

Shaken Baby Syndrome

An investigator's manual

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About the Author

Craig Smith retired from the Royal Canadian Mounted Police in 2000, after a 27-year career. He spent 17 of those years in plainclothes sections dealing primarily with homicide, sex crimes, and child abuse cases. Since his retirement, he has given presentations to more than 11,000 police officers, child protection workers, and other professionals, on sex crimes, interviewing techniques, child physical and sexual abuse, and Shaken Baby Syndrome investigations, throughout Canada, the United States, Australia, Singapore, and the Philippines.

Craig is an author of the *Manual for the Investigation of Child Sexual Abuse* (1988), and *Guidelines for Child Abuse Investigations* (1999). He was a member of the working group that developed the *Multidisciplinary Guidelines for the Identification, Investigation and Management of Suspected Shaken Baby Syndrome* (2004), a contributor to *Child Maltreatment — A Comprehensive Photographic Reference Identifying Potential Child Abuse* 3rd Edition (2005), and completed the (2006) revision of the Royal Canadian Mounted Police-sponsored manual *An Investigative Guide for Sexual Offences*. Craig also helped develop the RCMP sex crimes investigator course and was the facilitator for the first on-line, nation-wide sex crimes course, run for the RCMP (2008).

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Craig would like to dedicate this work to his mentors: Dr. Keith Aronyk, Dr. Graeme Dowling, Dr. Lionel Dibden, Dr. Alex Levin, Dr. Randell Alexander, Dr. Marcellina Mian, Dr. Tom Nakagawa, Dr. Ronald Barr, Marilyn Barr and all of the members of her staff at the National Center on Shaken Baby Syndrome and finally the late Special Agent Michael Vendola - Wisconsin Department of Justice. The author would also like to acknowledge the very helpful knowledge and advice provided by RCMP Major Crime Staff Sergeant Rob Parker on earlier drafts of this manual.

Foreword by Russ Nash, Superintendent, R.C.M.P.

As the Officer in Charge of the "E" Division Major Crime Section and an investigator who has conducted these types of investigations in the past, I wholeheartedly endorse this manuscript as an excellent aid for conducting Shaken Baby Syndrome investigations.

Death and/or serious injuries involving children have historically presented as extremely problematic investigations as they are highly emotional situations where there are rarely eyewitnesses, the victim cannot speak for him/herself, and the medical evidence is generally offered with a degree of ambiguity. This guide offers practical tips and suggestions that will prove to be very useful to police and Child Protection Services workers.

The author has done a masterful job in making sense of medical jargon, providing insight into the offender, and offering investigative tips and techniques which would allow an investigator to obtain the type of evidence necessary to advance charges. As outlined by the author, these offences present as a crime of exclusive opportunity, and this manuscript offers investigational techniques which will provide the investigator with the ability to recognize those cases involving Shaken Baby Syndrome, identify the person responsible, and offer practical instructions on obtaining the necessary evidence which is crucial to a successful prosecution. I commend the author for this instructional manual and recommend this as a handy reference guide for investigators.

Shaken Baby Syndrome

A baby continually cries and screams. The caregiver, perhaps an exhausted parent, grandparent, or babysitter, repeatedly tries to soothe the child with no success. Many “good” caregivers have found themselves in this situation. In some cases, they lose their temper with the incessantly crying child. On very rare occasions, the caregiver becomes violent with the baby as a result of exhaustion, frustration, or an inability to deal with the crying infant.

This guide addresses the aftermath of these violent responses and discusses what happens when an adult violently shakes a baby to the point of causing serious injury or even the death of the child. This form of child abuse is commonly referred to as Shaken Baby Syndrome (SBS).

This manual also provides details on a hypothetical case, the circumstances of which led to the kind of questions asked by an investigator involved with an SBS case. By following the details of the hypothetical investigation and reviewing the questions and answers, the reader will gain a deeper understanding of the obstacles faced by investigators and understand the step-by-step techniques used to overcome these obstacles.

The goal of this manual is to provide a practical, plain language overview of Shaken Baby Syndrome. The manual does not attempt to address the issues of prevention or medical treatment, but is intended to provide guidance to police officers, social workers, and prosecutors who respond to or investigate Shaken Baby Syndrome cases. For the typical investigator, who is not a doctor, many of the medical terms can be confusing. For this reason, the manual also provides a glossary of medical terms.

What is Shaken Baby Syndrome?

Shaken Baby Syndrome (SBS) is a condition that results from an infant being shaken violently by a caregiver (Health Canada, 2001). It is a leading cause of death in infants under the age of two years old (Nakagawa and Conway, 2004). SBS is a term used to describe not only the unique constellation of injuries suffered by the child, but also the way in which the child is injured. The main cause of injury is the severe rotational acceleration-deceleration that the child’s head experiences.

Shaken Baby Syndrome is a leading cause of death in infants under the age of two years old

The most common acceleration-deceleration injuries occur when an adult holds an infant by the torso and shakes the child violently. In SBS cases, the shaking is so severe that the baby’s forward head movement may result in the chin striking the chest and the backward movement may actually cause the child’s head to strike the spine. The head travels in a rotational arc moving from side to side, as well as forwards and backwards. The resulting violent, rotational forces stress the brain to the point where blood vessels and brain cells shear and tear (Vendola, 2002). Fractures of the skull, long bones, and ribs may also occur and are often an indication that the child has not only been shaken, but has also been impacted against a hard surface.

Is Shaken Baby Syndrome a newly discovered form of abuse?

While it was not referred to initially as Shaken Baby Syndrome, the first reported association between babies suffering from both long bone fractures and subdural hematomas was in 1946 from an American pediatrician and radiologist, Dr. John Caffey. Twenty-five years later, in 1971, Dr. Gutkelch, a British physician, suggested that subdural bleeding was caused by extreme, whiplash type forces that tore the tiny bridging veins that transport blood to the brain. One year later, Caffey (1972) coined the term “Whiplash Shaken Infant Syndrome” to describe infants who had no external signs of trauma, but showed internal signs, such as subdural bleeding, retinal bleeding, and long bone fractures. In 1984, Ludwig and Warman introduced the term Shaken Baby Syndrome in their study of infants who had been shaken, but showed no external signs of trauma.

The three most commonly found injuries in Shaken Baby Syndrome cases are:

- 1. bleeding in and around the brain, also called subdural or subarachnoid hematomas;*
- 2. retinal hemorrhaging, or bleeding in the different layers of the back of the eye; and*
- 3. brain swelling, also known as cerebral edema.*

Are there other terms for Shaken Baby Syndrome?

Over the years, there has been a move to the use of an alternative name for Shaken Baby Syndrome. In particular, lawyers have objected to the SBS term and this has caused medical practitioners to try to find a less pejorative, more inclusive and less descriptive term. In some fields, SBS is commonly referred to as Inflicted Traumatic Brain Injury (ITBI), Non-Accidental Head Injury (NAHI), or Inflicted Childhood Neurotrauma (ICN). The term that seems to be most popular and is used by both the Canadian Paediatric Society and the American Academy of Pediatrics is Abusive Head Trauma (AHT). While the term Abusive Head Trauma does include shaking with and without impact, it can also include a host of non-shaking injuries, such as blows to the head, cutting, and crushing injuries. The AHT term is also non-specific in relation to the age of the victim and can include injuries to adolescents and adults. However, this guide deals exclusively with injuries to infants. Specifically, it addresses injuries that result from violent shaking, with or without impact. Therefore, the term Shaken Baby Syndrome (SBS) will be used in this guide to describe this particular form of abuse and to differentiate it from other forms of child abuse that may involve injuries resulting from other actions.

In SBS incidents, the child is usually grasped by the torso or the arms and shaken violently back and forth. In some cases, the child may be held by the arms and legs or a combination of an arm and a leg and violently shaken. The child may also be slammed against a hard surface.

What actually occurs during an SBS incident?

Independent witnesses to SBS are rare. Given this, an account of how the child sustained their injuries can often only be obtained from confessions of perpetrators and/or from comparisons with accidental injuries. As noted previously, in SBS incidents, the child is usually grasped by the torso or the arms and shaken violently back and forth. In some cases, the child may be held by the arms and legs or a combination of an arm and a leg and violently shaken. The child may also be slammed against a hard surface. If the infant strikes a hard surface, such as a table, skull fractures or bruising may occur. This would more properly be referred to as Shaken Impact Syndrome. The baby may also be slammed against a soft surface, such as a mattress, and show no bruising or other outward signs of trauma. However, biomechanical and animal tested research has demonstrated that if a child is violently shaken and the head suddenly strikes a stationary object, the gravitational forces resulting from that sudden deceleration can be magnified nearly 50 times (Duhaime et al., 1987).

How violent and prolonged is the shaking in an SBS incident?

