

What do pediatric healthcare experts really need to know about *Daubert* and the rules of evidence?

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Background

Pediatricians, pediatric radiologists and neuroradiologists render countless medical opinions on a daily basis. When physicians use their specialized medical knowledge and sophisticated evaluative methods and tools to diagnose child abuse, their opinions shape and may even determine legal decisions in the juvenile, family and criminal courts. These out-of-court evaluations and in-court “expert opinions” frequently help courts decide cases involving abusive head trauma/shaken baby syndrome (AHT/SBS). In these cases, defense attorneys and their retained medical witnesses have increasingly challenged the scientific foundations for abuse diagnoses and this purported “scientific” controversy has been echoed in the medical and legal literature and the popular press.

Daubert and the admissibility of expert evidence

Expert witness testimony is governed by specific evidentiary rules and case law in each state. Although medical expert witnesses are traditionally asked to provide their opinions to “a reasonable degree of medical certainty,” this is confusingly *not* the legal standard for the admission of expert opinion testimony. The United States Supreme Court set the current admissibility standard for expert evidence in the federal courts in 1993 in *Daubert v. Merrell Dow Pharmaceuticals Inc.*, [1], and to date 30 state courts have adopted the *Daubert* standard [2]. Even in states that have not adopted *Daubert*, most state court judges report that *Daubert* has had a

powerful influence on their decisions to admit, exclude or limit expert evidence [3].

In *Daubert*, the Supreme Court abandoned the nine-decade-old *Frye* [4] standard, which had permitted judges to admit or exclude scientific evidence based solely on a determination of whether the evidence was generally accepted within the relevant scientific community [1]. According to the Supreme Court, *Frye* had not survived the adoption of the Federal Rules of Evidence (in the mid-1970s), which governed the admissibility of scientific evidence but did not contain a general acceptance standard. Instead, the *Daubert* Court decided that judges should serve as gatekeepers to protect the courts from invalid scientific information. Future judges would need to determine whether expert evidence is scientific knowledge [1], which “requires judges to critique scientific evidence and separate the wheat of valid scientific methodology from the chaff of chicanery” [5]. To assist judges with this new task, the *Daubert* Court developed a non-exhaustive list of scientific criteria: (1) testability, (2) peer review and publication, (3) error rate, and (4) general acceptance [1]. “Thus, *Daubert* moved judges into the role of gatekeeper, charged with the ‘responsibility of evaluating the scientific validity of the basis for expert testimony,’ and ‘obligated to become familiar with the methods and culture of science’” [6]. In 2000, Federal Rule of Evidence 702 was amended to codify the judge’s gatekeeping role in the federal courts and to clarify “that this gatekeeper function applies to all expert testimony, not just testimony based in science” [7]. Subsequently many states have made similar changes to their evidence rules.

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The pediatric healthcare expert’s role

Pediatric healthcare experts who understand the evidentiary standard will be in the best position to explain to the judge

and jury: (1) what they know, (2) how they know what they know (i.e. the methodology used in coming to their opinions), (3) how they assure that their opinions are valid (i.e. the science underlying their opinions), and (4) the likelihood that their opinions are wrong. This explanation invariably includes a discussion of the relevant human anatomy, the most efficacious imaging technology (e.g., explaining how the technology works and why the use of a particular imaging technique was in the patient's best interest, even if other technologies were available), the most current peer-reviewed, evidence-based medical literature (e.g., describing why certain studies, whether retrospective or prospective, employed sound methodology and, consequently, produced valid data and why other research lacks a solid scientific foundation), and the diagnostic process utilized in arriving at the opinion.

At trial, the medical expert explains and defends the decisions that lead to the abuse diagnosis. This testimony is especially important in child abuse cases because often “the only proof available is circumstantial [medical] evidence since abusive actions usually occur within the privacy of the home, the child is either intimidated or too young to testify, and the parents tend to protect each other” [8]. In criminal cases, the state typically offers medical evidence to establish that a child's injuries were caused by abuse and the defense (almost invariably) responds with medical expert testimony that supports a non-abusive alternative explanation for the child's injuries [9]. In both criminal and civil cases, the defense attempts “to prove the medical findings are not the result of shaking, but instead the product of some other disease process or circumstance, e.g. the child's injuries are consistent with an accidental fall” [9]. Given these competing objectives, judges use the rules of evidence to determine which evidence may be presented to the jury (or considered by the court as fact finder in a non-jury trial) [10–13]. To the extent that some or all of this evidence is admitted, the fact finder should use similar criteria to assess the weight of the competing medical evidence.

