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PROMOTING JUSTICE FOR VICTIMS OF ABUSIVE HEAD TRAUMA:

INFORMATION AND STRATEGIES FOR EFFECTIVE COURTROOM PRESENTATION

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Irresponsible expert witnesses have created and perpetuated a false controversy regarding the science underpinning the diagnosis of abusive head trauma. This policy paper seeks to present attorneys and other child maltreatment professionals with information and strategies to prepare and present a case that promotes justice for victims of abusive head trauma.

Abusive head trauma (AHT) is one of the leading causes of death in young children. It is the leading cause of fatal head injuries in children less than 2 years of age (Gill et al., 2009). An estimated 250 children die each year in this country because of inflicted abusive head trauma (Centers for Disease Control [CDC] National Center for Injury Prevention and Control, 2018).

Reviews of child abuse fatalities show that abusive head trauma is a cause or contributor in approximately half of all child maltreatment deaths (Palusci & Covington, 2014). A study of United States cases for the years 2000–2009 estimated that nearly 40 per 100,000 children under the age of 1 year were the victim of AHT (Niederkrötenhaler, Xu, Parks, & Sugerman, 2013).

Even when abusive head trauma does not result in a child's death, its impact on the child can be devastating. AHT is a significant cause of morbidity in young children (Hennes, Kini, & Palusci, 2001; Palusci & Covington, 2014; Choudhary et al., 2018; Starling et al., 2004). One study concluded that 40% of children who sustained, but survived, severe AHT presented with serious neurological impairment (Lind et al., 2016).

More chilling, these estimates are generally thought to constitute an undercount of actual cases (Narang & Clarke, 2014; Hennes et al., 2001, Choudhary et al., 2018).

AHT is particularly tragic because it is, to a large degree, preventable. For nearly 20 years the medical community has known that as many as 80% of these deaths may have been prevented if AHT had been recognized during a prior medical evaluation and reported to child protection authorities (Jenny, Hymel, Ritzen, Reinert, & Hay, 1999).

There is no valid medical controversy regarding the legitimacy of a diagnosis of AHT. There is no valid medical controversy regarding the accepted medical methodology used to arrive at such a diagnosis. More than 40 years of medical research underpins the diagnostic legitimacy of AHT, and multiple medical societies have produced and disseminated consensus statements regarding the validity of the diagnosis. Among those who regularly diagnose the cause of childhood head injuries, the diagnosis is almost universally accepted as valid.

Yet, in spite of the scope of the issue and the uniformity of the medical community's acceptance of the causes and mechanisms of AHT, and the ability of properly trained medical professionals to recognize and diagnose it, a gap exists between what is known medically and the reliability in achieving just outcomes of AHT cases in courtrooms. The reason for that gap is simple: Some within the medical profession, when testifying as expert witnesses, have managed to create – within the court system – a false controversy about the manner and mechanism of injury attributable to AHT. To restate: This false controversy exists only in the legal arena – there is *no* controversy in the relevant medical community, that is, among those who are properly trained and regularly diagnose the cause of injuries in children.

This false controversy has been fueled by advocates who selectively, and often irresponsibly, present the medical evidence in courtrooms with a tendency toward advocacy-inspired overstatements and irresponsible testimony. This has been magnified by the failure of lawyers and judges who have not adequately understood the state of the medical knowledge. As a result of these misdeeds, decision-makers have too often relied upon these irresponsible medical experts, their courtroom claims and their writings. Judges and jurors have been unwittingly fooled by irresponsible expert medical opinion testimony that lacks scientific support and that is at odds with the medical research.

This paper seeks to expose that false, litigation-driven controversy, review what is known about AHT and arm lawyers and investigators with sufficient information to properly prepare and present an AHT case and to confront the irresponsible expert medical witnesses who have created and perpetuated this false controversy just as they have defended those who have killed or severely injured children.

The Science

Abusive head trauma is “an injury to the skull or intracranial contents of an infant or child younger than 5 years caused by inflicted blunt trauma, violent shaking, or both” (Greeley, 2015; CDC, 2018). The range of injuries can include damage to the brain, the spinal cord, the skeleton and the eyes (Christian & American Academy of Pediatrics [AAP], 2009).

There is no significant scientific debate about AHT as a medical diagnosis. “The findings of AHT are consistently made by multiple investigators, in multiple countries over a span of more than 100 years” (Greeley, 2015). As Christian and colleagues (2015) note, the medical research regarding AHT is extensive and comprises more than 1,000 peer-reviewed clinical medical articles written by over 1,000 medical authors from more than 25 different countries (Christian & American Academy of Pediatrics [AAP], 2015).¹

One type of AHT involves violent shaking. For more than 40 years, the concept that violent shaking can cause severe injuries to an infant has been the subject of research. It is now well understood in the medical community that severe injuries may result from violently shaking an infant. This has been established by extensive peer-reviewed literature. Furthermore, research demonstrates that this concept is overwhelmingly accepted by medical practitioners (Narang, Estrada, Greenberg, & Lindbert, 2016).