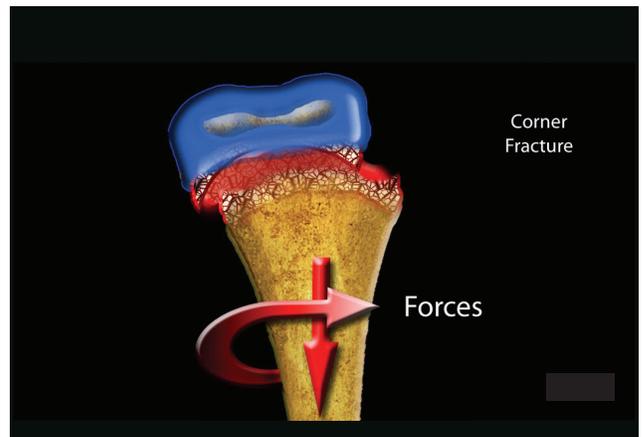
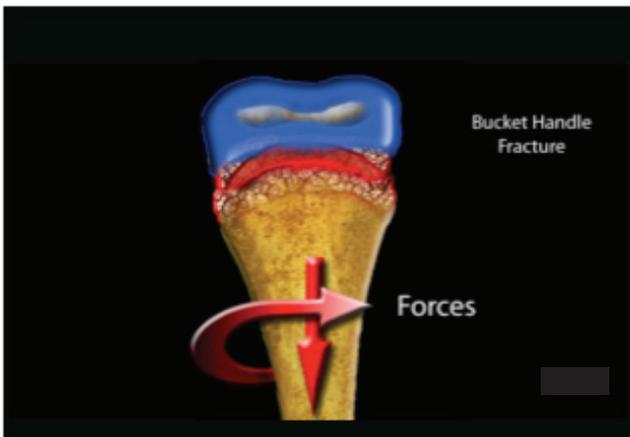
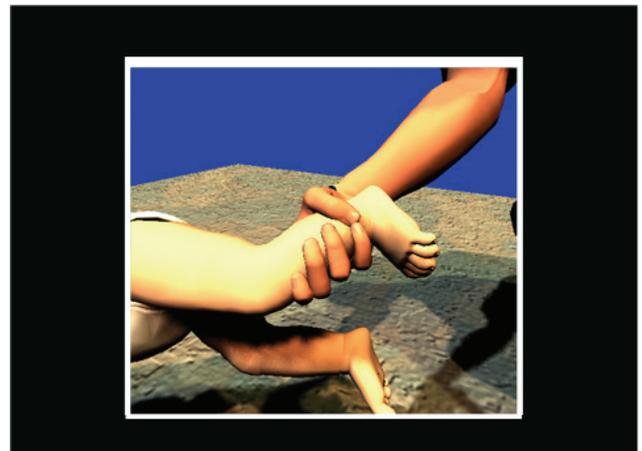
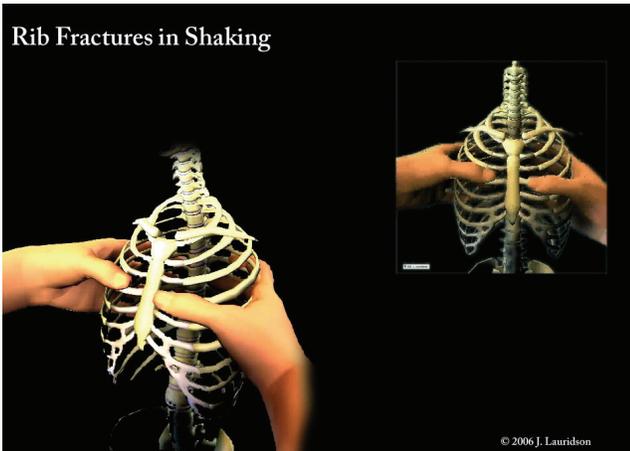
The perpetrator's actions in SBS are extremely violent. The severity of the shaking causes injuries that are far greater than those resulting from normal activity, such as rough playing. The currently accepted definition of SBS is that a neutral observer, witnessing this type of behaviour, would immediately recognize that the perpetrator was in danger of killing the child (Health Canada, 2001). Since the 1990's, there has been a growing body of medical and bio-mechanical research that has clearly identified the amount of force generated by perpetrators of this type of child abuse. Unfortunately, most medical personnel, police officers, child protection workers, and judges still know very little about the mechanism of injury and, therefore, they underestimate the amount of force used by perpetrators in these types of cases.

Biomechanical research has demonstrated that the average child who is shaken to the point of death or serious injury has sustained an average of between 5-20 seconds of shaking with as much as 2-3 shakes per second. The most damaging aspect of the shaking occurs when the child's head has gone through approximately three shakes as this is when the head begins to rotate in a violent, acceleration-deceleration movement.

Do shaken babies usually end up with broken bones?

Babies are actually quite malleable because their bones have not become inflexible, like in adults, but are more like cartilage. For example, an infant may be run over by a vehicle without sustaining any rib fractures because the rib cage in young children is still extremely flexible. In SBS cases, the perpetrator will often grab the child by the torso with the thumbs being placed on the front of the ribs and the fingers lining up along the child's spine. This leveraging position may cause the child's ribs to break near the junction with the spine. These breaks are called posterior rib fractures. Lateral rib fractures may also result from this leveraging in a manner that is similar to squeezing a Styrofoam coffee cup from front to back and seeing breaks along the sides. While rib fractures are highly suspicious, they are found in less than one-third of all Shaken Baby Syndrome cases (Reece, 2009).

When a baby is shaken, their limbs flail about violently. Twisting and pulling forces resulting from the shaking may cause fractures to the growth plates at the ends of the long bones. These fractures can also occur if the child is swung violently by either an arm or a leg. These injuries are only seen in violent child abuse cases and they are called classic metaphyseal lesions, or bucket handle or corner fractures.



What are the medical outcomes associated with SBS?

Approximately one-quarter of victims of SBS die. Another 50% are left with serious neurological impairments that may include speech and behaviour problems, cerebral palsy, paralysis, blindness, or falling into a complete vegetative state. The remaining one-quarter of victims appear uninjured; however, recent long-term studies have concluded that approximately one-half of these seemingly uninjured children subsequently develop behavioral problems, speech and coordination difficulties, visual problems, and learning difficulties once they reach school age and can be assessed on a greater range of skills and abilities (Healthy Child Manitoba, 2000).

How old are SBS victims?

Newborn babies have disproportionately larger heads than older children or adults. Their weak neck muscles initially have difficulty holding their head up. The newborn's brain is also quite soft and does not completely fill the skull cavity. Essentially, the brain floats in cerebral spinal fluid. All of these factors make the newborn most susceptible to damage from violent shaking incidents. The most important factor is the discrepancy in size and power between the victim and the perpetrator. As the child increases in size and weight, not only do they become more robust, but it also becomes much more difficult for an offender to hold them in the air and shake them violently for extended periods of time. As a result, most SBS victims are under the age of one year old; however, there have been cases of children being shaken at the age of two, three, and even four years old. The oldest recorded case of death by shaking involved a 30 year old male Palestinian terror suspect who was violently shaken by two Israeli "interrogators." They took turns violently shaking the man until he died. At the autopsy, the unique constellation of injuries noted in Shaken Baby Syndrome case was found to be also present in this adult subject (Pounder, 1997).

Approximately 30 per 100,000 children under the age of two years old are shaken violently each year

How common is Shaken Baby Syndrome?

A study in Scotland found that approximately 24.6 per 100,000 children each year were shaken to the point of death or severe brain injury (Barlow and Minns, 2000). Similarly, a North Carolina study showed rates of approximately 30 per 100,000 children under the age of two years were shaken violently each year (Keenan et al., 2003). It is likely that these studies underestimate the true number of children who are violently shaken each year because they only include those infants who were correctly diagnosed or brought to the attention of either law enforcement or a medical facility.

Could injuries from an accidental fall be mistaken for SBS?

Extensive research has shown that “short falls” or falls of less than ten feet do not cause serious brain injury or death in children. By comparison, SBS injuries more closely resemble physical damage resulting from high speed motor vehicle accidents or multi-story falls. This is because most “short falls” involve translational forces that involve a direct impact to one plane of the body causing one localized injury; however, the shearing forces found in SBS are caused by rotational forces that tear apart the structures of the brain (O’Keefe, 1997).

At the less severe end of the spectrum, infants subjected to violent shaking will often appear lethargic, unresponsive, and irritable with bouts of vomiting, an inability to feed, and periods of staring. More severe shaking will result in a bulging fontanel from brain swelling, seizures, breathing difficulties, minimal response to pain, unconsciousness, and death.

Can a child be shaken by one caregiver and not display symptoms of that abuse until sometime later when they may be in the care of someone else?

Simply put, no. A child who is violently shaken will be symptomatic immediately. They will not be able to walk, talk, crawl, follow objects with their eyes, or eat. This is one of the most crucial pieces of information for investigators who can use the time when the child was last well (walking, crawling, eating, smiling, etc.) as an “anchor point” on a time-line. When the child becomes unwell (e.g. a 911 call is placed) this should be noted as a second point on the time-line. The period between the “anchor point” and the second point on the time-line is known as “the window of opportunity”. Investigators then determine who was present with the child during this window of opportunity to determine who was responsible for inflicting the injuries to the child. Critically, there is no peer reviewed medical research or evidence to suggest that a child will have a “lucid interval”, or a time of being well, after being violently shaken.

What are the immediate symptoms that will be seen in a child that has been violently shaken?

The child will show a marked departure from their previous behaviour. At the less severe end of the spectrum, the infant will often appear lethargic, unresponsive, and irritable with bouts of vomiting, an inability to feed, and periods of staring. More severe shaking will result in a bulging fontanel (from brain swelling), seizures, breathing difficulties, minimal response to pain, unconsciousness, and death (Nakagawa and Conway, 2004).