In child abuse cases, these tasks are complicated by the fact that much of the medical evidence offered to support or refute abuse allegations is hard for the average judge or jury to understand—especially when well-credentialed experts present conflicting opinions. Pediatric healthcare specialists can help the courts by clearly and fully explaining the basis for their opinions. These explanations will transcend the clinical diagnostic process in this case (discussed above) to include the relevant scientific concepts and the supporting medical evidence (e.g., explaining the strengths and weaknesses of clinical medical articles, controlled trials, single case studies, opinion articles and letters, and the weight of medical opinion in the appropriate fields). In some cases, courts might also need to understand whether a theory has been (or could be) tested and to evaluate error rates by identifying, explaining and distinguishing types of errors.

How *Daubert* can help the pediatric healthcare expert

The clear lesson of *Daubert* is that “experts have to be much more prepared to disclose the scientific underpinnings of their opinions than they were in the past” [1]. Specifically, the pediatric healthcare expert must help the court to place the medical evidence into context, a task emphasized by the *Daubert* court conclusion that “[w]idespread acceptance can be an important factor in ruling particular evidence admissible, and a known technique which has been able to attract only minimal support within the community ... may properly be viewed with skepticism” [2]. Thus, to prepare for cross-examination, the pediatric expert must be ready to discuss the range of alternative diagnoses not account for the injuries in this case. This explanation should incorporate the peer-reviewed scientific literature assessing the statistical strength of relevant radiologic findings with particular diagnoses and the distinction between published research and published commentary. The effective expert will use this information to clearly explain why she excluded the alternative diagnosis.

Because *Daubert* emphasized peer-review and publication, the expert should also explain to the court that publication alone (even in a peer-reviewed journal) does *not* validate a particular alternative theory. Judges and juries seldom understand that scientific journals often publish minority or outlier articles *not* to endorse the view presented but to highlight areas of contention. Although this should be obvious when the journal has also published critique of the minority/outlier view, this editorial practice in medical literature remains foreign and confusing to the courts [14–18].

The pediatric expert and the so-called AHT/SBS scientific controversy

Today it is increasingly likely that courts will be influenced by a small but media-savvy group of physician witnesses and legal academics [19] who have drawn public attention to their claims of having “ripped the lid off” a wave of false AHT/SBS convictions. These claims have been repeated and further sensationalized by the mainstream media [20], which generally does a poor job of distinguishing what Dr. Robert W. Block, President of the American Academy of Pediatrics, recently referred to as “the real experts [who] are the physicians who work every day with these cases and have both authored and read voluminous literature that substantiates the existence of abusive head trauma, and are the folks who are the most capable of informing the public about what the issue really is” from those who “create these sham media blasts that cause great confusion” [19]. However, as Justice Stephen Breyer has stated, even when the science seems confusing to the courts “neither the difficulty of the task nor any comparative lack of expertise can excuse

the judge from exercising the ‘gatekeeper’ duties that the Federal Rules of evidence impose[;] [t]o the contrary, when law and science intersect, those duties often must be exercised with special care” [21, 22].

For example, pediatric healthcare experts should use *Daubert* criteria when they testify in AHT/SBS cases to help courts evaluate defense medical witnesses’ increasingly frequent claim that the subdural hemorrhages (SDHs) seen on CT/MRI images are *caused* by sagittal sinus venous thrombosis (SSVT) and not abuse. In these cases, the expert can use *Daubert* factors such as: (1) general acceptance, (2) peer-reviewed publication, (3) testability/falsifiability, and (4) error rates, to explain the associative but not causative relationship between SSVT and SDHs. Pediatric experts can use a similar approach to help judges and juries properly evaluate other alternative diagnoses such as the re-bleeding theory of SDHs and traumatic brain injuries attributed to short falls [23, 24]. This last example also provides an excellent opportunity for the expert to explain to the court that some scientific-sounding opinions are belied not just by the science but by everyday experience [25]. If short falls routinely produced the forces necessary to fracture infant skulls, emergency rooms would be flooded with infants and children suffering from skull fractures and traumatic head injuries after minor falls. Everyone knows this is not the case. Thus, as one scientific author has astutely commented, “when models do not conform with human experience, then there is something wrong with the model” [24].

