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## Keynote Address: Can a Sign or Occult Finding Predict a Causal Relationship?: How to Reason About Possible Child Abuse

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## KEYNOTE ADDRESS: CAN A SIGN OR OCCULT FINDING PREDICT A CAUSAL RELATIONSHIP?: HOW TO REASON ABOUT POSSIBLE CHILD ABUSE

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Dr. Peter Aspelin\*

This is only the second time I'm talking about child abuse. The first time was a few months ago for the Swedish Supreme Court.<sup>1</sup> I then explained that I can't testify on an individual case because I'm not a specialist who diagnoses—in spite of my profession as a radiologist—child abuse. But I explained that I'm experienced in evidence-based medicine. So I had the opportunity to testify in the Supreme Court and I contributed to change the verdict of the case. That ruling created some turbulence in Sweden about how to handle child abuse and Shaken Baby Syndrome (SBS) in the future. So I think that was why I was invited here. I will tell you about how I was reasoning when I came into the child abuse field just four years ago.

I have a disclosure. I have a son who was accused of shaking his son, my grandson Johan, and I will talk a little about that in relationship to the topic of today, and that will be referred to as Johan's case.<sup>2</sup> After more than three years, the charges were dismissed. I first want to emphasize that I personally believe that violent shaking may seriously injure a child. I heard Patrick Barnes say the same thing. I believe that some of the cases that I have been presented with over the years had involved violent shaking. Pediatricians should look for signs of child abuse. So let's make sure that these facts are never forgotten.

I have served in several different roles to analyze and evaluate science, especially the seven years when I was Chairman of the Scientific Board of the Swedish Board of Health Technology Assessment, whose main purpose is to promote evidence-based medicine. So, in summary, I'm not a specialist in diagnosing SBS, but I'm well-educated in evaluating research and especially evidence-based medicine.

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1. See generally *Högsta Domstolen* [HD] [Supreme Court] 2014-10-16 B 3438-12 (Swed.), [http://rffr.se/wp-content/uploads/2014/12/Swedish\\_supreme\\_court\\_20141016.pdf](http://rffr.se/wp-content/uploads/2014/12/Swedish_supreme_court_20141016.pdf).

2. Joseph Shapiro, *Dismissed Case Raises Questions on Shaken Baby Syndrome*, NAT'L PUB. RADIO (Dec. 21, 2012), <http://www.npr.org/2012/12/21/167719033/dismissed-case-raises-questions-on-shaken-baby-diagnosis>.

The scientific problem is: with what certainty can a sign or occult finding predict a causal relationship? And now I ask you to follow my way of reasoning.

After my son was accused, I started to study the evidence behind SBS. Before that, I was a true believer. Like Patrick says, I was trained in medical school: if you have the triad—retinal bleeding, subdural hematoma, and brain swelling—it’s Shaken Baby Syndrome.<sup>3</sup> It started with actually a very vague hypothesis by Guthkelch<sup>4</sup> that became a new theory by Caffey,<sup>5</sup> and that developed into child abuse parenting—the battered child syndrome—that was suggested already in 1962.<sup>6</sup> And over time, that developed to a theory of a pathognomonic causal relationship. This is the very short history of why we’re all here today.

I started to study the evidence for that. A pathognomonic finding in medicine means it is so definitive that it defines the diagnosis—it must be that and nothing else can explain that. What is the evidence that the triad is pathognomonic for child abuse, and what is the positive predictive value if you have the triad? I started to study the evidence behind that. There surely are a lot of people who say, “Why is a conference like this taking place?” Is there a controversy? “No,” they say, “There’s not a controversy, just a couple of foolish people who do not agree with us.” But my answer is, yes, there is a controversy. There is new evidence to the question, the theory behind the concept and the causal relationship.

When I first started to study this diagnosis and my grandson had the triad, I realized one crucial sign is the retinal bleeding. How can we explain this sign if he wasn’t shaken? The theory behind the retinal bleeding is mechanical: rupturing of the vessels in the eye due to shaking—shearing forces rupturing the vessels.<sup>7</sup> Then I started to investigate: are there really autopsy findings that show the torn vessels to support that theory? I am not convinced that there is

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3. Brian Harding, R. Anthony Risdon & Henry F. Krous, *Shaken Baby Syndrome: Pathological Diagnosis Rests on the Combined Triad, Not on Individual Injuries*, 328 *BMJ* 720, 720–21 (2004).