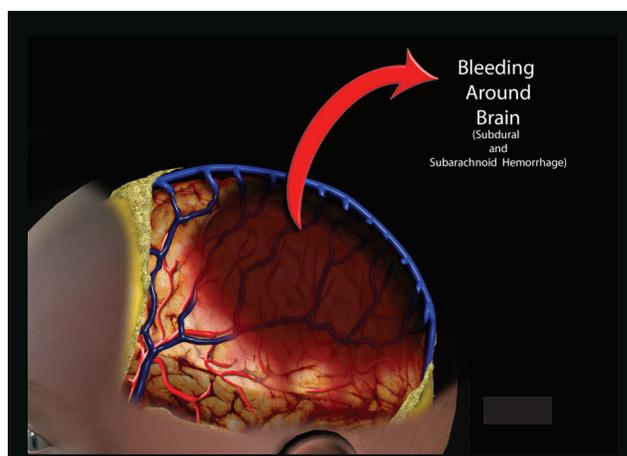
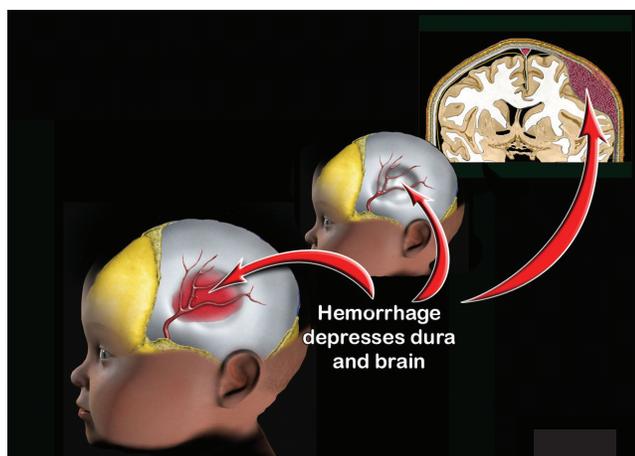
Are these symptoms clearly recognized as child abuse by doctors?

Doctors do not always recognise the symptoms of SBS. Many SBS symptoms, such as lethargy and vomiting, which can be the result of violent shaking, can often mimic common childhood illnesses, such as the flu. Research from one American study concluded that nearly one-third (31 per cent) of children under the age of three years old presented with abusive head injuries that were missed by medical personnel when they were first seen (Jenny et al., 1999). More than one-quarter (28 per cent) of these children were re-injured after the original missed diagnosis. This led the researchers to conclude that four-fifth of the deaths in the group might have been prevented if abusive head trauma had been initially recognized (Jenny et al., 1999). In a Canadian study, 60% of all Shaken Baby Syndrome victims showed signs of some previous maltreatment (King, MacKay, & Sirmick, 2003).

Are the head injuries in SBS similar to delayed injuries that occasionally kill athletes involved in contact sports?

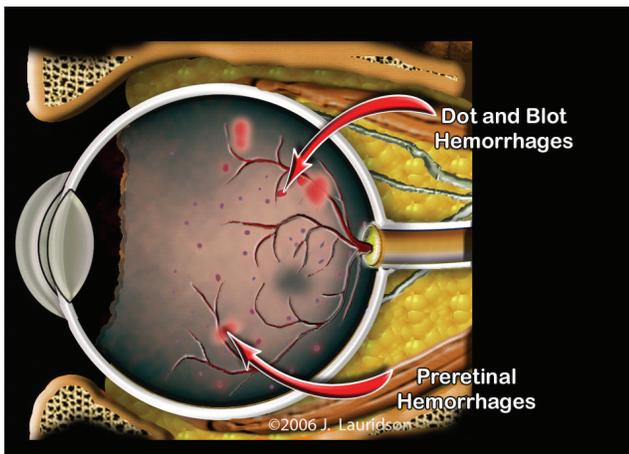
There are distinct differences between the injuries suffered by victims of SBS and athletes who participate in contact sports. The main reason for this is that contact sport injuries involve a very different mechanism of injury. A famous example is the death of Natasha Richardson, the actress wife of Liam Neeson, on March 18, 2009. Richardson struck her head when she had a minor fall during a skiing lesson in Quebec. She initially refused medical treatment and appeared to be fine. Several hours later, she began having headaches and she was eventually rushed to hospital where she died. Richardson died from an Epidural Hematoma, not a Subdural Hematoma. The blow to her head ruptured the large meningeal artery which lies on top of the membrane known as the dura. The slow continuous bleeding of the meningeal artery eventually put pressure on her brain and caused her death.

Contrast this with the Subdural bleeding found in SBS. Here, the bleeding is caused by the tearing of tiny bridging veins, not the meningeal artery. The bleeding underneath the dura is minimal, and although it is a marker injury for doctors, it is not fatal. (King, MacKay, & Sirmick, 2003).



What are retinal hemorrhages and what is its relationship to Shaken Baby Syndrome?

Bleeding in the back of the eye or the retina of an infant is often an indication that they have been severely shaken (Parrish, 2001). Retinal hemorrhages are different from petechial hemorrhages which may be clearly visible, even to non-medical investigators, in the whites of the eyes and are often seen in strangulation cases. Retinal hemorrhages can only be diagnosed by a doctor, preferably an ophthalmologist, examining the back of the eye. The eye is filled with a jelly-like substance called vitreous which is attached to the inner lining of the eye (the retina). The retina is multi-layered and is lined with blood vessels. During violent shaking episodes, the vitreous heaves and tears the blood vessels within the various layers of the retina. The resulting "bleeds" are known as "dot" (smaller) or "blot" (larger) hemorrhages. While a few retinal hemorrhages can be caused by pressure exerted during child birth, these are flame like in appearance and will usually disappear within a week or so (Parrish, 2000). There are a few rare metabolic disorders and diseases that can cause retinal hemorrhages, and there have also been rare cases where high speed motor vehicle accidents have caused retinal hemorrhages in infants (Makoroff, 2010). However, extensive multi-layered retinal hemorrhages and bleeding around the optic nerve are extremely rare in children in cases other than Shaken Baby Syndrome. In fact, retinal hemorrhages are present in approximately 85% of all SBS cases (Lauridson, 2006).



Why would anyone violently shake a baby?

Confessions by offenders consistently show that the most common precipitating factor for shaking a child involve frustration on the part of the caregiver. This often results from a baby's incessant crying, but other actions, such as a child spitting up on the caregiver or spilling food, can often be the reason behind the caregiver's violent response. Although no actions on the part of a child can justify this type of abuse, it is extremely important for the investigator to learn what actually triggered the abuse. This information can often be used during an interrogation, in order to minimize the moral actions of the offender. It should be noted that this interrogation technique in no way minimizes the legal responsibility of the offender.

What has been learned through the confessions of offenders?

Perpetrator confessions have confirmed several of the main medical conclusions previously outlined in this guide. One study examined cases of serious or fatal child abuse, where perpetrators admitted to deliberately injuring an infant, and found that there was no significant difference in the outcome for the victims regardless of whether the offender had shaken, impacted, or both shaken and impacted the child (Starling et al., 2004). This finding supported the position that shaking alone is enough to cause serious brain injury or death in a child. The confessions also showed that virtually all offenders (91 per cent) stated that when the child was brain injured, the symptoms appeared immediately. In the remaining 9% of cases, the timing was not clear, but none of the offenders described the child as behaving normally after they had been violently shaken (Starling et al., 2004).

What are CT and MRI scans and how do they prove that a child has been shaken?

CT and MRI scans are imaging techniques (see glossary for a more detailed explanation) used by doctors to see inside a child's skull. For example, using a CT or MRI scan, a doctor could find an acute (recent, rapidly developing) hematoma (collection of blood) on top of a chronic (older, pre-existing) hematoma. This suggests that the child had been abused before. As mentioned previously, subdural hematomas are caused by the tearing of the small bridging veins that supply blood to the brain. These small veins are stretched and torn when a baby's brain rapidly moves back and forth during a violent shaking incident. This is extremely important because, in the absence of any external injuries, such as those that would result from a multi-story fall or a car accident, the child abuse trained doctor can determine that the injuries were deliberately inflicted. Critically, subdural Hematomas are seen in only 10% of accident victims, but are found in 50% of child abuse cases (Starling, 2005).

Police Investigator's Response to Shaken Baby Syndrome

As a police investigator, where do I start?

If possible, contact a member of the local Child Protection Service (CPS) and work with them. All of the information that police investigators gather during an investigation should be shared with CPS colleagues and with the medical personnel (Canadian Paediatric Society, 2007). Investigators will need to obtain a statement from the doctor most knowledgeable about the case, usually referred to as the primary care physician. The investigator should strive to work cooperatively with all physicians involved, keeping in mind their schedule and often heavy workload. Investigators should take a statement from the primary care physician and any other doctors, such as neurosurgeons, ophthalmologists, or radiologists, who were involved with the treatment of the child. In these statements, investigators should ensure that the physicians describe in detail what they found and then obtain their medical opinions as to why the evidence suggests that the incident was a case of child abuse. It is very important that the medical personnel translate any medical terms into layman's language that can eventually be understood by prosecutors, judges, and a jury. The investigator should also ensure that the following three crucial questions are answered by the medical personnel interviewed:

- 1. are the opinions expressed by the medical personnel held to a reasonable degree of medical certainty and, therefore, can be sworn to under oath;*
- 2. did the false presenting history by a caregiver have any effect on the final outcome for the child and, if so, to what extent?; and*
- 3. did a delay in seeking medical attention by the caregiver have any effect on the final outcome for the child and, if so, to what extent?*

How is the Child Protection Service worker involved in the investigation?