The legal effects of the purported AHT/SBS scientific controversy were specifically addressed in a recent article by Dr. Daniel M. Albert published in the *Journal of the American Medical Association* [26]. Dr. Albert and his co-authors warned that the integrity of the adjudication of child abuse cases is increasingly threatened by “physicians with variable credentials [who] have a willingness to disparage scientifically grounded and accepted testimony, use unique theories of causation, omit pertinent facts or knowledge, use unique or unusual interpretations of medical findings, make false statements, or engage in flagrant misquoting of medical journals” [26]. Defense lawyers in child abuse cases, and the medical witnesses they retain, typically ignore the “evidence-based, peer-reviewed medical literature with 40 years of contributions by pediatricians, neuro-radiologists, clinical and forensic pathologists, ophthalmologists, and physiologists clearly supporting the construct of a medical diagnosis of AHT,” in their effort to “emphasize the overlap between AHT and other diseases” [26].

In AHT/SBS cases, it is also common for defense-retained medical witnesses, “[i]nstead of presenting the totality of all medical findings, ... [to] isolate each medical finding and its multiple differential diagnoses to confuse the jury” [26]. For example, these witnesses sometimes claim that their opinions are based *solely* on the images they reviewed. However, the direct and cross-examination of

these witnesses invariably includes an interpretation of findings (e.g., possible causes, severity of forces, associated symptoms, specificity for non-accidental trauma) that requires consideration of the totality of the medical findings. Medical witness testimony that isolates a single diagnostic tool (e.g., the radiologic images) or focuses only on the consistent medical findings while ignoring inconsistent findings violates professional ethical norms because “[e]xperts must not put forward untested or unacceptable views. ... [and their] [c]onclusions must be reached after considering all the available evidence, not just those aspects which support a particular view” [27]. Because “[o]rganized medicine has a responsibility to ensure that unbiased and evidence-informed opinion is used to explain to a judge and jury the significance of medical findings” [27], all experts “must be prepared to cast aside ideas of loyalty to one party or another and give evidence with the child’s welfare as the primary aim” [27]. When these ethical obligations are communicated to the courts, they should resonate. Not only does the legitimacy of our legal verdicts depend on unbiased and ethical expert opinion testimony, but Federal Rule of Evidence 702 (and its state equivalents) requires that judges carefully scrutinize testimony from experts who “have developed their opinions expressly for the purposes of testifying” [6].

The specific question of whether medical evidence of AHT/SBS meets the *Daubert* standard has recently been addressed by Dr. Sandeep Narang in his article, “A *Daubert* Analysis of Abusive Head Trauma/Shaken Baby Syndrome” [28]. Dr. Narang applies *Daubert* criteria to the medical literature used to support (and critique) the validity of AHT/SBS and to clinical diagnostic practice. Dr. Narang describes his research, which includes “eight systematic reviews, over 15 controlled trials, over 50 comparative cohort studies or prospective case series, and numerous well-designed, retrospective case series/reports, comprising thousands of cases, *supporting* the diagnosis of AHT,” and his finding that “there is *not one* clinical study that demonstrates a greater statistical association of either subdural hemorrhages or retinal hemorrhages with accidental trauma over abusive head trauma” and that “almost all of the papers questioning the validity of AHT (save two or three) are non-randomized, retrospective case series/reports, and without comparative control groups . . . or single case reports,” which together support his conclusion that AHT/SBS is a clinically valid medical diagnosis [28]. Dr. Narang also provides medical experts and courts with an exceptionally clear and useful review of the basic statistical tools necessary to assess the accuracy of increasingly common arguments that the scientific underpinnings of AHT/SBS are flawed because they are “predicated upon ‘circular reasoning,’ ‘data gaps,’ and ‘inconsistency of case definition,’ and that ‘as technology and scientific methodology advanced, researchers questioning the basis of SBS reached a critical mass’” [28].