4. See generally Arthur Norman Guthkelch, *Infantile Subdural Haematoma and Its Relationship to Whiplash Injuries*, 2 *BRIT. MED. J.* 430 (1971).

5. See generally John Caffey, *On the Theory and Practice of Shaking Infants*, 124 *AM. J. DISEASES CHILD.* 161 (1972); see also John Caffey, *The Whiplash Shaken Infant Syndrome: Manual Shaking by the Extremities with Whiplash-Induced Intracranial and Intraocular Bleedings, Linked with Residual Permanent Brain Damage and Mental Retardation*, 54 *PEDIATRICS* 396 (1974).

6. See generally C. Henry Kempe et al., *The Battered-Child Syndrome*, 181 *J. AMER. MED. ASS’N* 17 (1962).

7. Ann-Christine Duhaime et al., *Nonaccidental Head Injury in Infants—The “Shaken-Baby Syndrome”*, 338 *NEW ENG. J. MED.* 1822, 1823 (1998); Brian J. Forbes & Alex V. Levin, *Abusive Head Trauma/Shaken Baby Syndrome*, in *PEDIATRIC RETINA* 409, 418 (James D. Reynolds & Scott E. Olitsky eds., 2011).

any hard evidence that such is the case. I then looked into retinal bleeding in general. The typical bleeding is capillary. It's between the artery and the vein of the eye. And why does something rupture? Well, it happens when the pressure on one side is larger than on the other side.<sup>8</sup> So if the venous pressure becomes larger than either the eye artery or the atmospheric pressure, then the capillary ruptures and bleeds.<sup>9</sup> Any cause of an increased intra-cranial pressure may cause a rupture of the capillaries in the eye, and give a retinal bleeding.<sup>10</sup> Trauma can cause it,<sup>11</sup> and a post-operative swelling of the brain can cause it. Venous thrombosis, which is a fairly new entity, not as such because we have known that it exists for a long time but now with modern imaging methods, such as CT and MRI, physicians are seeing much more venous thrombosis than we did before these technologies were available.

One of the conditions that I found most interesting were the cases of high altitude disease where people climb up mountains—no trauma, nothing—but when the CO<sub>2</sub> goes up, the atmospheric pressure goes down, the brain starts to swell, then suddenly these eye capillaries rupture and you get bleeding.<sup>12</sup> People even go blind coming down from mountains, and there is absolutely no trauma or violence involved.<sup>13</sup> We also heard this morning about hypertensive crisis and hypoxia,<sup>14</sup> which may cause retinal bleeding.

We also know now that newborns can have spontaneous retinal bleeding after birth.<sup>15</sup> If a trauma is the cause (without the brain swelling or increased intra-cranial pressure), then you have to diagnose the retinal bleeding before the swelling of the brain happens. That means if the retinal bleeding is going to have value for a diagnosis of SBS, then the doctors have to diagnose it before the brain starts to swell, because otherwise it's a secondary phenomenon and

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8. Forbes & Levin, *supra* note 7.

9. *Id.* at 409, 417–18.

10. Paul J. Muller & John H. N. Deck, *Intraocular and Optic Nerve Sheath Hemorrhage in Cases of Sudden Intracranial Hypertension*, 41 J. NEUROSURGERY 160, 160, 162–65 (1974); see also John Plunkett, *Fatal Pediatric Head Injuries Caused by Short-Distance Falls*, 22 AMER. J. FORENSIC MED. & PATHOLOGY 1, 10 (2001) (noting in a study eighteen short fall-related head injury fatalities that retinal hemorrhage may occur whenever intracranial pressure exceeds venous pressure or whenever there is venous obstruction).

11. Gaurav Bhardwaj et al., *A Systematic Review of the Diagnostic Accuracy of Ocular Signs in Pediatric Abusive Head Trauma*, 117 OPHTHALMOLOGY 983, 990–91 (2010).

12. Benjamin Honigman et al., *High Altitude Retinal Hemorrhages in a Colorado Skier*, 2 HIGH ALTITUDE MED. & BIOLOGY 539, 539–41 (2001).