In 2009, the American Academy of Pediatrics (AAP) affirmed that shaking (i.e., rotational injury) can severely injure a child. At that time, the Academy recommended that in applying proper terminology it would be better to focus on the *injuries* to the child as opposed to defining a specific *mechanism* of injury (i.e., shaking). Thus the Academy urged that the term “abusive head trauma” be used generally to incorporate the condition which had been described by “shaken baby syndrome” and to reflect that such injuries were the result of nonaccidental or inflicted trauma (Christian, Block, & AAP, 2009). To emphasize: The Academy proposed a linguistic modification – that injuries from shaking are merely a subset of AHT, and it did not cast any doubt on the validity of the medical diagnosis, as some irresponsible experts have claimed.²

Across the globe, multiple, major medical associations have recognized the validity of the shaken baby syndrome diagnoses.³

In summary, AHT is widely accepted as a valid diagnosis of a constellation of injuries observed in a seriously injured child. It is based on decades of research, by studies, by retrospective analysis, by research on comparisons of observed injuries with perpetrator

¹ See also *Sissoko v. State* (2018): The controversy over the legitimacy of AHT “exists largely in the legal community, not in the medical communities.” The Court noted, “[t]he main controversy over abusive head trauma involves a minority of physicians and other scientists” before holding “the diagnosis of abusive head trauma remains generally accepted in the relevant medical/scientific communities.”

² This was firmly recognized in *Sissoko v. State* (2018). There the Court reviewed the history of the “shift in terminology” from “shaken baby syndrome” to “abusive head trauma” and concluded that it was not an effort to “shore up [the] diagnosis” before rejecting the claim that the shift undermined the legitimacy of the diagnosis.

³ For example, a 2018 consensus statement (Choudhary et al., 2018), authored by some of the leading medical experts in the field, has been endorsed by Society for Pediatric Radiology (SPR), European Society of Paediatric Radiology (ESPR), American Society of Pediatric Neuroradiology (ASPNR), American Academy of Pediatrics (AAP), European Society of Neuroradiology (E SNR), American Professional Society on the Abuse of Children (APSAC), Swedish Paediatric Society, Norwegian Pediatric Association and Japanese Pediatric Society and others. Similarly, in 2001 the American Academy of Pediatrics, Committee on Child Abuse and Neglect, called SBS “a clearly definable medical condition” (American Academy of Pediatrics, 2001). The Centers for Disease Control, too, recognizes the validity of the diagnosis (see Parks, Annest, Hill, & Karch, 2012).

confessions,⁴ by adoption of consensus and policy statements by professional organizations and by surveys of the professionals who engage in that work.

The Problem

Despite this consensus of medical opinion, cases of AHT have had mixed success in courtrooms. Trial judges, appellate court decisions, even some United States Supreme Court justices⁵ have articulated reservations about the diagnosis, citing testimony and writings by those who have challenged the diagnosis. Lay jurors, confronting a battle-of-the-experts in the courtroom, have, in too many cases, failed to hold offenders accountable.

This gap between what is known and generally accepted in the relevant medical community and the inconsistency of outcomes in legal proceedings is concerning, but remediable. The main cause of this gap is that a certain cadre of expert witnesses has fought, with disturbing success, to create – in courtrooms – the *appearance* of a medical controversy, even though such controversy does not truly exist.

This dispute is scientifically phony. Those who attack the validity of the diagnosis or dispute its linkage to fatal and near fatal injuries to children are generally making those arguments in legal or public media arenas, or in select research they produce primarily for use in the legal arena. As noted by Christian and colleagues, the argument advanced by irresponsible expert witnesses that the diagnosis of shaken baby syndrome is based on a triad of findings is “created to support legal arguments against the diagnosis” (Christian & AAP, 2015, p.7).⁶

What is troubling is that a small group of critics has experienced some success in media circles, in trial courts and in some appellate court decisions. Those successes are not a reflection of the state of medical knowledge or a challenge to the general acceptance of abusive head trauma by the informed medical community. Instead, those successes are generally the result of failings within the legal system by those who are responsible for preparing and presenting the testimony of legitimate medical experts and cross-examining irresponsible medical experts.

To properly understand the problem – and to fix it – it is important that we understand the role of the key players in the court system: The legitimate medical experts, the investigators, the presenting lawyers and the judges.

⁴ Biron & Shelton, 2005; Starling et al., 2004; Vinchon et al., 2010.

⁵ See Cavazos v. Smith (2011) citing six of the more than 1000 medical articles regarding AHT, all written by the minority of medical experts who question the AHT diagnoses, the dissenters in argued that “[w]hat is known about shaken baby syndrome (SBS) casts grave doubt on” it as a cause for the child’s death in this case.

⁶ See also [Sissoko v. State](#) (2018).

The Role of Judges

We start with the role of the judges, because they are the ones who decide whether evidence is admitted or excluded. In areas of scientific conflict, they are often the arbiters of whether there truly is a legitimate controversy in the relevant scientific field. In cases that do not involve jurors (e.g., when a criminal defendant opts for a bench trial or when in some civil proceedings in family court), they are the decision-makers, weighing credibility of witnesses and determining the facts.

By and large, judges want to make the right decisions. They want to be right. They want justice served.

But it is unrealistic to expect that judges will, on their own, know what the research is regarding AHT. For a variety of reasons,⁷ including a prohibition against their engaging in independent research, judges must rely on the attorneys and their expert witnesses to educate them about issues regarding AHT.

