: Critical Clues in the Diagnosis of Shaken Baby Syndrome.*

Buckley, David M. (312-876-1600 - Chicago, Illinois). *The Reid Technique of Investigative Interviewing for Shaken Baby Syndrome Investigations.*

Byron, Beverly L., RN, MSN (301-217-3176 - Silver Springs, Maryland). *Community Health Nurses: Front-Line Educators for the Prevention of Shaken Baby Syndrome.*

Case, Mary E., MD (314-522-1028 - St. Louis, Missouri). *Spinal Cord Injury in Child Abuse by Shaking.*

Casey, Elisa (803-871-2258 - Ladson, South Carolina), Everette Dannar (785-453-2360 - Overbrook, Kansas), and Cheri Robertson (909-699-4800 - Temecula, California). *1996 Parent Panel Revisited: Have Two Years Made a Difference?*

Casey, Mike (803-871-2258 - Ladson, South Carolina), Sunny Eappen, MD (617-732-7777) - Weston, Massachusetts), Mike McGinnis (314-405-0253 - Wildwood, Missouri) and Michael Trahan (501-890-5944 - Russellville, Arkansas). *Daddies of Victims Speak Out: Males Cope with SBS Differently.*

Chadwick, David, MD (619-579-6066 - La Mesa, California), Cindy Christian, MD (215-590-2058 - Philadelphia, Pennsylvania), Dyanne Greer, MSW, JD (602-506-5999 - Phoenix, Arizona), Kent Hymel, MD (301-319-4570 - Bethesda, Maryland). *Shaken Baby Syndrome: Fact, Fiction and Controversy.*

Cobb, Sandra, MSW (214-818-2622 - Dallas, Texas). *Loss of Control Can Result in Shaking Injuries.*

Collins, Kim, MD (843-792-1655 - Charleston, South Carolina). *Pediatric Homicide by Shaking: A Ten Year Retrospective Study.*

Conway, Edward E., Jr., MD (212-870-9692 - New York, New York). *Outcome of Pediatric Patients Admitted to the Pediatric Intensive Care Unit (PICU) with Shaken Baby Syndrome.*

Cullen, Bernard J., MD (419-893-2591 - Toledo, Ohio) and Carol, mother (Ohio). *No One Would Listen.*

Dean, Howard, MD (802-828-3333 - Montpelier, Vermont). *Shaken Baby Syndrome: Whose Problem is This?*

DerOhannesian II, Paul, JD (518-487-5460 - Albany, New York). *Jury Persuasion and Shaken Baby Cases.*

Downey, Susan (St. Paul, Minnesota), Jane Swenson, MS, CPNP (612-220-6703 - St. Paul, Minnesota, Lisa Winer (717-845-3041 - York, Pennsylvania) and Nina Born, RN (717-845-2908 - York, Pennsylvania). V*olunteer Organization Approach to a Child Abuse Problem: Shaken Baby Syndrome.*

Dully, Kathleen, MD (760-725-0397 - Camp Pendleton, California). *Neck and Cervical Spine Injuries in SBS and Accidental Head Trauma.*

Easter, Richard P., MS (573-751-0850 - Jefferson City, Missouri). *Scene Investigation in Shaken Baby Syndrome.*

Fetterman, Sharon I., MD (Alabama). *Elevated Liver Function Tests as a Marker of Delay in Seeking Treatment in Child Abuse.*

Frasier, Lori D., MD (573-882-3713 - Columbia, Missouri) and Kenneth Bopp, PhD (573-882-8412 - Columbia, Missouri. *Economic Consequences of Survivors of Shaken Baby Syndrome.*

Galbreath, Nathan, MFS (801-777-1852 - Hill Air Force Base, Utah). *I Want to Believe: Practical Investigative Steps for Head Trauma Cases.*

Goldie, William D., MD (805-289-3311 -Ventura, California). *Survivors of SBS - Challenges for Obtaining Needed Services.*

Goodman, Stephen I. MD (303-315-7301 - Denver, Colorado) and Andrew Sirotnak, MD (303-861-6919 - Denver, Colorado). *Evaluation of Abusive Head Trauma and GA 1 (Glutaric Aciduria Type I).*

Goree, Janet, grandmother (727-539-7954 - Clearwater, Florida) and Charlie Peters, BSIE (727-539-5023 - Florida). *Turning a Personal Tragedy into a Statewide Prevention Campaign.*

Greer, Dyanne C., MSW, JD (602-506-5999 - Phoenix, Arizona) and Kay Rauth-Farley, MD (602-406-3716 - Phoenix, Arizona). *Anatomy of a Shaken Baby Case: Investigation to Verdict.*

Hanna, Tom, BA (607-255-7794 - Ithaca, New York), Jane Powers, PhD (607-255-3993 - Ithaca, New York) and Dorothy Forbes, MA (607-254-5450). *Better the Baby Cry: A Multi-Disciplinary Strategy for Public Awareness and Community Education.*