In many jurisdictions, police and CPS conduct joint child sexual abuse investigations. In these jurisdictions, members of both agencies jointly interview non-suspect individuals, such as the child victim, any siblings, and the non-offending spouse of the offender. In SBS cases, the procedure is by necessity different from such joint investigations. The police are trained to conduct criminal investigative interviews and any discussions with caregivers would be considered “potential suspect” interviews. There are statement admissibility issues in court that make it advisable to have these suspect interviews done by the police alone. Even though these caregiver interviews are to be carried out by the police alone, it is strongly suggested that the police keep their CPS colleagues informed of all of the details of the ongoing investigation and provide them with transcripts of all statements.

Before starting an interview with any of the caregivers, the police investigator should meet with the primary care physician and the CPS worker to ascertain what, if anything, the medical personnel may have said to the caregivers prior to the arrival of the police. It is essential that CPS workers and medical personnel refrain from trying to interview/interrogate caregivers, as any comments they might make to a potential suspect could negatively affect the eventual outcome of the investigation. There have been cases in Canada where well-meaning child protection workers and doctors have made initial comments to caregivers which were subsequently viewed by the courts as “threats” or “promises” and resulted in the exclusion of confessions obtained by the police (R. v. Kerwin 2008). Doctors and CPS workers who speak to the caregivers prior to the arrival of the police certainly need to gather a history, but they should leave the more direct questioning to the police. Medical personnel and CPS workers should also refrain from discussing their theories on the mechanisms of injury with the caregiver as this can give an abuser the opportunity to adjust their version of events to coincide with the medical evidence.

A joint Police/CPS interview of non-suspect individuals, such as doctors and nurses, is often valuable in meeting both the investigative needs of law enforcement and the child safety concerns of the CPS worker. It is strongly suggested that a multi-disciplinary, Police/CPS/Medical team be formed early in the process to exchange information, including statements, medical records, and family histories (Canadian Paediatric Society, 2007).

After speaking to the primary physician, what is the investigator’s next step?

Once the investigator has interviewed the primary physician, the investigator should interview any non-suspect witnesses, such as emergency room doctors, nurses, and ambulance attendants. Often these professionals will have valuable information about how the caregivers acted at the scene. A perpetrator may be overheard apologizing to the victim by a nurse or ambulance attendant, and investigators will only learn this valuable piece of information if they interview these professionals. Nurses and first responders may also have valuable information from the suspect caregiver regarding what allegedly caused the injury, and they may be able to describe how the caregiver’s story changed over time. Often, offenders will amend portions of their original story when faced with skeptical medical personnel. The version of events may move from: “When I first found the child, she was a little groggy” to “When I first found the child, she was unconscious and having seizures”. These statements should be recorded as precisely as possible. Perpetrators are more likely to give semi-truthful responses to the ambulance driver or the emergency room nurse, but may become defensive when dealing with the police. The investigator should be careful to tease out exactly who provided the information as the caregiver who is providing the history may not actually have first-hand knowledge, and may be merely repeating what another person told them (Vendola, 2002).

A Hypothetical Case of Shaken Baby Syndrome

The following is a typical scenario for a police officer who is expected to deal effectively with a wide variety of societal problems. The subjects and events mentioned in this case are entirely fictional and are not meant to represent any real person or case.

You receive a call from your supervisor, who tells you that Mrs. Johnson, the wife of a prominent local lawyer, has just brought her two month old son, James, into the hospital. The child is unconscious and is in critical condition. The primary care physician, Dr. Brown, a pediatric neurosurgeon, believes the boy may have been abused and has, therefore, notified child protective services and the police. When you meet with Dr. Brown to discuss this case, he tells you:

This appears to be a case of Shaken Baby Syndrome. This child has a severely distended fontanel resulting from cerebral edema, and we are currently monitoring his ICP. We have done a CT scan and an MRI which revealed that the child had an acute, on chronic subdural hematoma which we have now evacuated. The boy also has some subgaleal bruising. Our ophthalmologist has done a fundoscopic examination of the boy and found extensive, bilateral retinal hemorrhaging. Together, all of these findings are pathognomonic of a non-accidental injury. The next few days will tell the tale, but, in these kinds of cases, a child will often die, not from the hematoma, which is really only an epiphenomenon, but from the cerebral edema or from diffuse axonal injury.

Meanwhile, Mrs. Johnson has contacted her husband, who has been away at a conference and is now on his way home. He will arrive tomorrow and other friends and relatives will no doubt be speaking to her in the meantime, so if you want to obtain an uncontaminated "pure version" statement from Mrs. Johnson as to what actually happened with her child, you had better act quickly! But what do you do? What do all of these medical terms mean? What questions do you ask of Mrs. Johnson? How do you ask them? Do you accuse her of abusing her son? Was this child previously abused? What do you do about the Johnsons' other child - the three year old daughter, Joanne? Is she in any danger and, if so, what can you do in order to protect her?

Dr. Brown explains that the subdural hematoma was most likely caused by someone violently shaking James causing the tiny bridging veins connected to the brain to shear and tear. The "acute on chronic subdural hematoma" indicated that the child, quite likely, had been shaken on a previous occasion and the fresh (acute) bleeding covered the membrane of the older (chronic) injury. Dr. Brown cannot date the chronic subdural precisely, but he believes that it is approximately two to three weeks old. The subgaleal bruising refers to bruises underneath the scalp. These show that the child's head was struck repeatedly with an object. Dr. Brown tells you that, in his opinion, when these injuries are combined with a specific type of bleeding in the back of the eyes and brain swelling, there is little doubt that James was abused.

Dr. Brown tells you that baby James is in critical condition and he will remain in the hospital until he shows signs of improvement. Initially, Mrs. Johnson told Dr. Brown that she was changing James when he rolled off of the change table and fell onto the floor. She went on to say that when she picked him up, he began gasping for air and his body stiffened up. Mrs. Johnson said that she immediately phoned her sister, Helen, who is a registered nurse and lives only two blocks away. Helen came over to the Johnson residence and, upon seeing the baby's condition, immediately called 911 and an ambulance was dispatched. Dr. Brown tells you that they are currently running some tests to see if this child has any pre-existing metabolic disorders or exotic diseases that may have affected James' condition, but, at this time, he is convinced that Mrs. Johnson's story of a short fall is inconsistent with the nature and severity of the injuries and that baby James was deliberately injured.

What are the suspicious aspects of Mrs. Johnson's story?

To begin, children do not usually start rolling over until they are at least three months old. Given this, it is highly unlikely that James, being only two months old, rolled off the table, as described by Mrs. Johnson. Investigators should interview any independent witnesses, such as friends or neighbours, who may be able to provide information about whether the child was actually able to roll over by himself. Mrs. Johnson's sister should also be interviewed to confirm the time she received the call from her sister, how the injuries were initially described, what observations she made, and what action she took upon arriving at her sister's residence.

Moreover, as previously mentioned, research has shown that children do not receive life threatening injuries as the result of short household falls. It should be noted that the "short fall" story is the most common excuse provided by perpetrators of SBS to explain a variety of serious injuries to a child (Fatal Child Abuse: The Pathologist's Perspective: By Dr. Robert H. Kirschner and Dr. Harry L. Wilson, 1994).

There are other aspects of Mrs. Johnson's behaviour that is suspicious. Most non-abusive caregivers would not hesitate to immediately call 911 if their child began having trouble breathing or was having seizures. However, Mrs. Johnson reacted in a manner entirely consistent with the response of many child abusers. She stalled by calling a relative. Rather than being primarily concerned with her child's welfare, she demonstrated that she was primarily concerned with being identified as a child abuser. It is quite common for child abusers to call friends or relatives, rather than the authorities, when they have seriously injured a child (Parrish, 2001). Many offenders actually put the child in a bed in the hopes that the child will somehow recover or that someone else will "discover" the child's serious condition.

The most dangerous aspect of stalling in SBS cases relates to the body's healing mechanisms. When an ankle is sprained, for example, the body responds by delivering chemicals to the injury site to begin the healing process. Part of that process involves the swelling of the ankle. The same type of healing process takes place when the brain is injured; however, unlike an ankle, the brain's ability to swell is restricted by the skull. If an infant's brain is injured during a violent episode, the child must be taken immediately to a medical facility where the swelling may be controlled, before it results in a restricted blood flow and a subsequent lack of oxygen to the brain. Brain swelling or cerebral edema can often result in increased brain damage and even death for the child. Investigators should carefully document all evidence of apparent stalling on the part of caregivers and try to ascertain if that stalling led to a more severe outcome for the child.

Dr. Brown also mentioned that shortly after his admission to the hospital, James was given a full series of x-rays, called a Skeletal Survey, and they found no broken bones. There were also no signs of external cuts or bruising, other than the subgaleal bruising, on James.

If an infant's brain is injured during a violent episode, the child must be taken immediately to a medical facility where the swelling can be controlled, before it results in a restricted blood flow and a subsequent lack of oxygen to the brain.

Does the absence of broken bones in this case cause any doubt that the child was deliberately injured?

The absence of broken bones does not necessarily raise any doubts that James was deliberately injured. Fractures, cuts, and bruises are often absent in SBS cases. About half of all SBS children show no external signs of damage whatsoever (Alexander et al 1990). Police and CPS investigators should be aware that it is considered a “best medical practice” in suspected child abuse cases to complete a full skeletal survey, rather than just a single “babygram”. It is also a best medical practice to run a second skeletal survey, 10 to 14 days after the first survey to observe whether there is any calcification of fractures that may not have been visible on the first set of x-rays (Canadian Paediatric Society, 2007). It is entirely appropriate for the Police or CPS investigator to ask the attending physicians if a second set of x-rays is being considered. Most child abuse trained doctors will usually consider a second skeletal survey a standard procedure; however, physicians with less experience in child abuse cases may not be aware that this is currently considered a best practices model (Canadian Paediatric Society, 2007).