13. See R. Douglas Fields, *Into Thin Air: Mountain Climbing Kills Brain Cells*, SCI. AM. (Apr. 1, 2008), <http://www.scientificamerican.com/article/brain-cells-into-thin-air/>.

14. Muller & Deck, *supra* note 10, at 160, 161–65.

15. A. Van Zundert et al., *Extradural Analgesia and Retinal Haemorrhage in the Newborn*, 58 BRIT. J. ANAESTHESIOLOGY 1017, 1020–21 (1986).

not a primary one. Moreover, the American Society of Ophthalmologists doesn't consider retinal bleeding pathognomonic because they know that it may occur for several reasons.<sup>16</sup>

Then I studied the evidence behind the subdural hematoma, which may be an effusion (an excess collection of blood, not necessarily caused by trauma). We talked about bias this morning: we are biased when we say that this is a hematoma. It might be an effusion. The argument within the Shaken Baby Syndrome diagnosis is that it must have a mechanical cause, namely tearing of the bridging veins such that only high energy trauma could cause it, especially in children.<sup>17</sup> Today we know that is not true. We know that subdural hematomas may happen in connection to birth.<sup>18</sup> They could result from an earlier effusion bleeding.<sup>19</sup> They can be caused by short falls,<sup>20</sup> and they can be caused by hypoxia.<sup>21</sup> So there are several reasons as to why a physician might find a subdural hematoma in addition to the shaking theory. There is absolutely no pathognomonic evidence that a high energy shaking is needed to create a subdural hematoma.

In the beginning, the brain swelling had the same hypothesis: it was described as a pure mechanical cause whereby the nerve fibers were torn apart by violent shaking, the shearing forces.<sup>22</sup> Researchers tried to prove this by staining brain tissue samples and there were studies trying to prove that axons in the brain were torn

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16. AMERICAN ACADEMY OF OPHTHALMOLOGY, ABUSIVE HEAD TRAUMA/SHAKING BABY SYNDROME (2015), <https://www.aaio.org/clinical-statement/abusive-head-traumashaken-baby-syndrome>; Evan Mastshes, *Retinal and Optic Nerve Sheath Hemorrhages Are Not Pathognomonic of Abusive Head Injury*, in AM. ACAD. OF FORENSIC SCI., PROCEEDINGS: AMERICAN ACADEMY OF FORENSIC SCIENCES 272, 272 (2010), <http://www.aafs.org/sites/default/files/pdf/ProceedingsSeattle2010Rev07-24-12.pdf>.

17. Duhaime et al., *supra* note 7, at 1822–25, 1827–28; Christopher B. Looney et al., *Intracranial Hemorrhage in Asymptomatic Neonates: Prevalence on MR Images and Relationship to Obstetric and Neonatal Risk Factors*, 242 RADIOLOGY 535, 537–40 (2007); E.H. Whitby et al., *Frequency and Natural History of Subdural Haemorrhages in Babies and Relation to Obstetric Factors*, 363 LANCET 846, 847–50 (2004).

18. Van Zundert et al., *supra* note 15, at 1020–21.

19. See V.J. Rooks et al., *Prevalence and Evolution of Intracranial Hemorrhage in Asymptomatic Term Infants*, 29 AMER. J. NEURORADIOLOGY 1082 (2008) (finding that forty-six of 101 asymptomatic neonates had subdural hemorrhage).

20. Nobuhiko Aoki & Hikeqki Masuzawa, *Infantile Acute Subdural Hematoma*, 61 J. NEUROSURGERY 273, 274 (1984); Plunkett, *supra* note 10, at 7–10.

21. See J.F. Geddes et al., *Neuropathology of Inflicted Head Injury in Children: Patterns of Brain Damage*, 124 BRAIN 1290, 1291 (2001) (correlating the presence of subdural hematomas with the presence of global neuronal hypoxia-ischaemia in eighty-four percent of infants and sixty-three percent of older children in a case study of fifty-three fatal non-accidental head injuries); see also J.F. Geddes et al., *Dural Haemorrhage in Non-Traumatic Infant Deaths: Does It Explain the Bleeding in “Shaken Baby Syndrome”?*, 29 NEUROPATHOLOGY & APPLIED NEUROBIOLOGY 14 (2003) [hereinafter Geddes et al., *Dural Haemorrhage*].