In a forthcoming response to Dr. Narang’s article, law professors Keith A. Findley and David A. Moran (along with

Drs. Patrick D. Barnes and Waney Squier) [10] reassert their opinion that there has been a paradigm shift in AHT/SBS diagnosis based on experts “failing to consider the wide range of known or alternative causes or the unique pathophysiology of the infant brain, [resulting in] studies [that] almost certainly overestimate the incidence of abuse” [10]. This argument ignores the vast quantity of medical evidence cited by Dr. Narang and appears to be based instead on two literature reviews published in 2011 by Drs. Barnes and Squier [29, 30].

Given the centrality of the *Daubert* decision, it is interesting to note that Findley et al. [10] reach the surprising conclusion that *Daubert* requires an all-or-nothing determination. In his view, *Daubert* applied to AHT/SBS evidence yields just two possibilities: (1) “[o]ne could exclude both sides of the debate from the courtroom because there is inadequate information to make a conclusive diagnosis” or (2) “experts with differing perspectives can argue it out in the courtroom, leaving it to judges or juries to sort out the intricacies of the infant brain and the complexities of biomechanics” [10]. This assertion is – to put it plainly – wrong. The text of *Daubert* and two decades of application by the courts directs judges *not* to adopt an all-or-nothing approach but instead to work with all of the experts, to understand the evidence, to make careful, accurate, evidence-based determinations, and to admit *only* that portion of the expert opinion evidence that actually has a “grounding in the methods and procedures of science” [1].

Conclusion

Familiarity with the gatekeeping principles of *Daubert* will allow healthcare experts to better serve both science and law by identifying and synthesizing the most valid scientific information to present to juries at trial. Pediatric healthcare professionals should confer, in advance of trial, with attorneys regarding the *Daubert* standards to ensure a shared understanding and use of these guiding principles.

In sum, pediatric healthcare experts called to testify in child abuse cases must help judges and juries understand:

1. Relevant human anatomy in basic terms
2. Imaging technologies that show the anatomy and pathology and the advantages and disadvantages of different technologies (e.g., safety, efficacy, availability)
3. The most current peer-reviewed, evidence-based medical literature and the distinction between medical research and commentary/opinion articles
4. The diagnostic processes utilized in arriving at the opinion
5. The range of alternative diagnoses and (when supported by the facts) why these diagnoses are not plausible (the specific problems with the alternative diagnosis and the probability that this diagnosis is correct).