Handy, Tracey Corey, MD (502-852-5587 - Louisville, Kentucky). *Evaluation of Head Injuries In Infants and Toddlers in A Forensic Medicine Program.*

Holmgren, Brian K, JD (703-739-0321 - Alexandria, Virginia). *Charging, Plea Negotiation, Pre-Trial Motions and Sentencing in Shaken Baby Syndrome Cases: How Medical Science Should Inform Legal Practice and The Legal System's Role in Facilitating Irresponsible Expert Testimony in Shaken Baby Cases - Challenges, Proposals and Professional Responses.*

Hudlett, Jean Marie Margaret, MSW (414-569-9186 - Milwaukee, Wisconsin) and Stephen Lazoritz, MD (414-266-2090 - Milwaukee, Wisconsin). *The Impact of SBS on Family Relationships.*

Hymel, Kent P., MD (301-319-4570 - Bethesda, Maryland). *Coagulopathy in Pediatric Abusive Head Trauma and Comparison of Intracranial Computed Tomography (CT) Findings in Pediatric Abusive and Accidental Head Trauma.*

Jenny, Carole, MD, MBA (401-444-3996 - Providence, Rhode Island). *Abusive Head Trauma: An Analysis of Missed Cases.*

Jenny, Carole, MD, MBA (401-44-3996 - Providence, Rhode Island), Helen Britton, MD (801-588-3650 - Salt Lake City, Utah), Nate Galbreath, MSF (801-777-1852 - Hill Air Force Base, Utah), Robert N. Parrish, JD (801-366-0510 - Salt Lake City, Utah), Robert M. Reece, MD (617-587-1512 - Boston, Massachusetts), Marilyn Sandberg, SSW (801-393-3366), and Jacy Showers, EdD (719-784-3330 - Florence, Colorado). *SBS: Where Do We Go From Here?*

Johnston, Judy A., JD (612-348-5550 - Minneapolis, Minnesota) and Daniel Davis, MD (612-347-2125 - Edina, Minnesota). *Demonstrative Evidence in SBS Trials.*

Kang, Kim, parent (612-404-1395 - Wayzata, Minnesota). *SBS and the Power of the Internet.*

Khan, Karen, MS, OTR (734-261-9010 - Livonia, Michigan) and Mariann Young, PhD (734-261-9010 - Livonia, Michigan). *Case Study of the Treatment of a Male Adolescent Victim of SBS.*

Kirschner, Robert H., MD (312-288-2299 - Chicago, Illinois), Robert M. Reece, MD (617-587-1512 - Boston, Massachusetts) and Lawrence R. Ricci, MD (207-879-6161 - Portland, Maine). *Shaken Baby Syndrome: A Forensic Response.*

Kleinman, Paul K., MD (508-856-3124 - Worcester, Massachusetts). *The Importance of Diagnostic Imaging in SBS Cases.*

Laskey, Antoinette L., MD (573-882-8350 - Columbia, Missouri). *Shaken Baby Syndrome: A Missed Diagnosis.*

Lazoritz, Stephen, MD (414-266-2090 - Milwaukee, Wisconsin), and Rich Kaplan, MD (Sioux City, South Dakota). *True Confessions: Perpetrator Admissions and Clinical Correlations.*

Lazoritz, Stephen, MD (414-266-2090 - Milwaukee, Wisconsin), Michael Vendola, BA (920-832-2750) and Brian K. Holmgren, JD (703-739-0321 - Alexandria, Virginia). *The Challenges of Shaken Baby Syndrome - A New Video.*

Levin, Alex V., MD, FAAP, FAAO, FRCSC (416-813-6524 - Toronto, Ontario, Canada). *Retinal Hemorrhages in Shaken Baby Syndrome: What Have We Learned?*

Mason, Carol, MEd (206-526-2194 - Seattle, Washington) and Debbie Anastasi Black, BA (206-464-6151 - Seattle, Washington). *An Evaluation of Washington's SBS Prevention Campaign Materials.*

Morey, Ann-Janine, PhD (618-453-3466 - Carbondale, Illinois) and Joan McDermott, PhD (618-453-5701 - Carbondale, Illinois). *Writing About SBS: Issues of Ethics and Advocacy in an SBS Study.*

Morgan, J. Tom, JD (404-371-4728 - Decatur, Georgia). *The Investigation and Prosecution of Fatal and Near Fatal SBS Cases.*

Nilsson, David E., PhD, ABPP (801-532-1475 - Salt Lake City, Utah). *Neurodevelopmental Consequences of SBS: Assessment, Intervention and Long-Term Management.*

Parrish, Robert N., JD (801-366-0510 - Salt Lake City, Utah). *What Every Investigator Must Know About Shaken Baby Syndrome.*

Peinkofer, James, ACSW (219-254-7609 - Mishawaka, Indiana). *Hospital Based Shaken Infant Syndrome Prevention/Education Programming.*

Pierre, Jim, MS, LSW (218-724-7463 - Duluth, Minnesota). *Multi-media Community SBS Prevention.*

