Circuit Court for Baltimore County
Case No. 03-K-98-003820

UNREPORTED

IN THE COURT OF SPECIAL APPEALS

OF MARYLAND

No. 0087

September Term, 2019

CLARENCE JONES, III

v.

STATE OF MARYLAND

Kehoe,
Reed,
Kenney, James A., III
(Senior Judge, Specially Assigned),

JJ.

Opinion by Kenney, J.

Filed: February 2, 2021

In 1999, after a bench trial in the Circuit Court for Baltimore County, appellant Clarence Jones was convicted of second-degree murder and child abuse of his infant son, Collin Jones, based on a diagnosis of Shaken Baby Syndrome ("SBS").[1] He was sentenced to thirty years of incarceration for second-degree murder and a concurrent fifteen years for child abuse.[2] In 2016, Mr. Jones filed a Petition for Writ of Actual Innocence. Following a seven-day hearing, the circuit court denied relief. Mr. Jones filed a timely appeal, presenting two questions for our review:[3]

> l. Did the circuit court err in ruling that most of Mr. Jones's evidence was not "newly discovered" as defined in § 8-301 of the Criminal Procedure Article ("CP")?
>
> 2. Did the court err in ruling that there is no substantial or significant possibility of a different result at trial had the trier of fact heard all of Mr. Jones's newly discovered evidence?

For the reasons that follow, we reverse and remand for further proceedings.

FACTUAL AND PROCEDURAL BACKGROUND

[1] The Shaken Baby Syndrome hypothesis is based on an infant presenting with three medical findings, sometimes referred to as the "triad" or "constellation": (1) subdural hematoma, (2) retinal hemorrhaging, and (3) cerebral edema (brain swelling) or encephalopathy.

[2] In October of 2000, this Court denied Mr. Jones's direct appeal. He subsequently filed a petition for post-conviction relief, which was denied in 2008. And, in 2009, we denied his Application for Leave to Appeal the Denial of Post-Conviction Relief.

[3] The Innocence Network and Center for Integrity in Forensic Sciences, a group of "Concerned Physicians and Scientists," and ten retired federal judges filed *Amicus Curiae* Briefs in support of Mr. Jones.

Collin was born on June 21, 1998 at the Greater Baltimore Medical Center; he was pronounced dead at Sinai Hospital on August 31, 1998. According to his pediatrician, Dr. Shari Reichenberg, he had several medical complications at birth. A traumatic vaginal delivery resulted in scalp bruising, "overlapping sutures" (material holding infant skull bones together), and red blood spots (petechiae) "on his skin, bleeding from the gums, [and] bleeding from the nose." Collin spent six days in in the Neonatal Intensive Care Unit because "he had swallowed some meconium," which is newborn stool, and had respiratory difficulties. He also had thrombocytopenia, which is a blood clotting disorder causing a low platelet count.[4]

On July 14, 1998, Collin was brought to Dr. Reichenberg's office after "spit[ting] up some blood and not eating" the night before. When he presented "pale and clammy and [was] breathing rapidly," Dr. Reichenberg ordered a chest x-ray. Because he was still "breathing very rapidly and was pale," when he returned from the x-ray, she "sent him to the emergency room at Sinai." Based on the x-ray scans, which showed bacteria

[4] Platelet deficiency (thrombocytopenia) usually appears during infancy and becomes less severe over time; in some cases the platelet levels become normal. Thrombocytopenia prevents normal blood clotting, resulting in easy bruising and frequent nosebleeds. Potentially life-threatening episodes of severe bleeding (hemorrhages) may occur in the brain and other organs, especially during the first year of life. Hemorrhages can damage the brain and lead to intellectual disability. Affected children who survive this period and do not have damaging hemorrhages in the brain usually have a normal life expectancy and normal intellectual development. Medline Plus Medical Encyclopedia, a service of the U.S. National Library of Medicine, National Institutes of Health ("*Medline Plus*"), (last visited Nov. 20, 20) https://medlineplus.gov/genetics/condition/thrombocytopenia-absent-radius-syndrome/.

infiltrates or consolidation, Dr. Reichenberg diagnosed Collin with pneumonia.[5] When he did not respond within the normal time range to a course of IV antibiotics and his respiratory rate had increased, he was transferred to the Pediatric Intensive Care Unit. He was discharged on July 19, 1998.

On August 25, 1998, after feeding Collin, Mr. Jones let him sleep. But later, hearing "sputtering noises coming from Collin," and seeing "baby formula emanating from his nose and mouth," Mr. Jones took Collin, now nine-weeks old, to the emergency room at Sinai.

Upon arrival at the hospital, Collin was in respiratory distress with an "undulating" heart rate "between 60 to 80." Within hours of his arrival, doctors had concluded that Collin's collapse was "due to [SBS]." Dr. Bernhard Zunkeler, a neurosurgeon, after noting in his 11:30 pm report that Collin had "no external signs of trauma" and that his hemorrhages "may be 7-14 days old or may reflect low hematocrit[6] of the blood," concluded that the "only possible cause [was] forceful 'abuse.'"

[5] Pneumonia is an infection in one or both of the lungs. It causes the air sacs of the lungs to fill up with fluid or pus. It can range from mild to severe, depending on the type of germ causing the infection, your age, and your overall health. *Medline Plus* (last visited Nov. 20, 20) https://vsearch.nlm.nih.gov/vivisimo/cgi-bin/query-meta?v%3Aproject=medlineplus&v%3Asources=medlineplus-bundle&query=+pneumonia&_ga=2.179220836.1190796311.1605894752-2065500123.1605894752.

[6] Hematocrit is a blood test that measures how much of a person's blood is made up of red blood cells. This measurement depends on the number of and size of the red blood cells. *Medline Plus* (last visited Nov. 20, 20) https://medlineplus.gov/ency/article/003646.htm.

On August 26, 1998, Detective Phillip Marll of the Baltimore County Police Department "was notified to respond in reference to . . . a possible shaken baby case." After speaking with the treating physicians, Dr. Timothy Polk and Dr. Aaron Zuckerberg, he interviewed Collin's parents at their Baltimore County apartment.