22. Caffey, *supra* note 5, at 161.

apart.<sup>23</sup> But no one could prove that theory. So there is no evidence to support that theory. Today I claim that there are many possible explanations to the brain swelling and it might have a hypoxic explanation, either of changing pO<sub>2</sub>, or pCO<sub>2</sub>. So if we look upon the triad now, we can say it was first believed to be mechanical, and could only be caused by high-energy forces generated by violent shaking.<sup>24</sup> Now we know that also low energy trauma can do it.<sup>25</sup> Short falls may produce the triad<sup>26</sup> and multiple other conditions can create both individual components and also the triad as a whole.<sup>27</sup>

Considering that the triad is pathognomic, we know in science that it takes only “one case” to contradict a finding that something is pathognomonic (by definition), and then that condition can no longer be pathognomonic. So if you have one case of a short fall causing the triad, nobody can claim that it’s necessary to have a high-energy trauma. If one case shows that something else has happened, then it’s not pathognomonic. Some may say, “Well, one case doesn’t prove anything.” But it proves that it’s not pathognomonic. That’s very important, especially in trials.

Shortly about my son’s case: my son was at home with his two children. He had gotten them from daycare, and he was caring for baby Johan, who was about four months old. The older kid was three-and-a-half years old, and he was in the kitchen opening the refrigerator. Their big dog—it was a Golden Retriever—could hear the opening of the refrigerator. They’re very good at that. The dog tried to compete with the three-and-a-half-year-old in getting the food out. Strawberries spilled on the kitchen floor. So my son took his almost newborn, and ran into the kitchen, slipped and fell, and the baby went silent. He phoned 911, the ambulance came, and they went to the hospital.

The father was not so nervous at the arrival. The emergency doctors said, “Well, it was a short fall accident. He has a Glasgow Score

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23. See, e.g., Michael W. Johnson et al., *Axonal Injury in Young Pediatric Head Trauma: A Comparison Study of  $\beta$ -Amyloid Precursor Protein ( $\beta$ -APP) Immunohistochemical Staining in Traumatic and Nontraumatic Deaths*, 56 J. FORENSIC SCI. 1198, 1199, 1205 (2011); see also Manfred Oehmichen, Daniela Schleiss, Ingo Pedal, Klaus-Steffen Saternus, Ivana Gerling & Christoph Meissner, *Shaken Baby Syndrome: Re-examination of Diffuse Axonal Injury as Cause of Death*, 116 ACTA NEUROPATHOLOGICA 317, 321 (2008).

24. Caffey, *supra* note 5.

25. Waney Squier, *Shaken Baby Syndrome: The Quest for Evidence*, 50 DEVELOPMENTAL MED. & CHILD NEUROLOGY 10, 12 (2008) (discussing evidence that low-energy falls, including falls on carpet, can result in greater head impact forces than shaking).

26. See Plunkett, *supra* note 10, at 7–10.

27. See Geddes et al., *Dural Haemorrhage*, *supra* note 21, at 19–21 (suggesting that subdural bleeding in some infant head injuries is not traumatic); Squier, *supra* note 25, at 12–13 (presenting evidence challenging the triad).

of 11.”<sup>28</sup> But, “we have to perform an x-ray of the head.” So they intubated him, took him to CT, and then detected a very small, two to three millimeters, subdural hematoma. They told the parents, “Most likely he will be okay tomorrow morning.” The doctors said the prognosis was good. Then my son phoned me in Sweden and told me what happened. And I said, “Well, a small hematoma, they’re probably right. He will be okay tomorrow morning, so don’t worry too much.” Then they performed another CT after six hours. Most of the brain was then ischemic. They took another CT after twelve hours. That CT showed a massive swelling. He was going into brain death.

Within the first twelve hours after the accident the child abuse pediatrician came and diagnosed the triad. He talked to my son for about ten minutes and said, “Your history doesn’t fit with the findings. And this is Shaken Baby Syndrome,” and the police were called. Twenty minutes. That’s all it took, twenty minutes. My son was taken into custody. I wasn’t thinking of going into this, but then I heard Richard Leo’s talk this morning about the interrogation by the police. The police told my son that if he confessed, then the doctors would know how to treat the patient and then Johan might survive. There were so many lies. They really tried to nail him.