Poyer, Kimberly L., MSW, LCSW (202-305-4882 - Washington, D.C.) and Ryan Rainey, JD (202-514-7192 - Washington, D.C.). *Children Who Witness Shaking Injuries and Fatalities.*

Quasney, Michael W., MD (901-572-5355 - Memphis, Tennessee). *Do Retinal Hemorrhages Occur After CPR in Children?*

Rainey, Ryan, JD (202-514-7192 - Washington, D.C.). *Shaken Baby Syndrome: Case Evaluation and Trial Presentation.*

Rannie, Katherine, RN (603-271-3891 - Concord, New Hampshire) and Barbara Andrews, grandmother (603-473-8736 - Union, New Hampshire). *SBS Prevention in New Hampshire: Is it Exploitation to Use a Baby Who Has Been Shaken as the Focal Point of a Campaign?*

Read, Julie, RN (317-274-8863 - Indianapolis, Indiana) and Heather Blacklock, RN (317-274-8852 - Indianapolis, Indiana). *Clinical Predictors of Developmental Outcomes in Infants Suffering Non-Accidental Traumatic Brain Injury.*

Rehm, Margie K., parent (414-695-8471 - Pewauhee, Wisconsin). *The Impact of Shaken Baby Syndrome on the Family: The Life Story of Hunter Dane Rehm - Shaken Baby Syndrome Survivor.*

Ricci, Lawrence R., MD (207-879-6161 - Portland, Maine). *Collaborative Medical and Psychological Diagnostic Decision Making in Shaken Baby Syndrome.*

Rooney, Lynn C., JD (617-666-2101 - Cambridge, Massachusetts). *Murder Conviction in the Woodward Case: A Prosecutor's Insight Into What Convinced the Jury.*

Sandberg, Marilyn, SSW, Stacy Iverson, BS, Dawn Fitzpatrick, CHES, Stephen Franks, BA, and Bart Ence, RN, BS (all 801-393-3366 - Salt Lake City, Utah). *Mission Possible: Preventing Shaken Baby Syndrome Through a National Service and Effective Programs.*

Shakely, Robin, JD (916-874-7019 - Sacramento, California) and Ryan Rainey, JD (202-514-7192 - Washington, D.C.). *Preparing Ophthalmologists, Radiologists, Neuroradiologists, Neuropathologists, Forensic Pathologists, Pediatric ER Physicians and Child Abuse Experts for Courtroom Testimony.*

Shapiro, Robert A., MD (513-636-7966 - Cincinnati, Ohio) and Charles J. Schubert, MD (513-636-7966). *Strategies to Differentiate Abusive Head Injury From Non-Intentional Trauma.*

Skelding, Elizabeth H., RN (619-576-0882 - San Diego, California). *A California Perspective: San Diego Responds to SBS.*

Spivack, Betty, MD (860-232-3808 - West Hartford, Connecticut) and Kent Hymel, MD (301-319-4570 - Bethesda, Maryland). *The Biomechanics of Abusive Head Trauma - What We Know and What We Need to Learn.*

Starling, Suzanne, MD (615-343-5747 - Nashville, Tennessee). *Perpetrators of Shaken Baby Syndrome: An Update.*

Swenson, Jane, MS, CPNP (612-220-6703 - St. Paul, Minnesota), Susan Downey (St. Paul, Minnesota), and Mark Sundby, PhD (612-523-2204 - St. Paul, Minnesota). *An Evaluation Strategy for SBS Prevention Programming.*

Vondra, Mary E., RN, MS (402-354-5575 - Omaha, Nebraska). *Statewide Campaign for the Prevention of Shaken Baby Syndrome Ongoing Efforts: Male Focus.*

Waarvik, Diane, RN, CPNP (612-220-6750 - St. Paul, Minnesota) and Carolyn Levitt, MD (612-220-6750 - St. Paul, Minnesota). *A Closer Look at Intracranial Injuries Due to Falls in Infants Less Than Two Years of Age.*

Weathers, Laura, MD (813-272-2268 - Tampa, Florida), Stephen Lazoritz (414-266-2090 - Milwaukee, Wisconsin) and William G. Brooks, Jr., MD, MPH (Tampa, Florida). *Twice Shaken: Recurrent Episodes of Shaken Baby Syndrome.*

Willard, Maryellen D., BSN, MPA (Somerville, New Jersey) and Kathleen M. Wright, RN, C, S.A.N.E. (973-383-8400 - Branchville, New Jersey). *An Interdisciplinary Approach to Shaken Babies: The Role of the Pediatric Nurse Consultant in Child Protection.*

Winer, Lisa M, BS, Nina Eldridge Born, RN, Philista Almquist, BS and Jane Lyter (all 717-845-3041 - York, Pennsylvania). *SBS Prevention: Inception, Intervention and Implementation of a Collaborative Community Project.*

Winkler, Sarah, BA (512-303-5061 - Cedar Creek, Texas) and Juan Parra, MD, MPH (210-358-3971 - San Antonio, Texas). *The Children's Trust Fund of Texas' Shaken Baby Syndrome Public Awareness Campaign.*