After the interview, Detective Marll asked the parents to accompany him and his partner to the Baltimore County Police Department to provide written statements. After obtaining his statement, Detective Marll asked Mr. Jones "a series of questions to follow up on the written statement he wrote." "[O]ne of the questions was, 'If you didn't cause the injuries to Collin, then who did?'" According to Detective Marll:

> During our interview with him he became upset with the questioning, saying, "it didn't happen, it didn't happen." At this time I told him, "it did happen. All you have to do is go to the hospital and see him lying there. The doctors aren't lying. They aren't making this up. Your son has been shaken."
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> Mr. Jones became loud and kept repeating, "it didn't happen. I didn't hurt him. No one hurt him. I didn't drop him."

Detective Marll stated that Mr. Jones said "I slightly shook Collin since he was having difficulty breathing" while driving to the hospital. "And he showed us how he shook him, barely moving his hand back and forth" and said "he knew that wasn't enough to hurt Collin."

Collin's condition continued to deteriorate. He showed signs of increased brain tissue-damage and swelling from lack of oxygen (hypoxic-ischemic-encephalopathy[7] or "HIE"). He was pronounced dead on August 31, 1998. The hospital's death report listed intracerebral edema as the principal diagnosis, with Disseminated Intravascular Coagulation[8] ("DIC"), sepsis, brain death, acute respiratory failure, and blood in the stool as secondary diagnoses.

The Trial

Mr. Jones was charged with first-degree murder and child abuse following Collin's death.

At the March 1999 trial, Detective Marll testified:

> [Mr. Jones] went on to say that he – that [when Collin's mother] . . . went to work approximately 2:00 p.m. on the 25th of August . . . Collin was laying in the swing. He was awake, he was smiling, acting well and alert.

[7] Hypoxia-Ischemia is a disorder characterized by a reduction of oxygen in the blood combined with reduced blood flow (ISCHEMIA) to the brain from a localized obstruction of a cerebral artery or from systemic hypoperfusion. Prolonged hypoxia-ischemia is associated with ISCHEMIC ATTACK, TRANSIENT; BRAIN INFARCTION; BRAIN EDEMA; COMA; and other conditions. Medical Subject Headings (MeSH), a service of the National Institutes of Health's National Center for Biotechnology Information ("*MeSH*") (last visited Nov. 20, 20) https://www.ncbi.nlm.nih.gov/mesh/68020925.

[8] Disseminated intravascular coagulation (DIC) is a serious disorder in which the proteins that control blood clotting become overactive. When someone is injured, proteins in the blood that form blood clots travel to the injury site to help stop bleeding. If these proteins become abnormally active throughout the body, DIC could develop. The underlying cause is usually due to inflammation, infection, or cancer. *Medline Plus* (last visited Nov. 20, 20) https://medlineplus.gov/ency/article/000573.htm.

> He said that after she left, he kept Collin in the swing and was preparing to do weight lifting, work out in the spare bedroom of the residence. He said the swing was located in the living room and he kept an eye on Collin from the spare bedroom where he was doing his weight lifting.
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> Mr. Jones continued to say he worked out to approximately five o'clock p.m. at which time Collin began to cry. He said he completed his routine and prepared a seven-ounce bottle of Similac baby formula. He said Collin drank approximately six ounces before he fell asleep. He said he laid him in the portable crib on his back with a foam protector against his head to keep him from rolling on his side and stomach.
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> After he did that he said he pushed the crib to the weight room, the spare bedroom, and turned the radio on to symphonic music, and began to prepare to take a shower in the bathroom located off the spare bedroom. And after taking a shower, he said he went into the master bedroom and fell asleep for approximately one and one-half to two hours.
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> He said upon waking up Mr. Jones heard sputtering noises coming from Collin. When he checked Collin, he observed the baby formula emanating from his nose and mouth. He said he wiped the formula away and noticed his breathing was difficult. And he said he immediately transported Collin to Sinai Hospital, since Collin had been treated at that facility in July for pneumonia.

The State presented medical expert witnesses who testified to a reasonable degree of medical certainty that the cause of Collin's death was violent shaking:

- Dr. Dennis Chute, an expert in forensic pathology, explained that SBS is "a constellation of findings that's the result of violently shaking an infant . . . swelling of the brain, bleeding on the open surface of the brain near the membranes that cover the brain, and bleeding into the retinas of the eyes." He identified Collin's "cause of death [as] Shaken Baby Syndrome."

- Dr. Aaron Zuckerberg, an expert in pediatric critical care, testified that the cause of Collin's injuries and death "was [the] complete cessation of blood flow to his

brain and he was shaken." He explained "*[t]hat retinal hemorrhage,*[9] *bleeding into the eye in a child is pathognomonic,*[10] *defines child abuse, defines severe acceleration/deceleration shaking*." (Emphasis added).

- Dr. Allen Walker, a pediatric critical care consultant, testified that "Collin's injuries were the *result of shaking, violent shaking*, resulting primarily in brain injury which caused his death." (Emphasis added). According to Dr. Walker, the violent shaking caused torn axons and extensive bleeding.

- Dr. Timothy Polk, an ophthalmology consultant, testified that he could "imagine no possible cause other than *violent shaking to cause [Collin's] injuries.*" *And given* "*the entire constellation* . . . [he could] come to no conclusion other than violent shaking" as the cause. Dr. Polk, like Dr. Zuckerberg, identified retinal hemorrhaging in infants as *virtually pathognomonic of violent shaking* and the most likely explanation of Collin's death.[11] (Emphasis added).

- State's experts at Mr. Jones's 1999 trial explained that they considered, but rejected, disease as a cause for Collin's death. For example, Dr. Zuckerberg found no evidence of septicemia[12] because septicemia shows "end organ effects" like renal damage and cardiac and pulmonary dysfunction. Dr. Polk concluded from Collin's normal platelet count when he arrived at the emergency room that Collin did not have a clotting disorder. And he also discounted septicemia because, while it could cause retinal hemorrhages, they are "moderate and localized, exclusive to the retina" and would not account for Collin's other eye injuries. He

[9] Retinal hemorrhage is bleeding from the vessels of the retina. *MeSH* (last visited Nov. 20, 20) https://www.ncbi.nlm.nih.gov/mesh/68012166.

[10] Pathognomonic is defined as "distinctively characteristic of a particular disease." MERRIAM-WEBSTER MEDICAL DICTIONARY (2020).

[11] Dr. Polk, in examining the slides of Collin's eyes, observed that hemorrhages covered Collin's entire retinas. He testified that they were the most "severe retinal hemorrhages that he had ever heard of or seen." The hemorrhages were present not only in the retinas, but also in the vitreous cavity, the clear gel inside the eye, and around the optic nerves.