In cases involving juries, the judge's role is primarily as a gatekeeper, making an assessment of what evidence can properly be submitted to the jury. In that function, the judge is wholly dependent on the information provided by the witnesses. Thus, the quality of the witnesses, the skill of the lawyers in presenting or challenging the experts' qualifications and opinions and the soundness and persuasiveness of the lawyer's arguments form the basis of the judge's decisions. If a judge permits unreliable information to be submitted to the jury, it is usually due to a failure of the opposing lawyer.⁸

In cases in which the judge is tasked with fact-finding, again, he or she can do so based *only* on the evidence that is introduced in the proceeding. Judges cannot seek out information on their own.⁹ They are unlikely to know the nuances of the scientific literature in an AHT case. They are unlikely to know, with confidence, which of

⁷ Including the Code of Judicial Conduct, which obligates judges to avoid even "the appearance of impartiality." This caution often makes many judges believe that it would be inappropriate, for example, to join specific organizations or attend trainings which provide current information about issues such as AHT. Instead, judges must rely on the information presented to them in court by the lawyers and their expert witnesses.

⁸ That statement is not universally true. Sometimes lawyers strategically choose to permit what might be unreliable scientific evidence to be submitted to the jury, in part because they have confidence they can effectively confront and rebut that evidence, and the admission of the evidence can extinguish potential issues on appeal. Thus the text above does not apply when the decision to admit unreliable scientific evidence is made by a well-prepared, thoughtful attorney making a calculated, tactical decision.

⁹ For example, the American Bar Association's Standing Committee on Ethics and Professional Responsibility issued Formal Opinion 478 (December 2017), which prohibits judges from conducting Internet-based research regarding adjudicative facts. This decision is consistent with other opinions that prohibit judges from conducting independent research.

competing medical theories is correct. Without substantial help, they are also unlikely to be able to accurately determine which expert is most honest and most reliable. Judges need someone in the courtroom whose opinion they can trust.¹⁰

Dr. Roland Summit observed: “What we choose to believe depends upon whom we rely upon as our teachers” (Summit, 1992, p. 21-25). That principle is one of the bedrocks of trial practice. In matters of science, which, for the sake of this discussion, we define as an area outside the common understanding of a particular fact finder, it means providing a person the fact finder can properly rely upon as their teacher. Thus, the job of the trial lawyer in an AHT case is to make sure that the judge (and the jury) rely upon *you and your* experts as their teachers and to expose why the opposing experts should not be relied upon.

This point must be underscored: All too often experts in this field look at decisions that judges have made and, understandably, express frustration, even bewilderment at *how* the judge reached *that* opinion. There is a temptation to be dismayed or upset with the judge. Thus this reminder: A judge can only make decisions based upon the information presented within the confines of the case. Attorneys should expect that without a sound and thoughtful presentation, judges may make their decisions based on pre-existing personal views and biases, including their beliefs regarding the kinds of people who would abuse their children, or on limited information obtained from media sources. If a judge makes a decision citing inaccurate science or shoddy research, the truth is, it is generally the result of the failure of attorneys and expert witnesses to have met their responsibility to have properly presented the better research and to have effectively countered the poor research. It is the job of the lawyers and the experts to properly educate the judiciary. This process can take time; it might require multiple cases and multiple opportunities. It is unreasonable to expect that a judge will, without guidance, know the science and be able to distinguish good research from bad, or honest opinion from irresponsible opinion.

Of course, judges who refuse to study or evaluate the science that is presented, or reject it and act on their personal opinions, preferences and whims in spite of the accurate science are ill suited for their job. We believe this is the rare exception.

The Role of Lawyers

Litigating child deaths and assaults resulting from abusive head trauma is demanding work.

It is the role of the lawyers to thoughtfully present the scientific evidence of AHT in court. It is further the role of the lawyers to effectively confront inaccurate or misleading information presented by the opposing side. This requires that the lawyer find a way to

¹⁰ This is discussed more fully in Stern, P. (1995).

translate complex scientific concepts and awkward medical terminology to make it understandable to a lay audience.

The very nature of the infliction of AHT is that it typically occurs in the absence of witnesses. Even if the child survives the assault, he or she is often too young to speak and is thus unable to describe what occurred or to identify the perpetrator.

These challenges are compounded by the fact that the accused is typically someone whom we might ordinarily think of as the child's caregiver and provider – a parent or loving relative – or someone who was entrusted by people who love the child with his or her care. It is often difficult to accept that such an individual would inflict harm or even kill that child.

Given these limitations, the explanation as to the cause of death or injury¹¹ rests in large part on medical experts. Unfortunately, many doctors – even pediatricians, emergency room physicians and medical examiners – lack knowledge of the science underpinning the diagnosis of AHT or training in how to diagnose it. Even when physicians are able to stay current and trained in the relevant medical research in this area, it can be a daunting task to conclude, articulate, present and support a diagnosis of AHT in court.

To make an articulate, compelling presentation of an AHT case, the lawyers involved in cases of AHT must know the relevant medical science.

Child homicide cases are unlikely to go from date of death to date of trial very quickly. These cases do not just show up on a trial docket one day. Many months, often a year or more, may pass before the case gets to trial. The fact that this is an AHT case will be known very early on. The lawyer's preparation must start when the case first arrives on his or her desk.

A first task is for the lawyer to become versed in the medical literature. Not only will the lawyer need to know the literature to most effectively present and confront the medical experts, but a familiarity with the medical literature will be extremely helpful in understanding the evidence presented by the police reports and in directing further investigative steps.