Is the absence of external bruising in James’ case significant?

The absence of external bruising is not necessarily significant. As noted previously, many SBS children do not show outward signs of abuse. Investigators should arrange at this stage; however, to have the child photographed each day by a medical photographer or a Police Forensic Identification Section member. It is not unusual for bruises to surface several days after the child is injured. Photographing the child’s entire body each day will show the progression of the development of any bruises, and may eventually reveal a pattern consistent with an imprint of a hand or household object used to restrain or strike the child. Careful documentation of the development of such injuries may be a critical component of an eventual successful prosecution. While the photographs are not meant to sensationalize the incident, they do offer a powerful depiction of the life threatening nature of the injuries, and they also serve to personalize the victim for the courts.

The absence of external bruising is not necessarily significant as many SBS children do not show outward signs of abuse

Are there other investigative procedures that should be considered in this case?

There are other investigative procedures that should be considered in this case study. If a child has been critically injured and is likely to die, the investigator may wish to consider tactfully asking the doctor to complete a bone scan. This procedure can often identify injuries that are not found during x-rays, or even during a post-mortem examination. A bone scan involves injecting a radioactive isotope into the blood stream which may show areas of healing at injury sites. This procedure can still be conducted even if the child is brain dead, as long as the heart is still beating and the blood is circulating. A doctor may not initially consider using this procedure since it can do nothing to save the child’s life; however, it may still provide information valuable to investigators.

When the Police and CPS investigator speak to the doctor, ambulance attendants, and nurses, they find small discrepancies in the versions of events given by Mrs. Johnson to different people. What is the next step?

This is where the Police and CPS temporarily part company. The police officer needs to conduct an interview of Mrs. Johnson. Although this is an interview, rather than an interrogation, because of the information that has become available, Mrs. Johnson should now be considered a potential suspect. Given this, the investigator is required to advise her that she has the right to refuse to say anything. It is essential that the fewest number of "persons in authority" are involved in this interview. CPS workers can be considered persons in authority and should, therefore, be excluded from discussions or conversations with potential suspects.

A word about "Investigative Bias" or "Tunnel Vision"

At this point, it is likely that the investigator has good reason to believe that Mrs. Johnson may have deliberately injured her child. The nature of the injuries, the seemingly improbable explanation of how James was injured, and Mrs. Johnson's decision to call her sister, rather than calling 911 all suggest that Mrs. Johnson was the person most likely to have abused James. Shaken Baby Syndrome cases are, by their very nature, intense investigations involving a helpless victim, and it is easy for officers to become emotionally invested in verifying a particular explanation of the crime. Investigators must maintain their objectivity and realize that their primary role is to "seek the truth".

In this hypothetical case study, if the investigator decided, prior to an interview with Mrs. Johnson, that she was the only person who could be responsible for causing the injuries to baby James, the potentially fatal flaw of Investigative Bias or Tunnel Vision may have entered the investigation. Once a presumption of guilt is made by the investigator towards a particular potential suspect, all other explanations of what may actually have happened to the child, or who else might be responsible for the injuries, are often discounted. It is the investigator's responsibility to obtain as much evidence as possible and then to follow the evidence, regardless of where it might lead. There has been a number of child abuse convictions overturned by the courts because the initial medical evidence was misinterpreted, or the investigator erroneously focused on one suspect without considering the possibility that someone else may have inflicted the injuries (Goudge, 2008).

Tunnel Vision not only can cause investigators to focus exclusively on one individual, it can also cause medical personnel, CPS workers, and the police to discount potential suspects who do not fit their preconceived notion of a child abuser. It is important to remember that child abusers come from both genders, and all ethnic, religious, and socioeconomic backgrounds. There is no single, definitive, profile of a child abuser. The wise investigator would do well to follow the evidence, rather than any preconceived notions and "look at the act, not the actor".

There has been a number of child abuse convictions overturned by the courts because the initial medical evidence was misinterpreted, or the investigator erroneously focused on one suspect without considering the possibility that someone else may have inflicted the injuries.

What are the practical differences between an interview and an interrogation?

The term “interrogation” has a far greater negative connotation than the term “interview”. Defence lawyers will often portray any police conversation with their client as an interrogation to conjure images of a coercive environment. However, most dictionaries simply define an interrogation as a formal questioning. To be clear, the use of threats or any type of coercion or physical force has no place in a professional police interrogation. In Canada, any type of violence, threat, explicit promises, or favours extended by the police during an interrogation not only violates the Canadian Charter of Rights and Freedoms, but will also compromise the credibility and professionalism of the individual investigating officer, and also the police in general. Some of the practical differences between an interview and an interrogation are:

Interview

- Non-confrontational, non-accusatory
- 90% of the talking done by subject
- Purpose is to gather information
- Subject helps clarify details
- Locations may vary
- There may be time limitations
- Subject is comfortable and may provide more information
- Story comes from memory - no stress

Interrogation

- Accusatory, but not rude
- 90% of the talking done by police
- Purpose is to obtain the truth
- Lying subject learns that his story does not fit the facts
- Location is private, usually in a police interview room
- No time limits as long as the suspect agrees to stay
- Lying subject is psychologically uncomfortable because of lies
- Lying subjects create stories from imagination and this causes lots of stress and detail errors

As an investigator, how do I begin my interview of Mrs. Johnson and what am I looking for?

The initial interview should be conducted in an empathetic, non-confrontational manner. The investigator should not only take a statement from Mrs. Johnson, but also interview any other individuals who may have had access to the child. The investigator needs to obtain enough detailed information from each person to lock them into their version of the events which explains how the child was injured. This will allow the investigator to find evidence to support the innocent caregiver and refute the story of the person who was actually responsible for abusing the child.

The law on statement admissibility is constantly evolving and investigators should follow the interviewing procedures consistent with current case law decisions and their departmental policies

The law on statement admissibility is constantly evolving and investigators should follow the interviewing procedures consistent with current case law decisions and their departmental policies. As a general rule, in Canada, once an investigator believes that an individual may have committed an offence and is a suspect, the investigator should give the suspect the Police Caution. However, telling someone that they may be a suspect should be done in a low key, non-confrontational manner. Do not forget that the caregiver may actually be innocent of any wrongdoing and may be confused about the nature of the injury. An empathetic approach, such as the one outlined below, is effective:

Mrs. Johnson, your son is seriously injured and, at this time, the doctors are trying to determine exactly what happened. I need to talk with you about what happened, but I do not know exactly what you may tell me. In this type of situation, there is the possibility that you or somebody else may have deliberately hurt the child, so, in order to be fair, I am going to advise you or anyone else who took care of your child of their rights before I ask anything about what happened. If I go too quickly or I say something that you do not understand, I want you to stop me and let me know so that I can explain it to you properly.

The first part of the statement should be in narrative form with the investigator saying as little as possible. This is known as a Pure Version Statement or a Free Narrative. Ask them to tell you everything that happened from the beginning until the time when they arrived at the hospital

In some areas, investigators advise suspects of their Rights to Counsel once they have become a suspect, in addition to giving them the Police Caution, even if there is no actual arrest or detention at the time. However, as noted above, each investigator should follow current case law and their local departmental policy in this regard.

This interview may be the most important step taken during the investigation. The investigator is looking for the Five W's: Who; When; What; Where; and Why. These are some interviewing suggestions:

- All interviews should be audio or videotaped. It is always a good idea to approach interviews in an empathetic, non-accusatory manner in order to establish some rapport with the caregiver. Spend a few minutes with them, expressing your condolences. Hold your hands out to the side with the palms up when you speak, as this is an open, non-threatening gesture. In many instances excellent cooperation from caregivers has been achieved by simply telling them that you are not going to pretend that you know how they feel, but that you have talked to a number of people in the same situation and that you wished there was something that you could say that would take this all away, but that you cannot. All that you are trying to do is to understand from the caretaker's perspective what happened.
- The caregiver may be angry, upset and looking to lash out at someone. By dealing with them in this way, it makes it more difficult for them to lash out at the investigator. The investigator is also laying the foundation for a possible subsequent interrogation, so it is critical that the caregiver be comfortable with the investigator. Let them talk and try not to direct them or interrupt in this initial phase of the interview.
- The first part of the statement should be in narrative form with the investigator saying as little as possible. This is known as a Pure Version Statement or a Free Narrative. Ask them to tell you everything that happened from the beginning, (if they do not know where to begin, pick a point about 12 hours before the injury occurred) and have them continue until the time when they arrived at the hospital. During this time, the investigator should resist the temptation to interrupt or comment. Let those uncomfortable silences drag on. It is usually a lot more uncomfortable for the person being interviewed who is trying to make up a plausible lie than it is for the interviewer who is merely listening intently. When the subject has finished, ask questions to clarify specific points. When asking questions, try to use the same terms used by the caregiver. If the investigator uses police jargon or medical terms, the subject may adopt that language and this can cause confusion. A skilled defence lawyer can also suggest at trial that their client did not fully understand what was being discussed during this initial police interview.
- Try to determine who had the opportunity to inflict the victim's injuries. Note the names of all of the people who may have had contact with the child around the time that the injury occurred. The investigator will need to interview all of these people at a later time in order to determine the health of the child when they were present. Ascertain who first noticed that the child was injured and who directed that the child be taken to a medical facility. Was there any delay in bringing the child to medical care? Try to establish if one person was alone with the child at the time of the injury; this is a key feature known as Exclusive Opportunity.
- Try to determine the timing of the injury by asking when the child last behaved normally. The questioning on this topic needs to be done in a subtle manner. Most people do not know that a child who receives a brain injury will be symptomatic immediately. An abuser will often relax and truthfully answer questions about when the child last crawled, walked, or ate something without realizing that the investigator is attempting to establish a timeline for when the child was well and when the child became unwell. When the child is shaken and the brain is injured, the changes will be immediate and obvious. The child will either be lethargic, vomiting, and disoriented, or they will be rendered unconscious right after being injured. As noted previously, a brain injured child will not have a lucid interval where they seem normal and then suddenly collapse hours later.