[12] Septicemia or sepsis is an illness in which the body has a severe, inflammatory response to bacteria or other germs. *Medline Plus* (last visited Nov. 20, 20) https://medlineplus.gov/ency/article/000666.htm.

> ruled out Terson's syndrome[13] based on the eye injuries found alongside the retinal hemorrhages.

Dr. Rudiger Breitnecker, a forensic pathologist, testified for the defense:

> I thought it was [] Shaken Baby Syndrome, and that's the end of it.
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> > But looking over the history and studying the medical records, there are so many other medical problems that the child had, that I began to wonder if I can really separate the medical problems from the pure traumatic part. And I don't think I can.[14]

Dr. Breitnecker pointed to the presence of hemosiderin[15] and a recanalized vein in Collin's retina to opine that the bleeding in Collin's eye had been going on for weeks. It was his view that Collin was sick, and that the bacteria circulating in his blood stream caused septicemia, which, in turn, explained Collin's DIC. As to Dr. Polk's testimony about the injuries to Collin's eyes, he opined that Collin's eyes may have already been

[13] "Terson's syndrome is intraocular hemorrhage (IOH) subsequent to subarachnoid hemorrhage (SAH). Its presence is associated with higher mortality in SAH." Anhar Hassan et al., *Terson's syndrome*, Neurocrit Care (2011).

[14] Dr. Breitnecker testified:

> And since you brought up the homicide, I suspect that had I known – which I don't know if they did at the time of autopsy. Had I known the whole history, I probably would have made it an undetermined matter. Because I abhor the thought of unjust accusation. And I have a reasonable doubt that this is not a homicide.

[15] Hemosiderin is a yellowish-brown, iron-containing, granular pigment that is found within cells (such as macrophages), is composed chiefly of aggregates of ferritin, and is typically associated with bleeding and the breakdown of red blood cells (as in hemolytic anemia). MERRIAM-WEBSTER MEDICAL DICTIONARY (2020).

weakened by other processes, which made them more susceptible to bleeding and detachment than a normal eye would be.

After hearing the testimony and closing arguments, the court announced its verdict:

> Obviously this case revolves itself on expert testimony. The law in Maryland is clear with regard to expert testimony that the trier of fact may believe all, part, or none of the testimony of any expert witness.
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> I was very impressed with Dr. Polk. He testified that this was the most severe case that he has ever seen or is aware of, and that it was his opinion that the cause of the injury was violent shaking, no other cause. And I wrote those comments down, because he said them with a great deal of significance. And they obviously had a great deal of impact on this [c]ourt coming from an expert such as him.
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> Suffice it to say the [c]ourt listened to all the experts in this case. And there may be some slight differences with regard as to the manner of death.
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> * * *
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> Suffice it to say that after listening to all of the testimony therein, the [c]ourt finds that this was a brutal shaking of a helpless young individual who was barely nine weeks old. And I am convinced beyond a reasonable doubt and to a moral certainty [Mr. Jones] is guilty of second degree murder and child abuse. There was nothing about the background that he was in any prior trauma[.]

The Petition for Writ of Actual Innocence

On December 21, 2016, Mr. Jones filed a Petition for Writ of Actual Innocence, claiming that newly discovered scientific evidence called the SBS hypothesis into question. The circuit court held a seven-day hearing on Mr. Jones's petition with six

expert witnesses testifying in support of his claim. Several of the witnesses criticized the literature from the 1990s for encouraging physicians to presume abuse when presented with the constellation without considering other potential causes. According to the witnesses, experts who had previously presumed SBS upon seeing the constellation were beginning to question the diagnosis in the early 2000s.[16]

In 2001, Dr. Patrick Lantz, a pathologist with expertise in forensic ophthalmology who had previously accepted the SBS hypothesis, examined a deceased child with massive retinal hemorrhages and perimacular folds which the treating ophthalmologist had presumed were diagnostic of shaking. After an accidental cause for the death had been established, Dr. Lantz conducted a review of the then-available literature related to accidental head injuries and the constellation findings and could not find any. In 2004, he published a case report entitled "Perimacular Retinal Folds from Childhood Head Trauma."[17] He concluded that retinal folds and retinoschisis[18] in children were not

[16] *See, e.g.*, Nati'l Research Council, Nat'l Acad. Of Sci., *Strengthening Forensic Science in the United States: A Path Forward* 37, 41 (2009), https://www.ncjrs.gov/pdffiles1/nij/grants/22809l.pdf; Marcia G. Ory &Matthew L. Smith, *Research, Practice, and Policy Perspectives on Evidence-Based Programing for Older Adults*, 136 Frontiers in Pub. Health l, 2 (2015) ("[I]n the early 2000s, . . . the broader movement toward evidence-based practice emerg[ed] in medicine, public health, [and] behavioral medicine.").

[17] Patrick E. Lantz, *Perimacular retinal folds from childhood head trauma*, BMJ (2004) (examining the premise that retinal hemorrhaging with specific characteristics is pathognomonic of shaking and concluding that it "cannot be supported by objective scientific evidence.").

diagnostic of child abuse because the same injuries were also associated with accidental head trauma. In his testimony in this case, Dr. Lantz referenced a 2016 systematic literature review questioning whether the triad of symptoms were specific for traumatic shaking. He explained that of the 3,700 articles addressing SBS, only two had adequately addressed whether shaking could cause retinal hemorrhages, cerebral edema, and subdural hematoma.[19] And that other than DIC, direct trauma, leaky blood vessels, and high blood pressure, there are now many more known causes of retinal hemorrhages.

Dr. Lantz acknowledged that, in the past, medical literature had stated that the severity of retinal hemorrhages were highly specific for SBS, but more recently, some medical literature saw the severity of retinal hemorrhages as only suggestive or less specific for abuse versus non-abuse. It was his view that all of the literature discussing a correlation between the number of retinal hemorrhages and abuse were flawed.

In reviewing the ophthalmologist's report from 1998, Dr. Lantz disagreed with the conclusion that Collin's retinal findings were "highly characteristic" and "almost virtually pathognomonic" of SBS. Based on his review of the literature and personal experiences, he opined that many retinal findings—severe hemorrhages, vitreous

(…continued)

[18] Retinoschisis is a vitreoretinal dystrophy characterized by splitting of the neuroretinal layers. It occurs in two forms: degenerative retinoschisis and X chromosome-linked juvenile retinoschisis. *MeSH* (last visited Nov. 20, 20) https://www.ncbi.nlm.nih.gov/mesh/68041441.