To gain that knowledge, the lawyers can rely on their existing medical experts (those who are already involved in this particular case) or can use consulting experts. A consulting expert is a person with a deep knowledge of the topic who serves in an advisory capacity. Consulting experts may provide technical knowledge and guidance, provide literature reviews, may help critique opposing expert witness reports, provide advice on presenting the case, assist in the drafting of direct examination and in

¹¹ The difference between a fatal and non-fatal infliction of AHT is often a mere fortuity. The timeliness of intervention, the skill of the interveners and the pediatric critical care providers and the underlying health of the child are among many factors that may distinguish whether the child victim lives or dies from the inflicted injury. As a matter of discussing the issues in this paper, our reference to child fatality will, unless otherwise noted, include serious, non-fatal inflictions of AHT.

preparing cross-examination of the opposing expert and may even provide illustrative trial exhibits.¹²

At the least, the lawyer should be prepared – early on – to go to his or her medical experts or to a consulting expert, and say, “Give me every article I need to fully understand the medical issues involved in this case and to appreciate the arguments of the other side.” The lawyer must then read them, and read them again. After studying the articles, the lawyer must meet with that expert (likely repeatedly) to review what was read and to make sure the lawyer understands the literature. Only then will lawyers be able to intelligently present their medical testimony, be able to respond fully to issues raised on the cross-examination of their experts and be able to fully engage in a meaningful cross-examination of the opposing experts.

Ideally, in a medium- to large-sized prosecutor’s office, at least one lawyer with an interest in these issues will be designated to handle AHT cases. This allows the lawyer to study the literature on an ongoing basis, not just try to absorb it on the eve of trial. A review of the research and the latest developments should be a part of that lawyer’s weekly routine. The assignment of a specific lawyer to handle AHT cases must also be supported with a commitment by the office to allow the attorney to attend trainings, subscribe to appropriate journals and build contacts with experts across the country.

In smaller offices, or where such specialization is not adopted, lawyers should know that in the area of child abuse and neglect, there is a nationwide network of veteran lawyers who have handled these cases, written about these cases, offered training about these cases and are eager to offer help. Organizations such as the American Professional Society on the Abuse of Children, National District Attorneys Association, the Association of Prosecuting Attorneys and individual state Prosecutors Associations maintain training material and a directory of prosecutors around the country who are committed to helping their colleagues understand, prepare and present AHT cases. The same is true for the medical and other professionals who might become involved in these cases. The lawyers are not alone: Help and resources are literally a phone call or email away.

It is *not sufficient* for a lawyer to believe that “the medical experts will explain all this.” If the lawyer does not understand the material, he or she cannot assist the judge or jury in understanding the science of AHT diagnosis or in an assessing the legitimacy of conflicting expert testimony. The lawyer needs to know the science underpinning the diagnosis of AHT to be able to thoughtfully present the testimony and to intelligently respond to any challenges that are raised.

While knowing the science is essential in these cases, this alone is not sufficient to prevail in the case. The lawyer must not *over-rely* on the medical experts. That is, as discussed in more detail below, the cases must also be built on a comprehensive investigation. Relying too much on medical testimony invites a “battle of the experts,”

¹² See generally, Stern, P. (2017).

which tends to ignore and overlook the facts of the case. This can lead to the unnecessary in-court medical disagreement where there otherwise would be none.

If a “battle of the experts” does ensue, it is likely to be one in which the assailants of the settled AHT research make what we have earlier called their phony arguments. Next, we provide thoughts about how the medical diagnosis of AHT should be made, followed by a summary and critique of some of those common arguments made by the naysayers of AHT.

The Role of the Medical Professionals: How the Medical Diagnosis of AHT Should Be Made

Medical clinicians “face unique diagnostic challenges” in suspected AHT cases (Cowley et al., 2018, p. 178). As Cowley (2018) points out, “there is no gold-standard diagnostic test for AHT and the history provided by the caregiver may be inaccurate or deliberately misleading.” While this is true, this challenge is “common with many areas of medicine” (p. 179). However, this challenge has not been an insurmountable barrier to establishing effective diagnostic criteria and procedures for cases of suspected AHT.

Several factors complicate the task of medical diagnosis in suspected AHT cases. Some factors, such as a lack of experience and inconsistent use of terminology, can be addressed through education and training. Other factors appear to be more personal to the diagnostician, such as the fear of making an incorrect diagnosis (either way), personal biases, and the emotional toll of making the diagnosis. Professionals in this field need to set those issues aside. We urge that the medical clinicians in this area base their analysis and interpretation solely on the best medical and investigative information available.

The identification of specific injuries through physical examination and/or radiography often alerts the physician to the possibility of AHT. “If a comprehensive examination reveals no other medical explanation for the child’s injuries, clinicians must decide whether the injuries are accidental or abusive” (Cowley et al., 2018, p. 187, Leventhal et al., 2014). While medical professionals will always treat a child’s injuries regardless of their cause, they must also consider their legal obligation under state law to report suspected child abuse and neglect in a timely manner.

A diagnosis of child abuse requires physicians to carefully consider several types of clinical data. This includes the child’s complete medical history, observations of the child, relevant findings from the physical examination, any particular pattern of injuries to the child, laboratory and radiologic testing and any explanation for the injuries provided by the caregiver. Certain patterns that include complex skull fractures, subdural hemorrhage, hypoxic-ischemic injury, rib or long bone fractures, retinal hemorrhages, bruises or additional signs of physical abuse, seizures or other trauma that is unexplained or inconsistent with the reported history are, in the absence of other

demonstrative medical conditions which adequately explain the entire scope of the injuries, highly indicative of AHT. Still, physicians should consider a number of conditions, using both case history and clinical findings, to arrive at a differential diagnosis.