- Try to determine the developmental level of the child. Could the child hold his/her head up, roll over, sit up alone, crawl, walk, or speak? What were the normal activities of this child? Ask the caregiver when the child last walked, crawled, spoke, sat up alone, visually followed an object or played. Very young infants are incapable of these types of actions, but all children eat. Therefore, it is often possible to establish a base point for a timeline by asking the caregiver when the child last ate, how much food was consumed, and what type of food was eaten. A brain injured child will be incapable of eating or any of the other previously noted actions. The investigator should attempt to get as much detail about the child's activities as possible as they are trying to establish a timeline showing that the child was behaving normally until a specific event occurred. The person who was with the child at the time of that event is usually the person responsible for injuring the child.
- Ascertain what allegedly caused the child's injury. Often, the caregivers will provide an implausible explanation for the child's injuries, such as the child fell off the couch. Do not dispute the implausible explanation at this time. Instead, use a non-threatening manner to obtain detailed information about the explanation. Where is the couch? What type of floor covering is near the couch? Has the child ever fallen from this couch before? While the investigator is not disputing the caregiver's story at this stage of the investigation, it is important to ask a lot of questions to get a detailed accounting of their version of the events leading up to the injury.
- Obtain a clear explanation of where the alleged injury occurred. If the caregiver states that the child fell from a swing or a chair, determine the exact location and the nature of the surface where the child landed. If the child allegedly fell on a cement patio or gravel driveway, the investigator should expect to see abrasions on the victim's hands, knees, or elbows consistent with such a fall. If those scrapes are not present, this may be an important factor in refuting the false explanation.

Many child abusers will repeatedly abuse a child and then "doctor shop" by taking the child to different medical facilities in an attempt to hide their pattern of abuse

- Ask the caregivers to sign a Consent Form for the Release of Medical Information on this child and any other children in their care. The investigator can truthfully tell the caregiver that this is a standard procedure in these kinds of cases in order to ensure the safety of the children. The Release of Medical Information may reveal that the child has been seen on several previous occasions for "flu like symptoms" that are now seen as consistent with earlier instances of abuse. Many child abusers will repeatedly abuse a child and then "doctor shop" by taking the child to different medical facilities in an attempt to hide their pattern of abuse.
- After you have obtained an explanation from the caregivers, ask them if they would clarify some points by demonstrating what took place during a scene re-enactment. If they agree to do this, photograph and videotape the re-enactment.

It should be emphasized again that an empathetic, non-confrontational approach to the caregiver is essential. At this stage of the investigation, caregivers usually cooperate with investigators who have established rapport through being empathetic and friendly. The caregiver's attitude towards the investigator may change dramatically later on.

Thinking in terms of the hypothetical case outlined above, Mrs. Johnson tells the investigator that James has always been a fragile, sickly child, and he seems to be most unwell whenever her husband leaves town. She explains that he has been "acting strangely" since he received a vaccination shot a few days ago. The investigator should listen carefully here and gather as much detail as possible, encouraging Mrs. Johnson to tell you everything she can about her child's medical history. Child abusers will often try to blame the child's recent injuries on a pre-existing medical condition. By taking note of any previous medical interventions, the investigator may be able to develop a timeline that demonstrates a connection between occasions when Mrs. Johnson was left alone for an extended period with her baby and the appearance of unusual medical problems for the child.

When she finishes giving her "free narrative" portion of the statement, the investigator should gently probe to discover what events preceded the call to her sister. Mrs. Johnson explains that when she woke up, she changed James and then fed him a bottle while watching the morning news. The investigator can casually ask about what was on the news and then check later with the television station to confirm that a certain news item was being broadcast at a particular time. This ensures that the timeline is as accurate as possible as it has corroboration by an outside, neutral source.

Mrs. Johnson confirms that there was no one in the house other than herself, her three year old daughter, Joanne, and her son, James. This is crucial information as she has just put herself in an exclusive opportunity position. She was the only adult alone with James, covering the time period when he was behaving normally by drinking two ounces of milk, up until the time when he was critically injured.

Child abusers will often try to blame the child's recent injuries on a pre-existing medical condition.

What should the investigator be attentive to while conducting a scene examination?

If the caregiver is cooperative, examine the scene with their consent. If they hesitate or refuse, ask yourself, "Do I have the necessary grounds for a warrant?" If the investigator did not have grounds to suspect the caregiver and did not warn them prior to taking a statement, it is difficult to now say that there are enough grounds for a warrant. If the investigator is unable to gain the cooperation of the caregiver in conducting a re-enactment, they should try to obtain judicial authorization in the form of a Search Warrant or a General Warrant to conduct a full site examination. The investigator should do this as soon as possible because the scene will change. Evidence, such as a bloodstained wall or empty liquor bottles scattered around the living room, will probably be cleaned up or removed within a day, and the investigator may lose important information about the physical surroundings as they existed at the time of the injury.

At the scene, take digital pictures, still photos, video, and diagram measurements noting the positioning of the caregiver and the child when the incident occurred. Include photos that depict the placement of any objects that may have played a part in the injury, such as an undamaged wine glass balanced on the coffee table right next to the couch where the fall apparently occurred. Details are extremely important and the details found at the scene will often support the truthful subject, while refuting the version of events given by a liar.

Remember that these abusive incidents are usually precipitated by some type of action on the part of the child. In violent crimes against other adults, investigators look for a motive. In child abuse cases, where there appears to be no logical motive, investigators should look for what is known as the Precipitating Factor or Event. The following is a list of some of the areas at a child abuse scene that may provide evidence of a precipitating event:

- Check the diaper pail: heavily soiled diapers often indicate that the child had diarrhea or some other illness. Illness causes a pre-verbal infant to cry because they can only communicate by crying, and incessant crying is the most commonly cited precipitating event in Shaken Baby Syndrome cases.
- Inspect the bathroom: an overturned potty toilet may indicate that the child was being unsuccessfully toilet trained. Many adults have unrealistic expectations of young children and their associated frustration with the child is often a factor in these cases.
- Check the child's bedroom, especially the crib: soiled bedding or a broken item may have been the last straw for the frustrated caregiver who then lashed out at the infant. Often, investigators may locate a child's baby book in the bedroom. This is an excellent source of information about the child's medical history as it often documents, among other things, milestones, immunizations, and doctor visits. Videotapes and photographs of the victim, found within the premises can also illustrate the child's state of health at various times, the overall appearance and figure of the child, and possibly the child's developmental abilities. The investigator should either record or seize this material as it is of great assistance in reconstructing the medical history of the baby.
- Examine the laundry hamper: The caregiver's clothes may be recently soiled. If the baby vomited, defecated, or urinated on the caregiver, that may have been the event that precipitated the abuse.
- Survey the area where the child eats. The high chair, floor, and nearby walls may all show evidence of food that was spilled or rejected. This common infant response can enrage some caregivers.
- Examine areas where the caregiver may have been involved in an activity at the time the child was injured. Is there evidence that the child may have interrupted the caregiver during a television program, a computer game, or while engaged in some household chore? Could that interruption have been the trigger for the abuse incident?
- Check the medicine cabinet: Infant medication may show that the child was recently ill. Rather than merely examining the bottles, check the contents and the prescription date to determine if the appropriate amount of medication was being dispensed on a daily basis. If not, efforts should be made to determine if medications were altered, substituted, or withheld, and this information should be provided, as soon as it is known, to pathologists and other medical professionals for toxicological analysis. Prescription medications or illicit drugs belonging to the caregivers may also be found at the scene and may shed some light on possible adult problems that might have led to the abuse.
- Check the phone. If there is a feature showing when calls were placed, it may give a timeframe relating to the injury or reveal a delay in seeking help for the child. Even a "redial" feature may show who the caregiver first called when the child was injured. A phone call made to a friend or relative before a call is made for an ambulance provides an indication of the caregiver's priorities.

- Take note of any certificates or documentation showing that the caregiver attended a parenting, child care, or First Aid course. Often, these certificates will be displayed in the home. If the caregiver took one of these courses, the investigator should follow this up later to determine if there was any specific information given during the course regarding the proper handling of a young child. This may be used at trial to show that, despite having taken a course on child rearing techniques, the caregiver knowingly engaged in behaviour that endangered the child's life.
- Obtain a doll that approximates the size of the child in your investigation and ask the caregiver to try to recreate the fall or other event that allegedly caused the child's injuries. Videotape this procedure. An expert medical witness viewing this video may be able to give an opinion on the likelihood of the child receiving their injuries in the manner described or demonstrated by the caregiver.
- If there are other children in the home, they should be assessed for their physical abilities. Perpetrators will often blame another child for inflicting the injuries on the child victim. A young child will lack the strength and coordination necessary to inflict the type of injuries seen in SBS cases, but this lack of ability may not be readily understood by a judge or jury who has not examined the child. The investigator should give the child a doll or even a simple household object, like a 10 pound bag of sugar, and ask the child to hold it up and shake it. This simple demonstration can be videotaped and shown to the courts to counter any defence lawyer suggestion that the victim was assaulted by another child within the home.