The brain swelling continued and Johan was declared brain dead and died after less than a week. It took about eight months before the autopsy was completed. And after we made a check of the results of the autopsy, we found so many questionable things that it had to be rechecked. They had missed several important issues and the medical examiner had to change her testimony about the cause of death from “homicide” to “uncertain.”

But what I think is very important is that it took us three months to gather all the medical information from Johan’s treatment. I come from Sweden where everything is digitized, but in San Francisco, it’s not. We had piles of handwritten notes. We found multiple questionable findings and treatments about the care and then it took us three years to gather testimonies from different experts concerning this questionable care. The child abuse team should have gone through hour-by-hour what was happening in the hospital and looked for explanations to Johan’s condition and pathological values on ventilation and oxygenation. This we had to do as the accused and his family. We went through every detail and every laboratory finding. Every CT, we rechecked. We talked with experts: “Is that a normal value, is that an abnormal value, how can that be

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28. The Glasgow Coma Score (1–15) is used to score a person’s level of consciousness after a traumatic brain injury.

explained?” “How and when was the eye examination done?” We went through everything like this.

We looked upon all the values that were found during the intubation and found he was wrongly intubated—it’s called “botched intubation.” He wasn’t correctly intubated for six hours. All the values were terrible, high and low, changing up and down. So there was absolutely no control during the night of the ventilation and oxygenation of Johan. The whole left lung and the upper part of the right lung were collapsed, no ventilation at all. And nobody had commented upon this fact. Nobody at all. So this is what we did in order to find all the details. And that takes a lot of time. For every, every value that did not seem correct, we had to talk with experts to get an understanding. I was very lucky because in my home hospital, I could ask the best experts about all the details in this, in order to create my own opinion. So there was a botched intubation for two to six hours, high and low, pO<sub>2</sub> and pCO<sub>2</sub> values, poor ventilation, and that can easily create an increased intra-cranial pressure causing the brain swelling and secondary to that, retinal bleeding. It’s really absurd to believe that within six hours a healthy child can go from a small subdural hematoma to almost brain dead just because of shaking when the first CT is almost normal.

The child abuse doctor had early declared that the story does not fit with the findings, there is no sign of a fall, he said. Fortunately, we had expertise within radiology, so we started to look for signs like soft tissue swellings. When Johan came in, there was a very small subdural hematoma on the top of his head, and there was a one to two millimeters’ swelling in the back of the brain, which of course was missed by a radiologist, because why would he report that? He saw bleeding but he didn’t have any thoughts of child abuse, and the child abuse doctor didn’t go back and ask him for signs of a short fall.

But we did, and three days later, there was an MRI. And then even you as non-radiologists can see that there is a typical swelling outside of the skull and under the skin, which is exactly in line with the father’s history. And then we did some other investigations. We reconstructed images and we can see that there was most likely a thrombosis because it was found at autopsy, not by the medical examiner but by our expert; that there was a thrombosis in the super-sagittal veins, which probably was an effect also of the short fall and the trauma to the head. We don’t know that for sure, but most likely.

What I learned was that the diagnosis was made too fast, even at an excellent university hospital in San Francisco. No evidence team

conference or retrospective analysis looking for alternative explanations to the triad (perhaps because to retrieve data is difficult and time-consuming). But also the autopsy was prejudiced. And they really tried to support the prosecutor, but after three-and-a-half years, the case was dismissed.

To be able to understand and reconstruct everything from my grandson's and my son's case requires a high level of medical knowledge. That is expensive unless it runs in the family. Too many of the professionals involved in these cases are biased towards supporting the prosecutor and the police. All involved healthcare personal and social workers always told us, "Why would the child abuse doctor lie? Why would he be wrong?" But they were sure that the defendant father must be lying.

I've been arguing that the theory behind the causal relationship—that the triad is only caused by violent shaking—is not evidence-based and the signs are not pathognomonic for child abuse.<sup>29</sup> In science we have a guiding principle we call "proof of concept." If we are going to start a new therapy with medication—e.g., let us assume there is a correlation between the triad and high-energy trauma. Then this assumption has to be proven in a "proof of concept" study. No such study exists. It's not otherwise valid as an explanatory reason. Can we claim that there are case-based correlations or associations from an epidemiological viewpoint? We know there are more than thousand cases reported that have been regarded as child abuse with the triad.