One type of AHT involves the violent shaking of an infant. The concept that violent shaking can cause serious, sometimes fatal, injury to infants has been well researched and understood in the medical community for more than four decades. It involves a constellation of findings, occurring together, as a result of rotational or inertial injuries, rather than from blunt force trauma or other contact injuries (Christian et al., 2009).

Much of the false criticism of the diagnosis of AHT caused by severe shaking is premised on the misleading claim that it is made purely on the existence of a “triad” of symptoms: subdural hemorrhages, retinal hemorrhages and encephalopathy.¹³ While those factors are significant, the research is – and for some time has been – quite clear that experienced clinicians do *not* diagnose shaking trauma to young children solely on the presence or absence of that symptom triad (Levitt, Smith, & Alexander, 1994; Lucas, Bartas, Bonamy, et al., 2017; Cowley, Maguire, Farewell, et al., 2018). Those factors might well be strong evidence of AHT, but they are not, solely of themselves, diagnostic.

In summary, the medical team must do the following: (1) determine what injuries are present; (2) consider the potential causes of those injuries, both individually and in concert with one another; (3) be aware of the child’s complete medical history; (4) have an understanding of the history of the current injuries as provided by the caregiver; and (5) seek to determine what is the best explanation for the injuries, if such an opinion can be reached. Coordination with colleagues across disciplines, both within the medical community (e.g., pediatric radiologists, endocrinologists) and without the medical community (e.g., law enforcement and children’s protective services), who have information about the child strengthens the diagnosis. A multi-disciplinary collaboration can help achieve a more carefully explored and considered diagnosis (Choudhary et al., 2018). In that way, not only will proper diagnostic conclusions be reached but also those advocates who continue to promote false claims about diagnostic procedures and use those false claims to build fallacious arguments against AHT in general, can be more effectively exposed.

¹³ The diagnosis of SBS has never been based solely on the presence of a “triad” of injuries. See Levitt, Smith, and Alexander. (1994), noting the need for radiological examination, laboratory tests and the need to work with law enforcement and children’s protective services professionals when making a diagnosis of SBS); Sissoko v. State (2018, at 905-906), rejecting the assertion that the diagnosis of AHT is made based upon the presence or absence of “the triad. The Court, noted that “[t]he process of reaching a diagnosis of abusive head trauma . . . is nuanced and fact-specific. Physicians presented with an infant suffering from suspected head trauma will rely on positive and negative clinical, historical, and test-generated pieces of evidence, each of which can support or detract from a diagnosis, including the diagnosis of abusive head trauma.”

A Summary of the Main Arguments of AHT Critics and Why These Arguments Are at Odds With Accepted Medical Consensus

Rather than basing their testimonies on data from well-supported medical research, irresponsible expert witnesses often use strategies suggesting novel causes for a child's injuries; focusing on rare, isolated or inapplicable cases; discounting legitimate research methodologies; or citing research studies that present conclusions of questionable validity considering the scope and level of evidence provided to support them. The intent is to cast doubt on a conclusion that the child's injuries are consistent with AHT. However, these theories are not supported by medical science, and in some cases, they are in direct contradiction to conventional medical knowledge. Some of the more common arguments used by irresponsible expert witnesses are presented below to help lawyers recognize and effectively respond to these attempts.

Sowing Confusion About the Legitimacy of Research Methodology Supporting the Medical Diagnosis of AHT

Irresponsible experts often claim that because AHT cannot be precisely tested in the laboratory, the scientific research underpinning the diagnosis is insufficient. They argue that because we cannot intentionally traumatize children in a laboratory research setting to determine the effects of trauma, this is an insurmountable impediment to accurately diagnosing AHT. This argument is a simplistic and inaccurate representation of the power of today's research methodologies and statistical methods. The evidence is, in fact, overwhelming regarding the legitimacy of the science underlying the medical diagnosis of AHT.

Short Falls

A frequently heard claim is that children with medical findings of AHT could have sustained their injuries from an accidental fall from a short distance, such as a fall to the floor from a couch, a bed, or similar object. Such short falls by children are almost always benign occurrences with no serious injuries. Skull fractures, without serious clinical complications, might be expected in about 3% of these cases; the majority of these are linear (Helfer, 1987) rather than complex or depressed, as is more common in abusive head trauma. Severe intracranial injuries from short falls are exceedingly rare (Duhaime, Alario, Lewander et al., 1992; Kemp, Jaspan, Griffiths, et al., 2011). In rare instances when a short fall results in a subdural hemorrhage, the hemorrhage is typically thin, focal and not associated with significant neurological changes, which is a far different presentation than is typically seen in children with AHT. The aggregate odds of dying from a fall from less than a three-story height is 0.26% (Chadwick, Bertocci, Castillo et al., 2008). The annual risk of death from short falls in young children is less than one in one million.

Severe Coughing from Illnesses Such as Pertussis/Whooping Cough

Coughing, gagging, choking and vomiting have been proposed as a cause of subdural hemorrhage and retinal hemorrhage in children (Geddes & Talbert, 2006). This theory suggests that coughing or choking could increase intracranial pressure sufficient to cause subdural blood vessels to burst. Coughing associated with pertussis has been specifically suggested to be a cause of subdural hemorrhage. The entire body of research cited to support this hypothesis appears to rest on a review of two clinical cases reported in 1968 and 1969, which predate modern neuroimaging techniques (Watts & Acosta, 1969). The authors of the review noted that the link between pertussis and subdural hemorrhage was obscure. There is no scientific basis for the claim that coughing, gasping or choking can cause symptoms that mimic the presentation of AHT.