As a police officer or a CPS worker what action should I take with regard to three year old Joanne, the daughter of Mrs. Johnson?

Both the police and child protection should be concerned for the safety of Joanne, especially since one parent is currently out of town and the other parent is strongly suspected of being a child abuser. Often, investigations reveal that if one child in a family is being abused, other children in the family are also being abused, or have been victims of abuse in the past. Given that the evidence suggests that Mrs. Johnson may have abused her son, CPS will need to assess the risk to Joanne and this should include a joint Police/CPS interview of the child, as well as a medical examination to determine if the child has suffered any suspicious injuries. Often, young children are not interviewed as investigators assume that such an interview would be futile because of the child's age. Although this is often true, attempts should be made to interview all verbal children, as children as young as three have been known to provide viable statements.

Investigators should attempt to obtain the medical records of any siblings of the victim. The medical records of each child should be carefully examined. Do any siblings have injuries of questionable origin? Have any siblings been the victim of a sudden death? These may be indicators of abuse of the other children. Does a comparison of baby James' records against his sister's records suggest inferior care? Is it possible he was a "target" child? A "target" child is one who is singled out for neglect/abuse, having been perceived by the caregiver as being different, unwanted, or responsible for some undesirable circumstance.

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What is the next step in the investigation?

Once all of the initial interviews have been completed and the scene has been thoroughly examined and recorded with photos, video and diagrams, the investigation should focus on trying to locate any and all information that will support or refute the statement of the primary suspect(s). Whereas the initial investigation was done as quickly as possible to gather evidence before it disappeared or became contaminated, these next steps in the investigation may take weeks or even months to complete.

Interview any remaining doctors, including specialists, such as radiologists, pediatricians, neurologists, and ophthalmologists, as well as any nurses who dealt with the caregivers on this occasion or who have dealt with them on prior occasions. Take statements from them and determine if the story of how the injury occurred has changed at all. Check with the doctors for the results of any medical tests that may have been conducted to rule out metabolic disorders or disease processes that could have played a role in this case.

Check to see if the child was previously taken to any other medical facilities for the treatment of suspicious injuries. As noted previously, abusers often "doctor shop" in an attempt to locate a physician who has not become suspicious after repeatedly treating the same child for a variety of mysterious ailments.

Check the child's medical records to see if he/she was sick or received a vaccination just prior to this last incident. Immunization shots may cause a painful reaction in a child that can result in an increase in their level of crying. Remember that frustration with a crying or sick child is often a precipitating factor in a shaking incident. It is also critical to examine the medical records of any other children in the home to determine if they ever presented with similar injuries. The investigator may require a search warrant to get these records if the caregivers have not signed a Consent Form for the Release of Medical Information.

Conduct neighbourhood inquiries to learn if anyone heard or saw the child or caregiver around the time of the injury. In past cases, witnesses have revealed that they heard a child crying, followed by a shout and the cries then abruptly ceased. This type of information can be extremely valuable in the development of a time-line and for later use during an interrogation.

Interview current and former spouses to see if the caregivers have a prior record of abuse, especially violence toward children. The current or former spouse may also be able to supply information about possible triggers for violence that may be invaluable during a subsequent interrogation of the suspect.

CPS and Police computer checks must also be completed to determine if there have been any past Police or Child Protection involvement with the caregivers.

The investigator should obtain any 911 tapes relating to this incident and review them carefully to determine if there are any unusual background noises present. Is the caregiver's description of the mechanism of injury during the call consistent with the scene examination? Has the caregiver's original version of the event changed or evolved in any way?

If the child dies, the police investigator should attend the autopsy. If the child dies soon after reaching the hospital, there may not have been time to process conventional scene photos. Digital photos of the baby in the hospital along with scene pictures may assist the pathologist who has not had an opportunity to visit the scene. The investigator should take only brief notes at the autopsy. The pathologist will usually prepare a full report and defence lawyers will often attack any discrepancy that exists between the report of the pathologist and the notes of the police investigator.

In child death cases, the pathologist usually removes the eyes and brain, placing them in a preserving solution. These organs may provide evidence to support the contention that violent shaking was the cause of death and rule out an accidental or disease mechanism of injury. The brain and the eyes cannot be immediately dissected, as would be the case with an adult, as they lack a solidifying material called myelin. A period of approximately 30 days is needed before the brain and eyes can be properly dissected and then subjected to laboratory analysis. There will also be further delays associated with obtaining the results of the various lab tests. During this stage of the investigation, it is often useful to create a series of timelines that can be used to graphically illustrate points in the child's life in general, and the incidents surrounding the time of his injury, in particular.

What type of information would be included in a timeline?

Two basic timelines relating to this hypothetical case have been included below. The first timeline covers the victim's short life, but demonstrates how the victim was brought to a medical facility for "flu like symptoms" after he was left alone with his mother, while the father was out of town. The subsequent finding of an earlier subdural hematoma seemed to coincide with this initial visit to a medical facility. The next time the victim was brought to a medical facility again coincided with the father being out of town and this time the child died from his injuries.

Aug 04	James Johnson is born. He is the 2nd child of Allen and Audrey Johnson
Sept. 18 - 22	Allen Johnson is working out of town
Sept. 23	James is brought to a walk-in clinic with flu-like symptoms
Oct. 05	James receives his first DTAP vaccination
Oct. 07	Allen Johnson leaves town to attend a 4-day conference
Oct. 09	James is brought into the hospital in critical condition. Audrey Johnson is suspected of abusing him
Oct. 11	James dies from massive brain swelling

The second timeline covers the actual date when the victim was fatally injured. The seemingly mundane information relating to the day's events were provided by Audrey Johnson, the suspect in this matter. The true value of this timeline can be found in the clear depiction of the "window of opportunity" which occurred between the times when baby James was being fed a bottle of milk, at approximately 0730-0800, and the time when he was fatally brain injured and Audrey calls her sister Helen for help at 0902. The only person capable of inflicting the injuries during this time was Audrey Johnson.

07:30	James wakes up. Audrey changes his diaper
07:30 - 08:00	Audrey feeds James 2 ounces of milk, while she watches the morning news
08:00 - 09:00	James vomits. He is upset and crying
09:00	Audrey places James on the change table. He rolls off and falls to the floor.
09:02	Audrey phones her sister Helen and asks her to come
09:10	Helen arrives and, upon seeing James, immediately calls 9-11
09:17	Ambulance arrives and transports James to the hospital

Once all of the background information has been gathered, what does the investigator do next??

After gathering all the background information and meeting with the medical experts who can provide opinions about whether or not the child's injuries could have resulted from the incident described by the caregiver, the investigator should arrange for a group meeting with the Prosecutor, Medical Examiner, Child Protection Worker, and key Medical personnel. This will give the prosecutor an opportunity to review the entire case file, including any social history, statements, and medical evidence to determine if there is sufficient evidence to lay charges and proceed to trial. SBS cases are often very emotional and involve complex medical evidence. It is essential that the Prosecutor fully understands all of the medical evidence. The opinions of all of the medical professionals should be consistent as to the mechanism and timing of the injuries. If there is any doubt about the evidence, the investigator may wish to consider obtaining second opinions from additional specialists to verify that the best evidence is available to put before the courts. It is vital that all medical evidence is reviewed and understood by the police investigator before embarking upon the final phase of the investigation.

What is the final phase of the investigation?

The final phase of the investigation is to arrest the suspect and interrogate him/her. As noted previously, an interrogation is by its very nature confrontational and accusatory, but the interrogator should still be respectful towards the suspect. Few people will confess to an interrogator who is disrespectful or rude. If the investigator is well prepared with detailed medical information, a clearly outlined time line, a positive attitude, and some good interrogation skills, they will have an excellent chance of obtaining a confession. If the investigator is unable to obtain a confession, the initial exculpatory explanation of the suspect can still be useful as medical experts, scene photos, and changes in the story work to refute the suspect's version of events.

Where can an investigator go to keep up to date and to learn more about SBS?

The National Center on Shaken Baby Syndrome (NCSBS) is a non-profit organization dedicated to the prevention of this type of child abuse. The NCSBS is an excellent source of material on this topic for law enforcement, prosecutors, and CPS. They are located in Ogden, Utah and can be reached through their website at www.dontshake.org. The NCSBS also hosts international conferences on Shaken Baby Syndrome, one of which takes place in either Canada or the United States every two years.

Glossary of Medical Terms

Acute: 1. Sharp, severe. 2. Having a rapid onset, a short course and pronounced symptoms.

Anterior: In the front. Opposite is Posterior.

Apnea: Cessation of breathing for more than 20 seconds.

Arachnoid: The thin, delicate membrane covering the brain. It is located beneath the dura.

Axon: The tail end of a nerve cell. These are the “wires” that carry the signals between cells. When the axons in the brain are severed due to violent shaking, the nerve cells attached to those axons atrophy and die.

Babygram: A single x-ray of the entire body.

Bilateral: Affecting two sides or halves.

Bone Scan: Injecting a radioactive isotope into the bloodstream and then monitoring for “hot spots”. Certain isotopes can locate injuries undetected by X ray, such as a recently stressed, but not broken bone. This technique can only be performed when the patient is alive and the blood is still flowing. It can be done when the child is still on life support and essentially brain dead.