[19] A "subdural hematoma" is a collection of blood between the covering of the brain (dura) and the surface of the brain." *Medline Plus* (last visited Nov. 20, 20) https://medlineplus.gov/ency/article/000713.htm

hemorrhages, perimacular folds, retinoschisis, retinal detachment, and vitreous detachment—could be associated with head trauma, abuse, non-abuse, or natural disease processes. As to the 1998 medical understanding of the retinal findings as pathognomonic of abuse, Dr. Lantz opined:

> I think based on the subsequent studies that have been done showing that there's other conditions, and not only finding these other conditions, but if now going back and reviewing the literature critically, we'll find out some of the literature that – those conclusions were based on – were based on literature of low quality, where there was not good medical evidence to support those conclusions.

Dr. Lantz acknowledged that the medical examiner's and eye pathologist's conclusions regarding SBS in 1998 were consistent with the medical literature available then, but they did not reflect the current medical literature.

Dr. Lantz also disagreed with Dr. Chute's testimony at the 1998 trial that the dilated blood vessels in Collin's cortex indicated a traumatic cause. It was his opinion that they could indicate a reaction to the hypoxia ischemia. He opined that Collin's epidural hemorrhages could be dated back to Collin's birth, and that epidural hemorrhages often occur from trauma to the skull.

Regarding the timing of Collin's bleeding, Dr. Lantz, noting several eye findings when Collin was admitted to the hospital, dated the bleeding to before August 25, 1998. He testified that the disposition of hemosiderin seen in Collin would require several days to weeks to develop, and that Collin's central retinal vein occlusion was likely one to two weeks old.

Dr. Lantz concluded that Collin had died from a hypoxic ischemic brain injury with cerebral edema.

Biomechanical-Engineering Research

Dr. Christopher Van Ee, an expert in biomechanical engineering, explained that the SBS diagnosis assumes that shaking causes a subdural hemorrhage. He discussed the history and development of the biomechanical literature relating to the SBS diagnosis. In 1987, a study using football players shaking a test device had concluded that shaking produced low levels of acceleration and was unlikely to produce the injuries associated with SBS. *See* Ann-Christine Duhaime, et al., *The Shaken Baby Syndrome: A Clinical, Pathological, and Biomechanical Study,* 66 J. Neurosurgery 409, 409 (1987). The same lab produced another study in 2003 using a more sophisticated testing device and a larger experimental scope. According to Dr. Van Ee, the post-1987 biomechanical studies "clarified a number of issues and looked into some new issues that were not touched on" by the 1987 study. That study found that one-foot falls onto carpet produced greater damaging forces than shaking. Based on a post-1999 literature review, Dr. Van Ee opined that shaking produced relatively low rotational forces at the surface of the brain and would be unlikely to cause traumatic subdural hemorrhage.

Dr. Van Ee testified that Collin's medical records did not reflect the typical injuries—scalp fracture, scalp bruising, or gripping marks—associated with violent shaking. According to Dr. Van Ee, due to an infant's weak neck, the biomechanics of violent shaking typically result in an injured neck, injured spine, and crushed ribs.

Other Constellation Causes

The defense experts in the actual innocence hearing posited that, unlike 1999 when the constellation was believed to be diagnostic of SBS, doctors must now consider "the list of possible explanations or conditions that lead to or could have led to the child's condition or circumstances" in their differential diagnosis.[20] And, more specifically, that since 2001, researchers have published studies on natural causes of retinal hemorrhage and other findings related to the eye. These studies have identified many more conditions such as bleeding or coagulation disorders like DIC; infections including sepsis; central retinal occlusions; HIE; leakage from brain bleeding; and increased intracranial pressure that can cause retinal bleeding. Dr. Lantz explained that many of these same conditions, and retinal hemorrhages themselves, can lead to eye findings of retinoschisis, perimacular folds, vitreous hemorrhage, and vitreous detachment. In addition, Doctors Daniel Sahlein, Michael Laposata, and Janice Ophoven also testified that the research has uncovered many other natural causes of subdural hemorrhages as well, including HIE, clotting abnormalities, infections, and old bleeds. Dr. Salhein testified that brain swelling (cerebral edema) is non-specific for shaking and can be triggered by other causes, including HIE.

Lucid Interval/Timing

[20] A differential diagnosis "looks at the possible disorders that could be causing [] symptoms" and "rul[ing] out conditions and/or determin[ing] if you need more testing." *Medline Plus* (last visited Nov. 20, 20) https://medlineplus.gov/lab-tests/differential-diagnosis/.

In the context of an abusive head injury, a lucid interval reflects a delayed deterioration to the injury during which a prolonged period of normality or near-normality may proceed the collapse. Its importance in a SBS prosecution is that the person with the child when the child collapsed is considered to be the primary suspect.

According to Doctors Laposata, Jerome Klein, and Ophoven, it is now widely accepted that a child can be lucid and appear essentially symptom-free for some time prior to collapse, whether after trauma or in the presence of infection or DIC. And regarding Collin's hematomas, hemorrhaging, and hemosiderin:

- Dr. Ophoven discussed that the change in understanding of cerebral edemas related to lucid interval periods and described the variation of such periods.

- Dr. Laposata testified that a blood test could produce normal results even if a child were experiencing a blood disorder.

- Dr. Klein provided some narrative examples to describe how sepsis could internally build over a period of time before it caused an abrupt collapse.

- Dr. Lantz testified that the epidural and subdural hemorrhages observed at autopsy were older, not acute, and that the epidural tissue showed growth of new blood vessels and fibroblastic layers at least a number of weeks old, perhaps dating to birth. And he observed that the subdural hemorrhage contained little fresh blood, had developed fibroblasts, and showed inflammation around the blood vessels, potentially indicating a prior infection or HIE.

The State's Experts

The State called two witnesses: Dr. Michelle Chudow, who qualified as an expert in pediatrics and child abuse, and Dr. Rudolph Castellani, an expert in neuropathology.