Lumbar Puncture

Some physicians have testified that a lumbar puncture in the pediatric population is a common cause of subdural hemorrhage. The mechanism offered is a post-puncture leak of cerebral spinal fluid, causing low pressure inside the head that results in subdural hemorrhage (Lee, Lau, Li, Wong, & Chiang, 2007). There is no medical evidence to support this hypothesis.

Cerebral Sinovenous Thrombosis

Cerebral sinovenous thrombosis (CSVT) is a blood clot in a large vein in the head. Some advocates have claimed that by causing bleeding into the subdural space, CSVT is an underdiagnosed cause of acute subdural hemorrhage that may precisely mimic the acute subdural hemorrhage seen in AHT (Matsuda, Matsuda, Sato, & Handa, 1982). Reviews of large numbers of pediatric patients with known CSVT have failed to support any association between CSVT and the development of subdural hemorrhage (McLean, Frasier, & Hedlund, 2012).

Hypoxic Ischemic Injury

Hypoxic ischemic injury is a condition in which the brain swells from a lack of oxygen (hypoxia) and/or a lack of blood perfusion to brain tissue. This condition has been offered as a putative cause of subdural hemorrhage and retinal hemorrhage similar to that seen in AHT caused by severe shaking (Geddes et al., 2003). Geddes et al. (2003) based this hypothesis on having observed similar presentations in children who suffered hypoxia and children with AHT. Punt, Bonshek, Jaspan et al. (2004) disputed the claim that children with hypoxia could be compared with children who had experienced AHT from shaking. Their position gained support from Byard et al. (2007), who compared infants with severe hypoxic ischemic injury with children who had experienced AHT and found that no subdural hemorrhages were identified in children who had not experienced AHT.

Benign Enlargement of Subarachnoid Spaces (BESS)

BESS has been offered as a structural cause for subdural bleeding because veins inside the head are theoretically stretched in BESS and can, therefore, break more easily and as a result of lesser degrees of trauma. BESS is commonly seen in children with macrocephaly (enlarged heads). Most current research indicates that few patients with BESS will develop subdural bleeding as a result of minor trauma (Tucker, Choudhary, & Piatt, 2016).

Rebleeding

Birth injuries and much later rebleeding have been offered in court as an explanation for new subdural hemorrhages. Significant brain injuries incurred at the time of birth normally become symptomatic immediately, and if present, hemorrhages are found in the posterior fossa, a location in the brain that is distant from more recent bleeding resulting from AHT (Looney, Smith, Mack, et al., 2007; Rooks, Eaton, Ruess, et al., 2008; Takagi, Fukuoka, Wakabayashi, Nagai, & Shibata, 1982).

Vitamin Deficiencies

While vitamin deficiencies have been associated with bleeding or weakness in vascular or bony structures, there is no evidence that a vitamin deficiency can cause the constellation of injuries commonly seen in AHT (Fung & Nelson, 2004).

Immunizations

Immunizations have been purported to cause brain swelling and intracranial injury, but there is no legitimate evidence supporting the contention that immunizations can cause the spectrum of injuries commonly seen in AHT.

Drugs and Environmental Toxins

Drugs and environmental toxins have been purported to cause symptoms similar to those of AHT. While substances can certainly cause neurologic damage, they do not result in the clinical presentation seen in AHT.

Brittle Bone Disease

Brittle bone disease is another condition that has been purported by irresponsible expert witnesses to cause medical findings similar to AHT. While bone diseases, such as osteogenesis imperfecta, may predispose to fracture, they do not result in the clinical presentation seen in AHT.

Claims That Biomechanical Models of Acceleration Prove That Vigorous Shaking Cannot Cause Injury

Some witnesses, testifying as experts, have claimed that research on biomechanical models disproves the possibility of severe physical injury resulting from shaking a young child. They often use irrelevant studies relating to injury thresholds caused by impact forces. One article, for example, states that biomechanical models of acceleration show that “vigorous shaking generates accelerations roughly equivalent to a one-foot fall onto carpet,” thus causing serious doubt regarding “pure shaking as a mechanism of injury (Findley, Risinger, Barnes, et al., undated, p. 11). A recent systematic review notes that these models are inadequate and inaccurate to explain the translational and inertia forces generated by shaking a young child (van Zandwijk, Vester, Bilo, et al., 2019). Attorneys, particularly, are encouraged to consult with experts in both biomechanical science and medicine if confronted with one of these claims.

While the above arguments are the most common, they are not the only arguments used to assail a diagnosis of AHT; other equally specious arguments have been given. Often, irresponsible witnesses propose multiple alternative explanations, and when one argument is discounted, another is offered in its place. In one case, the court noted that the defendant’s five expert medical witnesses could not agree about the cause of the child’s death, but they agreed with a reasonable degree of medical certainty that AHT had *not* been the cause (Sissoko v. State, 2018).

The Role of Investigators

The medical diagnostic team is aided by considering the history provided by the caregiver for the injured child. This history, however, is often unreliable or fabricated when child maltreatment is involved. The more thorough the police and social services investigations are, the more information that is available for the decision-makers to be more accurate and more confident in their conclusions. The goal, of course, is for the decision-makers to get the diagnosis right. The more information, and the better the quality of that information, the greater the ability of the medical experts to make a correct diagnosis.