Bridging Veins: These are the tiny veins that attach to the Superior Sagittal Sinus or “central vein” and transfer blood to and from the brain. These veins can tear during a violent shaking episode and, if the tear occurs underneath the dura, the result is a subdural hematoma. If the veins tear underneath the arachnoid membrane, the result is a subarachnoid hematoma.

Bucket Handle Fracture: A type of metaphyseal fracture found at the end of a “long bone” where the zone of growth has been twisted and pulled away with great force resulting in a “bucket handle” appearance. Metaphyseal fractures are highly suggestive of child abuse.

Cause of Death: This is the medical reason for death, such as a gunshot, strangulation, or drowning (See: Manner of Death).

Cerebral Edema: Excessive accumulation of fluid in the brain and brain swelling. This is a common outcome of shaking injuries and is often the cause of death in these cases.

Cerebral Infarction: The death of brain tissue caused by an obstruction of the blood supply which supplies oxygen to the brain.

Chronic: Long term or continual. An acute injury would be more recent, whereas a chronic injury may have occurred some time ago or has continued for some time.

Computed Tomography: Also commonly known as a C.T. or Cat Scan. A brain imaging technique used to detect intracranial bleeding requiring surgery. This is usually the first imaging technique obtained to determine the nature of the injuries to a brain injured child.

Contusions: Bruises.

Corner Fracture: This is another type of metaphyseal fracture where a long bone is subjected to twisting and pulling forces causing the zone of growth to move sideways. All metaphyseal fractures are highly suggestive of child abuse.

Diagnosis: Determining the nature of a disease or injury by examining the accompanying symptoms (i.e. identifying the medical problem).

Diffuse: Scattered. Not limited to one spot or area.

Diffuse Axonal Injury (D.A.I.): Shearing injury to the axons located deep within the white matter of the brain and brainstem. The axons are like a series of electrical wires carrying messages from the brain, including the message to breathe. When the axon system is disrupted, the immediate effect is altered breathing and loss of consciousness. These are subtle injuries that can only be detected by means of chemical staining tests on the brain after an autopsy. They are characteristic of a shaking injury. At this time, DAI cannot be directly detected in living subjects, but the death of adjoining cells can be seen radiologically.

DTP Immunization: Diphtheria, Tetanus, and Pertussis vaccines are commonly administered to babies. Some defence lawyers have called medical “experts” who claim that these immunizations can mimic the symptoms of Shaken Baby Syndrome. However, there is no accepted medical research to support this causal connection.

Dura: The fibrous membrane inside of the skull that forms the outermost covering of the brain. The Dura and the Arachnoid membranes can be likened to two pieces of saran wrap, one on top of the other.

Glossary of Medical Terms

Ecchymosis: A bruise.

Egg Shell Fracture: A skull fracture that radiates out in different directions. This injury is only caused by a significant amount of force.

Emesis: Vomiting.

Epidural Space: The space between the skull and the dura.

Epidural Hematoma: This injury can be caused by a minor fall which causes the soft skull of an infant to deform or fracture, rupturing the meningeal artery and causing bleeding into the epidural space. After the initial injury, the child may seem to recover and act completely normal until the expanding blood puts pressure on the brain causing unconsciousness and even death. This injury is not caused by shaking.

Esotropia: A condition where one eye focuses on an object, while the other looks inward.

Extra-Axial Fluid Collections: Blood between the skull and the brain.

Fontanel: The "soft spot" on a baby's skull that exists before the cranial sutures have fully grown together. As bone forms, the fontanel gradually close and the soft spot is completely covered by the time the child is about 18 months of age. A bulging fontanel indicates brain swelling.

Frontal Bone: The large bone that forms the forehead.

Fundoscopy Examination: Looking at the back or fundus of the eye.

Global: Refers to an injury involving the entire brain, rather than one specific area.

Hematoma: A localized collection of blood.

Hemorrhage: Bleeding.

Hypoxic: A decreased or inadequate supply of oxygen to the brain cells.

Indirect Ophthalmoscope: A device used by ophthalmologists to examine the eye in order to detect retinal hemorrhages.

Intracranial: Within the skull.

Intracranial Pressure: Also referred to as ICP. This is a buildup of pressure within the skull, usually caused by swelling. Severe elevation of ICP leads to brain atrophy and death.

Ischemia: Localized tissue injury due to obstruction of the inflow of arterial blood (loss of oxygen supply). This occurs as a result of spasms, disease, or trauma.

Magnetic Resonance Imaging: An M.R.I. is another brain imaging technique. It is more difficult to obtain, more expensive, and somewhat slower than a CT, but it gives excellent imaging of even small details. It is usually the second imaging technique used on a brain injured subject.

Manner of Death: There are five listed categories: Homicide; Suicide; Accidental; Natural; and Undetermined (See Cause of Death).

Metaphysis: The growing ends of the shafts of long bones. A break in the metaphyseal region of a bone requires more force than a break in the middle of the shaft, and is usually an indication of a deliberately inflicted injury.

Myelin: An insulating sheath that forms around the axons in the brain and allows for more rapid transmission of electrical signals from one neuron to another. A baby's brain is not fully "myelinated" for at least the first two years of life and it is, therefore, quite soft.

Occipital Bone: This bone covers the lower and back part of the skull.

Occlude: To close or shut out.

Occult Fracture: A broken bone that is hidden or not initially recognized as a fracture by x-ray. It is only after healing has begun that the x-rays show evidence of new bone formation and the fracture is revealed.

Ophthalmologist: Physician specializing in diseases and defects of the eyes.

Parietal Bones: A pair of bones that form the top and rear of the skull.

Pathognomonic: A definitive characteristic of a disease or mechanism of injury.

Glossary of Medical Terms

Posterior: Towards the rear or back. Its opposite is Anterior.

Posturing: Stiffening of the body.

Prognosis: A forecast about the probable outcome of an illness or an injury. A prediction about the end result of the medical problem.

Retinal Hemorrhages: Bleeding in the rear of the eyes. In children, this is usually a clear indicator that the child has been shaken. Severe acceleration/deceleration of the head causes this bleeding. Retinal Hemorrhages are found in approximately 85% of all Shaken Baby Syndrome cases. The injuries are usually bilateral (both eyes), but can be unilateral (one eye). Retinal hemorrhages can be caused by childbirth and are common in newborns, but they resolve themselves within a few days or perhaps weeks. Other types of Retinal Hemorrhages occur in less than 3% of accidental pediatric head injuries and are usually associated with children who have been involved in high speed, side impact motor vehicle accidents. CPR rarely causes retinal hemorrhages.

Retraction Balls: These are the marker injuries associated with Diffuse Axonal Injury. They occur when the axons are severely damaged. They may be found post mortem when the brain is subjected to chemical staining tests. The absence of retraction balls does not mean that the child was not shaken, since these marker injuries are so subtle that they may not be found in all cases of Shaken Baby Syndrome.

Rotational Force: Violently shaking a child causes the brain to move not only back and forth within the skull, but also from side to side. This rotational force causes shearing injuries within the brain. Rotational force injuries are far more damaging to the child's brain than the translational force injuries that result from straight falls.

Shaken Baby Syndrome (SBS): A medical diagnosis describing a constellation of injuries in small children who have been abused. Definitions of SBS usually refer to babies less than six months old; however, there have been numerous cases of older children who have been injured in this way. The shaking of the child is clearly recognizable as abuse and anyone observing the event would realize that the shaking was so violent that the child would have to have been physically injured.

Shaken Impact Syndrome: There is some controversy over whether or not shaking alone can generate the necessary "G" forces associated with severe brain injury and death. Approximately 50% of children injured during shaking incidents show some evidence of impact as

well. The impact may be with a hard or a soft object. Shaken Impact and Shaken Baby Syndrome have also been referred to as Whiplash Shaken Infant Syndrome.

Skeletal Survey: A radiographic study of 12 - 19 x-rays covering all areas of the body. In SBS cases, a skeletal survey may show evidence of fractures and long bone injuries that are consistent with shaking or swinging a child prior to impact.

Subarachnoid Hemorrhage: Bleeding between the brain and the delicate membrane located between the dura and the brain.

Subdural Hematoma: A collection of blood between the skull and the dura. This is a common injury in shaken infants that results from the tearing of the bridging veins which carries blood to and from the brain. In these cases, subdural hematomas usually result from: a moving object striking the head; the moving head striking a stationary object; or violent acceleration-deceleration forces generated during shaking causing shearing stress on the bridging veins.

Subgaleal: Under the scalp and on top of the skull.

Sudden Infant Death Syndrome: The sudden death of a previously healthy child who is under the age of one year old, where a complete investigation, including a full autopsy and a thorough scene examination, fails to uncover a specific cause of death.

Superior Saggital Sinus Vein: The central vein running from the front to the back of the brain. It carries the bulk of the venous blood leaving the brain and returning to the heart. The tiny bridging veins that drain blood from the brain are connected to this "central vein".

Temporal Bones: The pair of bones on either side of the skull covering the temple.

Traumatic Retinoschisis: Splitting of the retina. This type of injury in children is specific to Shaken Baby Syndrome.

Translational Force: These are the forces generated in straight fall injuries. They generally involve one plane of the body. Even when the translational force impacts the head of a child, as in the case of a short fall, the damage is usually minimal when compared to the damage caused to a child's brain by the use of rotational forces.

Turbid: Cloudy, thick, or dense.

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