Dr. Chudow, who did not believe a controversy existed regarding SBS, discussed the SBS diagnosis and Collin's medical history. In response to Dr. Ophoven's testimony, Dr. Chudow stated that the scientific literature supported a SBS diagnosis when there are certain injuries and suggested that the last person with the victim is the perpetrator. Based on her review of the research referenced by Dr. Ophoven, she concluded that the literature did not disprove whether shaking could achieve the requisite force to injure and disagreed with his analysis. She considered Dr. Lantz's review of the literature to be unbalanced because it ignored other studies and conflicting data. It was her opinion that the literature indicated that a lucid interval does not truly exist when shaking is involved.

She opined that a significant traumatic event could have caused Collin's symptoms from July 14, 1998 without external signs of injury. In her view, And that there were no lingering effects of thrombocytopenia from Collin's July 14, 1998 hospital admission, and based on his blood test results, a bacterial infection was unlikely.

In regard to Collin's computerized tomography ("CT") scans on August 25 and 26, 1998, she observed isodense[21] hematomas. She disagreed with the other experts on whether a physician could age the hematomas to less than three hours when Collin was still actively bleeding. In her view, the costochondral[22] changes in the ribs could have been caused by squeezing if Collin was held by the torso. She also stated that the

[21] Isodense is defined as "[d]enoting a tissue having a radiopacity similar to that of another or adjacent tissue." FARLEX PARTNER MEDICAL DICTIONARY (2012).

[22] Costochondral is defined as "relating to or joining a rib and costal cartilage." MERRIAM WEBSTER DICTIONARY (2020).

negative head ultrasound and lack of neurological abnormalities, which would almost always be seen in a baby with a significant intracranial bleed at birth, indicated that it was highly unlikely Collin had a significant subdural or intracranial bleed at birth. Although the severity of retinal hemorrhages increased "the specificity" for SBS, they were not the sole diagnostic factor. It was her opinion that the "sum totality of [Collin's] findings [could] point to nothing other than abusive head trauma."

On cross-examination, Dr. Chudow acknowledged that the symptoms associated with SBS have other known causes, and that doctors should look at clotting disorders and screen for other causes that mimic SBS even when SBS is the most likely explanation.

Dr. Castellani testified that retinal hemorrhaging, which is common in SBS, is less common in accidental trauma, and much less common and less severe in natural disease processes. It was her opinion that severity of the retinal hemorrhages in Collin's case correlated positively with physical abuse. He stated that a macular fold, vitreous based detachment, and retinoschisis ("splitting of the retina") are "priority evidence of a mechanical trauma." According to Dr. Castellani, the medical field has understood cortical contusions, which are "traumatic lesion by definition," to be positively associated with severe head trauma since "the mid '90s."

On cross-examination, Dr. Castellani agreed that retinal hemorrhaging was not pathognomonic or diagnostic for abuse, but that it was still a useful marker. He recognized that there were other known factors that modulate the hemorrhage, and other known non-traumatic causes of retinal hemorrhages, such as bleeding disorders, ruptured

aneurysms, and sepsis. But he had never seen or heard of such other causes that were plausible explanations for the extent and severity of Collin's ocular hemorrhage.

The circuit court, in its February 14, 2019 memorandum opinion, denied Mr. Jones's Petition for Writ of Actual Innocence. The circuit court reviewed five categories of purported "new" evidence: 1) non-intentional medical conditions, 2) cerebral edema, 3) retinal hemorrhaging, 4) lucid intervals, and 5) biomechanical engineering. The court concluded:

> Although the medical community's opinion regarding the cause of cerebral edema in SBS cases has evolved since 1999, Collin's autopsy report indicated that his brain injuries were hypoxic-ischemic (due to a lack of oxygen) with no reported torn axons. . . . Therefore, axonal tearing as a cause of Collin's brain swelling was not raised at trial. Instead, the experts discussed various causes of brain swelling, in addition to trauma, that may have been attributable to a lack of oxygen and blood flow in Collin's brain.
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> * * *
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> No expert opinion was based solely on the notion that cerebral edema is pathognomonic of SBS or that torn axons, which were not evident in Collin, were an indicator of shaking. [Mr. Jones's] 1999 trial proceeded with questioning and evidence indicative of the current medical view of brain swelling caused by hypoxic-ischemia. Therefore, this [c]ourt finds that there is no substantial or significant possibility that the outcome of [Mr. Jones's] 1999 trial would have been any different had the current medical consensus on the issue been known to the trier of fact.
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> * * *
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> A review of these experts' testimony alongside the 1999 trial transcript indicates that there is really nothing new to the argument that was not already understood and explored at Petitioner's trial. . . . No study has been conducted that refutes the premise that shaking can cause the symptoms present in Collin on August 25, 1998, even when the symptoms present without external evidence of trauma. Besides the shift in understanding regarding cerebral edema, the only "new" aspect of SBS that has emerged

> since 1999 is that a vocal group of experts from a range of disciplines have challenged the validity of the diagnosis itself.

Noting that it is not the court's place to "criticize, rebut, or refute decades of medical literature and practice [concerning SBS] [] particularly when the medical community has failed to do so," the court denied Mr. Jones's petition. The court found that the "newly discovered" cerebral edema evidence provided no "substantial or significant possibility" of a different result at trial.

STANDARD OF REVIEW

We review the denial of a Petition for a Writ of Actual Innocence for an abuse of discretion. *Smith v. State*, 233 Md. App. 372, 411–12 (2017). In doing so, we apply the well-recognized "before and after" test and ask whether there would be a "substantial or significant possibility" of a different outcome had the new evidence been presented to the jury. *Ward v. State*, 221 Md. App. 146, 169 (2015) (citing *Yonga v. State*, 221 Md. App. 45, 108).

DISCUSSION

History of SBS

In *Sissoko v. State*, 236 Md. App. 676, 728 (2018), *cert. denied*, 460 Md. 1 (2018),[23] this Court summarized the history of SBS:

[23] The circuit court adopted and incorporated by reference the *Sissoko* Court's analysis of SBS literature. It "acknowledge[d] the different postures of the instant case and *Sissoko*," but stated that "the *Sissoko* Court's holding makes clear that a differential diagnosis of SBS was, and remains, a cognizable medical diagnosis."