One of the traps of AHT cases is that reliance on expert medical opinion to explain the extent, consequence and, if possible, mechanisms of the child’s injuries can often lead non-medical professionals to an over dependence on such opinions (Cowley et al., 2018). While informed medical opinion is vital, it is not a substitute for a comprehensive investigation by law enforcement and children’s protective services personnel.

While each case will present its own unique challenges, the basics of a full, professional investigation are the same: The police must process the crime scene completely,

photograph it, seize everything they can seize¹⁴ and obtain statements from all witnesses (the more adverse the witness is likely to be, the more detailed his or her statement must be). They should try – hard – to interview the suspect. If the suspect provides an explanation for the child’s injuries that involves a fall or accident, seek to videotape a reenactment of his or her version of how that accident/fall occurred. If the fall was from an item (e.g., a couch), document and, if possible, take the item. If the fall was onto a floor, rip up the carpet (a decent-sized section will do) and the carpet pad and document the surface below. The medical records and documentation from everyone who treated the child must be secured as well as additional statements from those who provided direct care; these include, of course, everyone who treated the child at the hospital but especially those who treated the child at the scene and en-route to the hospital, including firefighters, EMTs or an ambulance crew. Since the defense in these cases will often try to attribute the fatal injury to pre-existing health issues, investigators must seek to obtain *every* medical record that exists on the child, from birth forward. Interviews must be done with those who had been around the child over the past several days (to document the child’s condition, which also helps fix the time window for when the fatal injuries were most likely inflicted). Additional interviews should be done with those who witnessed the suspect interacting with the child on previous occasions (to reflect on how they typically cared for the child).

This list is hardly exhaustive. Nor is it prescriptive. In a given case, some of this information may be unobtainable or prove to be unnecessary. The failure to obtain all the information on this list does not necessarily mean the diagnosis is inaccurate, nor does it necessarily mean the investigation is deficient. It would be a misuse of this discussion for one to claim that the failure to obtain or achieve every item as a “gotcha.” This is merely the start of a blueprint for the methodical and exhaustive process of collecting every piece of evidence that the investigative team can contemplate gathering.

Responding To False Claims About AHT

Preparing Expert Testimony on AHT

Much of the success or failure in a case will depend upon the expert witnesses’ qualifications, preparation and communication skills.

A well-qualified expert, acting within his or her area of specialty, should objectively examine all of the available evidence in a case, apply the most reliable and current applicable research, layer on his or her own clinic experience, and offer a fair and dispassionate interpretation of what those facts mean. The expert opinion should be presented clearly, precisely and objectively.

¹⁴ The basic rule is: If you are there, see it. If you can see it, photograph it. If you can photograph it, take it. (Of course, *with* a warrant, as needed.) A more complete review of the investigation is available in Vendola M. (2001).

For the Medical Professionals: How the Medical Diagnosis of AHT Should Be Presented in Forensic Settings

Drawing a medical conclusion about the cause of a child's head trauma is a specific skill. Articulating those conclusions is another distinct skill.

The medical expert who becomes involved in a forensic matter must take pains to consider what their findings are, how they made those findings and how to express those findings in terms that lay people can understand. They must also be able to acknowledge the limitations of the opinions based upon those findings.¹⁵ In considering those issues, the expert should ask themselves these questions:

- What do I know?
- How do I know what I know?
- What don't I know?
- Why don't I know what I don't know?

In recent years there has developed a robust cottage industry of those who have been strident in their efforts to assail the diagnosis of AHT. For those medical experts who have been on the receiving end of the in-court challenges, the attacks can feel unfair and personal. Unfortunately, some have chosen to react to those attacks with their own overstatements or defensive advocacy. That is unwise and unhelpful. While confidence in an opinion may be warranted, arrogance in giving that opinion is not helpful. Slowly, thoughtfully explaining the *reasons* for an opinion is vital in a forensic setting. An approach that answers the question, How do you know that? with a response of, "Because I am *me*," may be sufficient in certain circles, but it is unacceptable in the forensic field. Over-advocacy is not defeated by over-advocacy.

The explanation of what happened to the child must also be provided in terms that laypersons – jurors and judges – can easily grasp. Thus some fundamental discussions about how the body works, biomechanics, and how injuries are visualized are crucial. Explanations about how injuries are detected and what kinds of bodily insults lead to what types of injuries are helpful. Illustration is helpful. To the extent such explanations can be reinforced with images or models or examples, those means of visualized presentation should be utilized.

The medical expert should be prepared to discuss what non-abusive medical explanations were considered to explain the child's injuries. The medical expert should also be prepared to explain (if accurate) why none of those explanations are consistent with, or provide logical explanation for, the child's injuries based on the findings and the child's medical history. Additionally, the medical expert must consider what pieces of evidence, from outside the doctor's examination, might help support their findings.

¹⁵ For a fuller discussion on providing expert testimony, see Stern, P. (1997).

For the Lawyers: What Lawyers in AHT Cases Need to Know About Cross-Examining Medical Experts

As noted above, the ideal expert is one who has objectively reviewed all the available evidence, applied the most accurate research and reached a thoughtful, considered opinion. However, what has too often come into the debate about AHT are advocates for a particular side. In cases involving AHT, advocacy often appears to hold particular sway over the interpretation of evidence. In these cases, for *those* experts, it seems that too frequently, instead of allowing the facts and the science to lead to an objective conclusion, a specific conclusion has become the starting point, and then the facts (or the absence of facts) and self-supporting research¹⁶ are cited to justify that conclusion. The presentation of that expert opinion is often guided by politics or ideology rather than by rigorous scientific inquiry. The ideology can be influenced by values, greed, guild interest or a mere egotistical desire to have people think you are right.