References

1. *Daubert v. Merrell Dow Pharm. Inc.*, 509 U.S. 570 (1993) Available via <http://www.law.cornell.edu/supct/html/92-102.ZS.html>. Accessed 11 October 2012
2. MDex Online (2012) Post-Daubert standards for admissibility of scientific and other expert evidence in state courts, 90 A.L.R. 453. Available via <http://www.dauberttracker.com/gatekeepingstandards.cfm>. Accessed 11 October 2012
3. Gatowski SI, Dobbin SA, Richardson JT et al (2001) Asking the gatekeepers: a national survey of judges on judging expert evidence in a post-Daubert world. *Law Hum Behav* 25:433, 442–447
4. *Frye v. United States* 293 F. at 1014 (1923) Court of Appeals of District of Columbia
5. Beecher-Monas E (1998) Blinded by science: how judges avoid the science in scientific evidence. *Temp L Rev* 71:55,62
6. Federal Rules of Evidence (2010) Advisory committee notes for The Committee on the Judiciary House of Representatives. *Fed R Evid* 702
7. Sarah C, Jason C (2001) 10 Nebraska Court of Appeals 184, 626 N.W.2d 637
8. Townsend BA (1998) Defending the ‘indefensible’: a primer to defending allegations of child abuse. 45 A. F. L. Rev 261, 270
9. Holmgren BK (1999) The legal system’s role in facilitating irresponsible expert testimony. *SBS Quarterly* (Summer) at 1. Available via <http://www.dontshake.com/sbsummer99expert.html>. Accessed 11 October 2012
10. Findley KA, Barnes PD, Moran DA et al (2012) Shaken baby syndrome, abusive head trauma, and actual innocence: getting it right. *Hous J Health L & Pol’y*. Available via <http://ssrn.com/abstract=2048374>. Accessed 11 October 2012
11. Imwinkelried EJ (2010) Shaken baby syndrome: a genuine battle of the scientific (and non-scientific) experts. *Crim L Bull* 46:156. Available via http://papers.ssrn.com/so13/papers.cfm?abstract_id=1494672. Accessed 11 October 2012
12. Tuerkheimer D (2011) Science-dependent prosecution and the problem of epistemic contingency: a study of shaken baby syndrome. *Ala L Rev* 62:513. Available via www.law.ua.edu/pubs/lrarticles/Volume%2062/Issue%203/TUERKHEIMER-Science-Dependent_Prosecution.pdf Accessed 11 October 2012
13. Tuerkheimer D (2009) The next innocence project: shaken baby syndrome and the criminal courts. *Wash U L Rev* 87:1, 11. Available via <http://lawreview.wustl.edu/in-print/the-next-innocence-project-shaken-baby-syndrome-and-the-criminal-courts/> Accessed 11 October 2012
14. Goldbert C (2010) Pediatrics Academy president-elect on ‘shaken baby syndrome.’ WBUR. Available via <http://commonhealth.wbur.org/2010/10/pediatrics-academy-president-elect-on-shaken-baby-syndrome>. Accessed 11 October 2012
15. Brazelton E (2011) Shaken baby syndrome faces new questions in court. Available via <http://www.pbs.org/wgbh/pages/frontline/the-child-cases/>. Accessed 11 October 2012
16. *General Electric Co. v. Joiner* (1997) 522 U.S. 136, 148 (Breyer J concurring)
17. Goodman-Delahunty J (1997) Forensic psychological expertise in the wake of *Daubert*. 21 *Law Hum Behav* 21:121
18. McLean LA, Frasier LD, Hedlund GL (2012) Does intracranial venous thrombosis cause subdural hemorrhage in the pediatric population? *AJNR* 33:1281–1284
19. Slovis TL, Chapman S (2008) Vitamin D insufficiency/deficiency – a conundrum. *Pediatr Radiol* 38:1153
20. Keller KA, Barnes PD (2008) Rickets vs. abuse: a national and international epidemic. *Pediatr Radiol* 38:1210–1216
21. Chesney RW (2008) Rickets or abuse, or both? *Pediatr Radiol* 38:1217–1218

22. Jenny C (2008) Rickets or abuse? *Pediatr Radiol* 38:1219–1220
23. Slovis TL, Chapman S (2008) Evaluating the data concerning vitamin D insufficiency/deficiency and child abuse. *Pediatr Radiol* 38:1221–1224
24. Chadwick DL, Kirschner RH, Reece RM et al (1998) Shaken baby syndrome—a forensic pediatric response. *Pediatrics* 101:321
25. Moreno JA, Holmgren B (2012) Dissent into confusion: the Supreme Court, pseudoscience, and the false ‘scientific’ controversy over shaken baby syndrome. *Utah L Rev* (in press)
26. Albert DM, Blanchard JW, Knox BL (2012) Ensuring appropriate expert testimony for cases involving the ‘shaken baby.’ *JAMA* 308:39–40
27. Chapman S, Hall CM (1997) Non-accidental injury or brittle bones. *Pediatr Radiol* 27:106–109
28. Narang S (2012) A Daubert analysis of abusive head trauma/shaken baby syndrome. *Hous J Health L Pol’y* 11:505, 540. Available via http://papers.ssrn.com/so13/papers.cfm?abstract_id=1919054
29. Barnes PD (2011) Imaging of nonaccidental injury and the mimics: issues and controversies in the era of evidence-based medicine. *Radiol Clin North Am* 49:205
30. Squier W (2011) The ‘shaken baby’ syndrome: pathology and mechanisms. *Acta Neuropathol* 122:519