You have to look at the science again. Are there correlations between the triad and the gold standard (gold standard is defined as the "truth")? Normally in these cases a gold standard of observational evidence would be an independently-witnessed shaking leading to the triad. If you go through the world literature, there aren't more cases that are independently witnessed than there are shortfalls. I don't say it couldn't be the truth anyway. But there are not enough cases to prove this theory. Are there independently-witnessed violent shakings with no triad? Yes.<sup>30</sup> There are at least

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29. See Faris A. Bandak, *Shaken Baby Syndrome: A Biomechanics Analysis of Injury Mechanisms*, 151 *FORENSIC SCI. INT'L* 71, 76–79 (2005) (finding that an infant head subjected to the levels of rotational velocity and acceleration required in the shaken baby syndrome literature would result in forces on the infant neck that far exceed the cervical spine's limits); see also Squier, *supra* note 25, at 12–13 (presenting evidence challenging the triad).

30. See C. Ruddick, M. Ward Platt & C. Lazaro, *Head Trauma Outcomes of Verifiable Falls in Newborn Babies*, 95 *ARCHIVES DISEASE CHILDHOOD-FETAL & NEONATAL* F144, F144 (2010) (presenting evidence of injuries sustained from falls in newborn babies witnessed by someone other than the mother or under verifiable conditions because "the prevarication and false histories that are part of the presentation of child abuse create difficulties for clinicians

two cases objectively witnessed and filmed, and two short falls.<sup>31</sup> These figures are very low. I agree with that, and I'm still not saying I know the truth. But the causal inferences about what happened to these infants are then based on confessions and conclusions from child abuse teams. It's even more important if there is no gold standard evidence to scrutinize these confessions. The confessions then ratify the scientific conclusion that abuse occurred, but they are based on circular reasoning. The circular reasoning goes like this: the hypothesis is that the triad is highly specific for SBS. So we educate doctors that the triad is highly specific for SBS. If the triad is present, then it is SBS. So what clinical findings are predictive for SBS in diagnosing SBS? The triad. I have never seen more evident circular reasoning. Scientifically, it's the worst case of circular reasoning I have ever seen.

Then I looked upon some of the statistics, especially the Maguire papers from 2011, where they had very high probability. They say it's [an upper limit of] ninety-nine percent positive predictive value<sup>32</sup> and eighty-five percent [positive predictive value].<sup>33</sup> First of all, nothing in medicine has ninety-nine percent positive predictive value. If something has that, then we know it's a lie. Medicine isn't like that. I asked myself how researchers get these figures. Well, they have no false positive cases. But then you can't calculate positive predictive values. That is scientifically wrong. There is not one single false positive case in these meta-analyses and statistics. And that makes all these epidemiology predictive values worthless. At least, you cannot use it as a proof. So the mechanical theory is not proven; it's not evidence-based. The epidemiology outcome is not proven; it's not evidence-based. That doesn't mean that shaking does not happen. I must emphasize that.

Naturally somebody says, "Well, something must have happened." I mean, you bring in an injured child, so you have to have another explanation. I explained to the Supreme Court of Sweden in my testimony, because they asked me this question. And I answered, "What's wrong with 'We don't know?'" Joseph Heller, author of *Catch-22*, later wrote a book called *Good as Gold*.<sup>34</sup> There is

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and researchers alike"); Matthieu Vinchon et al., *Accidental and Nonaccidental Head Injuries in Infants: A Prospective Study*, 102 PEDIATRICS 380, 381 (2005).

31. Horace B. Gardner, *A Witnessed Short Fall Mimicking Presumed Shaken Baby Syndrome (Inflicted Childhood Neurotrauma)*, 43 PEDIATRIC NEUROSURGERY 433 (2007); Ruddick et al., *supra* note 30, at F145; Vinchon et al., *supra* note 30.

32. S.A. Maguire et al., *Retinal Haemorrhages and Related Findings in Abusive and Non-Abusive Head Trauma: A Systematic Review*, 27 EYE 28, 31 (2013).

33. Sabine Ann Maguire et al., *Estimating the Probability of Abusive Head Trauma*, 128 PEDIATRICS e550, e557 (2011).

34. JOSEPH HELLER, *GOOD AS GOLD* (1st ed. 1976).

a very low administration person who suddenly rises up in the administration of the White House and becomes the President's personal advisor because he is the only one who's ever given a straight answer to questions in the White House. He's extremely popular. Do you know what his answer to these questions is? "I don't know." Nobody has ever given such an honest answer.