This effort has been successful, in significant part, because, as previously noted, the advocates for those accused of inflicting AHT often have managed to manufacture the appearance of a legitimate medical debate in the legal arena. The lawyers cross-examining those experts must be prepared to expose this phony debate.

The key to successfully confronting misleading or irresponsible expert testimony is in the preparation by the lawyers. Crucial for the lawyer seeking to challenge an opposing expert witness is to focus *less* on what the ultimate opinion is, and instead fully understand the *reasons* given for that opinion. That is, the cross-examining lawyer must completely appreciate *why* the expert believes what he or she believes. To restate: The attorneys should concentrate on the reasons for the expert's opinion, far more than the simple bottom-line articulation of an opinion.

Thus, an attorney preparing to cross-examine an expert witness should devote much of their pre-trial preparation (including any interviews/depositions of that expert as permitted within the jurisdiction) to understanding the expert's response to the following:

1. Tell me each and every conclusion/opinion you have drawn from your analysis in this case
2. For each opinion, explain each and every reason you relied on to reach that conclusion

¹⁶ One of the hallmarks of the faux science advanced in these areas is the incestuous nature of the "scientific" publications relied upon by its advocates. Typically a few combine to write an article, submit it to a journal published by a like-minded advocate who has it "peer reviewed" by additional selectively chosen like-minded advocates. Once published, the players shift positions with another pairing doing the next writing while others "peer review" for the next sympathetic journal editor. The result may be a plethora of articles, but all are conceived, written, reviewed and published by the same small cadre of motivated professional allies. In the forensic arena, one can then go to court with this pile of publications, hopeful that the opposing side won't unravel this tight web of committed, collaborative advocates.

By understanding the reasons for each opinion, the attorney can then structure his or her cross-examination to challenge the soundness of each reason relied upon by the expert. If sufficient reasons are successfully weakened or eliminated, the opinion(s) they support can no longer stand.

Reasonable, responsible experts can reach different opinions from the same set of facts. On the other hand, the irresponsible expert witness will purposefully rely on false or misleading reasons for their opinion, or permit their opinion to be formed around a pre-existing or fixed ideology. In cases of AHT, ideology has played a huge role in the formulation and articulation of expert medical opinion.¹⁷

The structure of a cross examination of an expert witness can be centered on four additional questions:

1. Is the person qualified? What is the witness's level of training, knowledge and experience?
2. What case information and discovery have been made available for the experts to review? Have they had access to the entirety of the case materials?
3. Was the evaluation done properly? To what extent has the expert adequately utilized proven processes and procedures, relied upon appropriate studies and research and made logical conclusions based upon the facts and information available?
4. Has the witness remained objective and unbiased? Is the witness an expert or an advocate in expert's clothing?¹⁸

To be able to answer these questions, the cross-examining lawyer will not only need to know the relevant medical research, but also do a comprehensive study of the particular expert witnesses. This means knowing their background, their training, their experience, reading their past research, their writings, including list-serv and blog posts, reviewing as many transcripts of prior testimony as can be located and comparing what they have said in these various forums.¹⁹ As noted previously, there are resources readily available to help prosecutors track down and obtain these materials.

A structured cross-examination, considering these factors and using them to challenge the soundness of the irresponsible expert's opinion can expose the fallacies of the expert's reasoning and reveal their preexisting ideology and bias.

¹⁷ So we are clear, this caution can apply to proponents on both sides of the debate.

¹⁸ These are drawn from Stern, P. (1997).

¹⁹ One of the things the prior testimonies may demonstrate, particularly in the case of an irresponsible expert witness, is that the medical expert delivers the same didactic lecture in every case, without regard to the specific facts in the case.

Summary

There is no scientifically valid controversy regarding the etiology of AHT. Nor is there any valid controversy regarding the proper methods and procedures used to establish an accurate medical diagnosis of AHT. Medical science has provided physicians with the capability to accurately diagnose abusive head trauma in infants.

Nevertheless, some medical expert witnesses, testifying on behalf of those accused of killing or injuring children, have presented multiple alternative medical theories as possible explanations for the injuries and symptoms seen in AHT. Properly trained medical personal, and the trial lawyers presenting these cases, need to carefully, thoughtfully and forcefully confront those theories which lack factual support and which misrepresent the true body of medical science regarding AHT.

There is uniformity of research findings and opinion about the soundness of the AHT diagnosis among those who regularly diagnose the cause of childhood head injuries. A small cadre of irresponsible medical witnesses, however, has managed to get the *legal* community to debate the validity of *medical* science.

Debates about medical research belong in the relevant scientific community. Advocacy belongs in the courtroom. Lawyers arguing AHT, in both criminal and civil settings, are in a unique position to expose this false debate. It is incumbent on the medical experts to help educate and prepare those lawyers. It is incumbent on the medical clinicians to be well trained, well informed and to engage in the best, most thoughtful, most coordinated evaluation and diagnosis possible. It is incumbent on all medical experts to fully, fairly and ethically explain the strengths *and* limitations of their opinions. Thorough police and children's protective services investigations are essential.

With a commitment of the practitioners to apply the best medical research, and of the lawyers to become knowledgeable of the field and to articulately educate judges and jurors, we can expose the inaccurate testimony of irresponsible expert witnesses, and obtain justice on behalf of killed and injured children.

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