In 1860, Auguste Ambroise Tardieu, a renowned French forensic physician, published *Étude Medico–Légale sur les Sévices et Mauvais Traitements Exercés sur des Enfants*, which translates as *Forensic Study on Abuse and Ill–Treatment of Children*. [Sandeep K. Narang, *A Daubert Analysis of Abusive Head Trauma/Shaken Baby Syndrome*, 11 Hous. J. Health L. & Pol'y 505, 523 (2011) (hereinafter "*Narang I*")]. He documented 32 cases of suspected child abuse, including cases where infants with no external signs of injury died and were found on autopsy to have bleeding on the surface of the brain. *Id.* Midway into the next century, with the great advancements in medicine, evidence began to build for a connection between trauma and the presence of subdural hematomas in young children. In 1946, John Caffey, M.D., published a study examining the correlation in infants between long bone fractures, which often are associated with abuse, and subdural hematomas. *Id.* at 526. In several of the cases, retinal hemorrhages also were present. After ruling out medical causes, Dr. Caffey attributed all the radiological findings to trauma. He did not reach any conclusions about the traumatic mechanism involved, however. *Id.* In 1962, C. Henry Kempe, M.D., a pediatrician, and colleagues published *The Battered–Child Syndrome*, 181 J. Am. Med. Ass'n 105 (1962), identifying unexplained bruises, fractures, and subdural hematomas as findings that should lead physicians to consider child abuse as a possible etiology. *Narang I* at 527.

A little over a decade later, Dr. Caffey and others began to hypothesize that shaking was the mechanism of abuse that was producing subdural hematomas in infants and young children who also had long bone fractures. He and Norman Guthkelch,[24] a neurosurgeon, theorized that the "multiple acceleration and deceleration events, caused by head shaking, resulted in the intracranial injuries," including subdural hematomas and retinal hemorrhages. *Id.* at 528. Originally called "parent-infant traumatic stress syndrome," and later "whiplash shaken infant syndrome," the syndrome soon became commonly known as shaken baby syndrome. Christopher S. Greeley, *Abusive Head Trauma: A Review of the Evidence Base*, 204 Am. J. of Roentgenology 967, 968 (May 2015) (hereinafter *Greeley*).

In the latter decades of the 20th century, it became widely accepted in the involved medical communities that shaking was the likely

[24] Dr. Guthkelch's article is *Infantile Subdural Hematoma and its Relationship to Whiplash Injuries*, 2 Brit. Med. J. 430, 430-31 (1971).

> mechanism of brain injury when infants and young children presented with subdural hematomas, retinal hemorrhages, and brain swelling, but without external evidence of trauma or a reported history of a significant traumatic event.
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> It remains the prevailing view within the relevant medical communities that there are some internal findings that are highly correlated with abusive head trauma, even in the absence of external findings; and when those internal findings are coupled with an inconsistent clinical history or one that is inadequate to explain them, and cannot be explained medically, a diagnosis of abusive head trauma is supported. *See Narang I* at 574–76 (listing organizations that endorse abusive head trauma as a medical diagnosis, including the American Association for Pediatric Ophthalmology, the American College of Radiology, the American Association of Neurologic Surgeons, the World Health Organization, and the Royal College of Paediatrics and Child Health). External findings associated with abusive head trauma include bruising or swelling of the scalp or other parts of the body. Internal findings include skull fractures; long bone fractures; rib fractures; retinal hemorrhages; subdural hematomas; subarachnoid hemorrhages; brain swelling; and cervical spine injuries. As noted, the consensus is that no single finding or combination of findings is pathognomonic for abusive head trauma. Rather, a differential diagnosis must be made based upon the totality of the circumstances in each individual case. A congruence of multiple findings, each of which independently correlates with abusive head trauma, narrows the field of potential diagnoses significantly, however, and absent a clinical history of accidental trauma or evidence of a disease process consistent with those findings, a diagnosis of abusive head trauma may be made. *See Greeley* at 969.

Overview of Changes since 1999

In 2001, both the National Association of Medical Examiners ("NAME") and the American Academy of Pediatrics ("AAP") published papers endorsing the SBS hypothesis. The AAP paper declared that "[s]haken baby syndrome injuries are the result of violent trauma" and there should be "a presumption of child abuse when a child

younger than l year has suffered an intracranial injury." These papers, each published by a nationally recognized medical association, indicated a mainstream consensus on the legitimacy of the SBS hypothesis in 2001.[25]

Later, some, in the fields of biomechanical engineering, neuropathology, and forensic pathology, concluded that the SBS hypothesis was unsupportable and tantamount to a "medical diagnosis of murder." Deborah Tuerkheimer, *Science-Dependent Prosecution and the Problem of Epistemic Contingency: A Study of Shaken Baby Syndrome*, 62 Ala. L. Rev. 513, 516 (2011). In 2006, Dr. Jan Leestma, a neuropathologist, concluded that the medical community's immediate acceptance of SBS had resulted in a lack of studies into other potential causes of the constellation or triad, even while SBS itself remained unproven:

> It should be apparent that from virtually every perspective many flaws exist in the theory that shaking is causative. No case studies have ever been undertaken to prove even a partial list of possible confounding variables/phenomena, such as the presence of intracranial cysts or fluid collections, hydrocephalus, congenital and inherited diseases, infection, coagulation disorders and venous thrombosis . . . or recent or remote head trauma.

Jan E. Leestma, *Shaken Baby Syndrome Do Confessions by Alleged Perpetrators Validate the Concept*, 11 J. Am. Phys. Surgeons 14, 15-16 (2006); *see also* Deborah Tuerkheimer, *Flawed Convictions: "Shaken Baby Syndrome" and the Inertia of Injustice*

[25] *See, e.g.*, Keith A. Findley et al., *Shaken Baby Syndrome, Abusive Head Trauma, and Actual Innocence: Getting It Right*, 12 Hous. J. Health L. & Pol'y 209, 232 (2012) ("By 2001, shaking as the primary or exclusive cause of the triad had been taught in the medical schools for decades, not as a hypothesis but as scientific fact.").

25 (2015) ("[I]n denying that a universe of potential non-traumatic alternatives might even exist, the classic diagnosis falsely promised certainty."). The 2001 NAME paper was withdrawn in 2006.