"Yes," I agree, "Something must have happened." But two hundred years ago, in Sweden, we executed people when their babies suddenly died; the parents were accused of having suffocated the children. Nowadays, everybody has accepted that Sudden Infant Death Syndrome can be the cause and that no crime must have occurred. And as far as I know, nobody has an explanation. They don't know. But what I have learned is, it's not suffocation. So there is still room for "I don't know what has happened."

And then I studied the professionals doing the analysis of the perpetrator. Supposedly these child abuse teams are large and interdisciplinary. Where are the psychologists? Where are the psychiatrists? Who is analyzing this? In Sweden it is rare to involve other doctors, because we assume the child abuse doctors know all the subspecialties.

I realized there was another "triad" to describe the perpetrator. One, anyone can do it. Two, no one has seen it. Three, denial is proof of guilt. I mean, how does anyone defend himself against this? Witch hunts in the seventeenth and eighteenth centuries in Sweden were exactly this: anyone can do it, no one has seen it, and denial is proof.

I don't know elsewhere in medicine of another example in which the diagnosis implies both an intention and an etiology. They have introduced a diagnosis where you already know that there is an intention to harm. I don't see any evidence for having a diagnosis that implies both intention and etiology. I don't think we will ever have evidence for the triad because it's unethical to conduct a trial, and I understand that most people who do shake children do it when nobody sees it. So I don't say that it's wrong because we don't have evidence-based medicine. But you can see here, we can never do a systematic review. We can never do good meta-analyses. We can never do randomized controlled studies. We maybe do some, some case controls, but we are down low on the evidence scale, expert opinion. And when I was working for the Health Technology Assessment, we said, everybody says, "Evidence-based medicine, what is it?" Then I usually respond that sometimes it's easier to explain what it's not.

In medicine, doctors have a large freedom to act individually. It doesn't have to be evidence-based. So you can say this is child abuse, and it doesn't have to be evidence-based. But you have to know then that it's not evidence-based. And there's a big difference between knowing, strongly believing, suspecting, and not knowing. So the main purpose of evidence-based medicine is not to have evidence, but to know where there's *no* evidence. We must be aware of that in court or in the hospital. This is the difference between evidence-based and "eminence-based." If doctors said if you had the triad, then it's Shaken Baby Syndrome—that's eminence-based. Sometimes that might be right, but it's not science.

The Swedish have a board for technology assessment. They took on the SBS topic because there have been so many SBS cases in Sweden. They systematically go through all the papers that have been written about SBS, ever. They rank individually every paper according to criteria from evidence-based medicine, and we don't know the outcome yet.<sup>35</sup> I've read enough to be almost sure that they cannot come up with the hard evidence for it, because there are no level-one and -two studies.

Again, I don't say that Shaken Baby Syndrome and the triad do not exist, but it's not evidence-based. And I read this from, it was Deming I think, "In God we trust, all others must bring data."<sup>36</sup> And I think that really is valid for the whole discussion because the final answer isn't in. I'm not sure of the final answer.

I haven't been started to be hunted yet, but after this lecture, they will probably start hunting me in Sweden. So I want to share some reflections I had when I said yes to this presentation. Tolerance is defined as paying attention to views that lie outside your own internal opinion. Don't stipulate dogmas, but stimulate argumentation. I understand that in a trial, in the courtroom, there could be fighting. But as doctors, like Patrick said, we do agree on a lot of things. We do agree that we should protect the children and that we should be cautious in trying to find the perpetrators that harm children. So there are a lot of things we can agree on.

But why can't we argue about this issue? I'm in radiology; we argue a lot of things in radiology without hating each other or saying that someone is suspicious. In all political systems, those who are

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35. SBU ASSESSMENT REPORT 2255E/2016: TRAUMATIC SHAKING—THE ROLE OF THE TRIAL IN MEDICAL INVESTIGATIONS OF SUSPECTED TRAUMATIC SHAKING (2016). The report, also cited in the Introduction to this Symposium, has since been published and is available for download at <http://www.sbu.se/en/publications/sbu-assesses/traumatic-shaking—the-role-of-the-triad-in-medical-investigations-of-suspected-traumatic-shaking/>.