In the early 2000s, in regard to SBS, physicians and experts in such fields as neurology and neuropathology, were identifying other causes for the triad or constellation of symptoms that had been largely overlooked due to the mainstream consensus on the SBS hypothesis. Some were concerned that much of what had been accepted as objective and reliable forensic results was "based on imprecise and ill-defined criteria, biased selection, circular reasoning, inappropriate controls, and conclusions that overstep the data." Jennian Geddes & John Plunkett, *The evidence base for shaken baby syndrome: We need to question the diagnostic criteria*, 328 Brit. Med. J. 719 & 1317 (2004); *see also* Rubin Miller & Marvin Miller, *Overrepresentation of Males in Traumatic Brain Injury of Infancy and in Infants with Macrocephaly: Further Evidence that Questions the Existence of the Shaken Baby Syndrome*, 31 Am. J. Forensic Med. Pathology 165, 169, 170 (2010) (asking "How could such a diagnosis based on such flimsy evidence and with such far-reaching implications become so entrenched in pediatric and legal medicine?" and concluding that "[t]he diagnosis of SBS thus became a default diagnosis, but defended as an irrefutable dogma [and that] [i]t was based solely on the finding of the triad—not for lack of other evidence, but for lack of looking for other evidence").

In 2003, Dr. Mark Donohoe, an Australian practitioner, examined more than 50 different studies supporting the SBS hypothesis published between 1966 and 1998. Mark

Donohoe, *Evidence-Based Medicine and Shaken Baby Syndrome Part I: Literature Review, 1966-1998*, 24 Am. J. Forensic Med. Pathology 239, 239 (2003). He found that "there was inadequate scientific evidence to come to a firm conclusion on most aspects of causation, diagnosis, treatment, or any other matters pertaining to SBS." *Id.* at 241. He noted that no study included control groups that could evaluate other potential causes of SBS symptoms, such as "trauma without shaking [or] other illness" and that many studies did "not add to the quality of understanding of the condition, nor [were] they necessarily accurate in what has become a rather emotionally charged area of research and polarized opinion." *Id*. Given the weak evidentiary foundation for SBS, Dr. Donohoe concluded that "the commonly held opinion that the finding of SDH [subdural hemorrhaging] and RH [retinal hemorrhaging] in an infant was strong evidence of SBS was unsustainable, at least from the medical literature."[26] *Id.*

Dr. Donohoe's article was published in the NAME journal in September 2003, and, as indicated above, in 2006, NAME declined to renew its 2001 paper. The same day

[26] On October 26, 2016, the Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU) presented a report on SBS supporting Dr. Donohoe's 2003 findings. The report was the result of a two-year scientific evaluation of SBS by a systematic literature review concerning the diagnostic criteria of SBS. The purpose was to evaluate the diagnostic accuracy of retinal hemorrhages, subdural hemorrhages, and encephalopathy that have been used to diagnose SBS. The SBU report concluded that the science behind the triad is very weak and not specific for shaking. From more than 3,700 articles found, only thirty met the stated inclusion criteria (such as sufficient sample size), and only two observational reports gave some (moderate) scientific support for the triad. These two studies were partially based on confessions, but the SBU report noted that neither of the two articles provided details about the confessions or under what circumstances the confessions were obtained.

that NAME declined to renew its paper, NAME hosted a conference with presentations entitled "Use of the Triad of Scant Subdural Hemorrhage, Brain Swelling, and Retinal Hemorrhages to Diagnose Non-Accidental Injury is Not Scientifically Valid" and "Where's the Shaking? Dragons, Elves, the Shaking Baby Syndrome and Other Mythical Entities."[27]

In 2009, the AAP noted that "advances in the understanding of the mechanisms and clinical spectrum of injury associated with abusive head trauma compel us to modify our terminology to keep pace with our understanding of pathologic mechanisms" and issued a new paper acknowledging that "mechanisms and resultant injuries of accidental and abusive head injury overlap" and that "medical diseases can mimic the presentation" of symptoms that AAP previously believed to be caused solely by violent shaking. Cindy W. Christian et al., *Abusive Head Trauma in Infants and Children*, 123 Pediatrics 1409-10 (2009).[28] The AAP's 2009 policy statement stated that "there is no single or simple test to determine the accuracy of the diagnosis," omitted the "presumption of child abuse" that appeared in its prior reports, and said "[p]ediatricians also have a responsibility to

[27] *See* Keith A. Findley et al., *Shaken Baby Syndrome, Abusive Head Trauma, and Actual Innocence: Getting it Right*, 12 Hous. J. Health L. & Policy 209, 241 (2012).

[28] Medical professionals have also identified accidental, non-traumatic causes of the triad of SBS symptoms, sometimes called SBS "mimics" because they mimic the symptoms of SBS but are not actually caused by shaking or abuse. *See*, *e.g.*, John Lloyd et al., *Biomechanical Evaluation of Head Kinematics During Infant Shaking Versus Pediatric Activities of Daily Living*, 2 J. Forensic Biomechanics l, 7 (2011) (listing seven different possible events (with more than fifty variations) that may cause the triad of symptoms found in SBS cases).

consider alternative hypotheses when presented with a patient with findings suggestive of AHT [Abusive Head Trauma]."[29] *Id*. at 1410. This paper acknowledged that the mechanism of injury is unclear and that abused can no longer be presumed from the presence of the triad.

In 2012, Dr. Guthkelch, who had authored "Infantile Subdural Hematoma and its Relationship to Whiplash Surgeries" in 1971, criticized the SBS hypothesis:

> [T]here seem to have been instances where in which both medical science and the law have gone too far in hypothesizing and criminalizing alleged acts of violence in which the only evidence has been the presence of the classic triad or even just one or two of its elements. . . . ln reviewing cases where the alleged assailant has continued to proclaim his/her innocence, I have been struck by the high proportion of those in which there was a significant history of previous illness or of abnormalities of structure and function of the nervous system, suggesting that the problem was natural or congenital, rather than abusive. Yet these matters were hardly, if at all, considered in the medical reports.

A. Norman Guthkelch, *Problems of Infant Retina-Dural Hemorrhage with Minimal External Injury*, 12 Hous. J. Health L. & Pol'y 201, 203-04 (2012).

Contentions

Mr. Jones challenges the circuit court's denial of his petition on two fronts. First, he contends that the circuit court abused its discretion in rejecting as newly discovered evidence the "modern debate . . . regarding the validity of a default SBS diagnosis" in the presence of retinal hemorrhages, brain swelling, and subdural hematoma. More

[29] The policy statement shifted away from the name Shaken Baby Syndrome, using the term Abusive Head Trauma instead. *See* Cindy W. Christian et al., *Abusive Head Trauma in Infants and Children*, 123 Pediatrics 1409 (2009).

specifically, he argues that the court abused its discretion in not finding as new: 1) other causes for Collin's retinal hemorrhages, brain swelling, and subdural hematoma; 2) the potential for a lucid interval when a child suffers a brain injury; and 3) biomechanical engineering research that shaking cannot generate sufficient force to cause the injuries associated with abusive head trauma. In his view, the question is whether "the scientific understanding of SBS has evolved since [his] trial" and whether that controversy "may cast doubt upon the validity and admissibility of the trial evidence."