36. Mary Walton, *THE DEMING MANAGEMENT METHOD* 96 (1986).

loved by the general public, here the child abuse doctors, can obtain justice. But legal rights for the individual means justice for the repugnant. This is what it's all about. It's so difficult to argue because it's so easy to say, "Of course you shouldn't harm a child." But who has ever said that it is okay?

Everyone thinks that Charles Darwin wrote that if you're strong and smart you survive. But that is not it. It's those who can adapt to change who survive. And I think in the whole debate about Shaken Baby Syndrome, we have to adapt to change, and we have to look upon it with open eyes and test the hypotheses and try to be humble because we don't know. Thank you very much.

#### QUESTION AND ANSWER SESSION

AUDIENCE MEMBER: So this is obviously very divisive in America. I'm wondering if the Swedish, and more broadly, the European experience might offer any lessons for getting the medical communities at war over these issues in the United States closer to being on the same page?

PETER ASPELIN: I was very reluctant to come here and make a presentation, because I know what will happen afterwards, and it's not that I'm afraid. I'm ready to defend everything I said today. In Sweden the debate is much smaller, but it's the same debate. Everyone who questions the diagnosis is questioned as an individual. At least for the next coming decade or something, I'm convinced that we are not going to be able to change the mind of the child abuse doctors. They have invested in a lot of this.

When I came to the Supreme Court in Sweden, I realized that the judges were much more open. The law system was actually asking, "What is the evidence for this?" Because it's not only Shaken Baby Syndrome in Sweden, but there are a lot of other things going on where some doctors appear in court and they're many times a hundred percent sure. So when I come up and said there are two parties here: one that says abuse is almost always there and one that says it's almost never there. And both are mostly very good doctors. But I said then "the truth" must be more something in-between. The Supreme Court of Sweden decided, well, it's not evidence-based, and it's not without reasonable doubt. So I think what we can teach today is to try to teach the judges and the law system that when doctors say they are a hundred percent sure, there must be questions raised. I think they will convert a little. The Supreme

Court in Sweden prompted a lot of other lower courts to look differently on SBS. You can't put innocent people in prison because someone is a hundred percent sure when there is no evidence for being that sure.

AM: I want to thank you for your comments. I feel compelled to offer condolences for your loss and your family's loss. It was incredibly powerful to hear your story. I was reflecting on the idea that the evidence has been so slow to take hold in the medical community. The analogy that you made toward the end, in terms of looking at the term "Shaken Baby Syndrome" and the biases inherent in that term, and that it doesn't exist in other medical terms, made me think about whether or not the resistance that you see in this context has other parallels in medicine to other situations, diseases, and maladies that have also been slow to change in the medical community. I wonder if there are any lessons learned in those successful cases where people have come to understand that the new evidence replaces what we used to think?

PA: We are slow in adopting new data. In cardiology, they could show that Xylocain was doing the patients worse—the first paper, I think, was in *New England Journal of Medicine*. But it took ten years before it was generally accepted that we treated the patients wrongly instead of rightly.

With the swine influenza vaccine, there were kids who got narcolepsy. Everyone said, "Well, why did you get that? There must be something wrong with the vaccination substance." But then research showed that there were some kids that had a genetic disorder that caused them to react totally differently to the vaccine than ninety-nine percent of the population. And what I sometimes internally speculate in Shaken Baby Syndrome, maybe there are individuals, not many, but enough to have some kind of disorder that we might never find, but that are prone to even after a slight shaking, a small trauma, that they can start this process and it goes on, and it's sort of a vicious circle. Now if you say that, then you're just foolish. But we have a lot of other things in medicine where we slowly but surely found out that there are individual variations that might explain things that are inexplicable for science today

AM: You mentioned that Waney Squier was involved in your case, and I wonder if you would want to comment on the new tactic of going after people who are willing to testify for the defense?

PA: I'm not deeply involved. I only know that there is probably a tactic. To go after the person that has done the best science in pathology the last two decades is to me totally absurd. I don't even understand how this is going on and how anyone can do this—but that's a personal reflection. I haven't looked deeply into the situation, but when I heard about it, I just was horrified. I mean, this is really shooting the messenger.