Second, he argues that the circuit court abused its discretion in not appreciating the materiality of the newly discovered evidence. In his words, the "fierce controversy surrounding the SBS diagnosis" that has developed since his trial creates a significant possibility of a different result at his trial.

The State contends that the "circuit court acted within its discretion in denying [Mr.] Jones's petition for writ of actual innocence." It asserts that Mr. "Jones's complaints ignore the circuit court's ruling that the majority of his allegedly newly discovered evidence was, in fact, discussed at his 1999 trial," and that "[t]he fact that [Mr.] Jones called more experts in support of his defense at the 2018 petition hearing than at his trial does not mean that [Mr.] Jones has met his burden to prove newly discovered evidence." According to the State, "evidence of alternate causes and an alternate timeline for Collin's injuries" did not constitute newly discovered evidence.

Analysis

Section 8-301(a) of the Criminal Procedure Article ("CP") provides:

> A person charged by indictment or criminal information with a crime triable in circuit court and convicted of that crime may, at any time, file a petition for writ of actual innocence in the circuit court for the county in which the conviction was imposed if the person claims that there is newly discovered evidence that:
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> (1)(i) if the conviction resulted from a trial, creates a substantial or significant possibility that the result may have been different, as that standard has been judicially determined[.]

See also Md. Rule 4-332(d)(8). The petitioner bears the burden of proof.[30] CP § 8-301(g); Md. Rule 4-332(k).

"To qualify as 'newly discovered' evidence must not have been discovered, or been discoverable by the exercise of due diligence" in time to move for a new trial. *Argyrou v. State*, 349 Md. 587, 600-01 (1998). And it must support the claim of actual innocence. *Smith v. State*, 233 Md. App. 372, 413 (2017). In other words, that the "petitioner did not commit the underlying crime for which he or she was convicted." *Smallwood v. State*, 451 Md. 290, 316 (2017). But it "need not definitively prove his or her innocence." *Smith*, 233 Md. App. at 413. "That the newly discovered evidence does not definitively exonerate appellant, or may be countered by other evidence, goes to the weight of the evidence." *Id*.

[30] Viewing various burdens of proof as a continuation running from the highest to the lowest, the most demanding burden would be "beyond a reasonable doubt," followed by "probable," then a "substantial or significant possibility," and then the least demanding, "might." *McGhie v. State*, 449 Md. 494, 510 (2016). The burden of establishing a "substantial or significant possibility" of a different result is less than "probable" but greater than "might." *Id*.

This Court has stated that scientific evidence that calls into doubt the validity or admissibility of evidence that was introduced at trial can qualify as newly discovered evidence. *Ward v. State*, 221 Md. App. 146, 163 (2015). In *Ward*, Gary Ward was convicted of first-degree murder and a related weapons offense. *Id.* at 148. His petition for writ of actual innocence was premised on a claim of newly discovered evidence of national scientific studies criticizing the use of compositional bullet lead analysis (CBLA) in criminal trials. *Id.* The circuit court denied the petition, and defendant appealed. *Id.* at 149.

On appeal, Ward contended that scientific studies published after his 1993 criminal trial undermined the validity of CBLA evidence. *Id.* at 159-60. The State countered that the studies were "not newly discovered evidence as that term has been judicially defined, and further, that the studies would merely impeach the expert's testimony at trial." *Id.* at 162.

In reversing, we explained that "a different rule applies to later discovered scientific evidence which casts doubt upon the validity and admissibility of evidence that was introduced at the time of trial." *Id.* at 163. We observed that "[c]ourts in other states have recognized that 'newly discovered evidence' can include 'new testing methods or techniques that did not exist at the time of trial, but are used to test evidence introduced at the original trial." *Id.* at 163 (quoting *Wyatt v. State*, 71 So.3d 86, 100 (Fla. 2011). We acknowledged that in 1991 "[d]oubts existed in the scientific community . . . regarding the reliability and accuracy of the CBLA comparisons, as well as the inferences that

could be reasonably drawn from the analysis." *Id.* at 157. But the newer studies were significantly more critical of CBLA evidence than a previous 1991 study. *Id.* at 159–60, 164. We held that these new studies were newly discovered because they provided facts the petitioner could not have known at the time of trial nor could have been discovered by use of diligence. *Id.* at 164.

Some courts already have recognized new medical and scientific research as newly discovered evidence in overturning convictions. *See, e.g.*, *Commonwealth v. Millien*, 474 Mass. 417, 418, 442 (2016) (vacating shaken baby conviction and remanding for new trial citing the "heated debate in the medical community" over SBS and finding that "the jury heard only one side of this debate"); *Commonwealth v. Epps*, 474 Mass. 743, 770 (2016) (stating that there was "a substantial risk of a miscarriage of justice where the jury heard no scientific or medical expert challenging the majority views on shaken baby syndrome and short falls, and where new research has emerged since the time of trial that would lend credibility to the opinion of such an expert"); *People v. Bailey*, 144 A.D.3d 1562, 1564 (N.Y. App. Div. 2016) (holding that "advancements in science and/or medicine may constitute newly discovered evidence" and that "defendant established that 'a significant and legitimate debate in the medical community has developed in the past ten years over whether infants [and toddlers] can be fatally injured through shaking alone'").

In *Wisconsin v. Edmunds*, 746 N.W.2d 590, 596 (Wis. Ct. App. 2008), Audrey Edmunds was convicted of reckless homicide for shaking a seven-month-old infant in her

care. The infant was acting normally on the morning before her death. *Id.* at 592. Later, when the child was crying and could not be consoled, Edmunds left her in a car seat with a propped bottle. *Id.* When she picked her up after the crying had ceased, she realized that the infant had gone limp and liquid was coming out of her nose and mouth. *Id.* The infant was pronounced dead later that night. *Id.*

At her 1996 trial, "the State presented numerous medical expert witnesses who testified to a reasonable degree of medical certainty that the cause of [the infant's] death was violent shaking or violent shaking combined with impact that caused a fatal head injury." *Id*. Edmunds presented one medical expert witness who agreed with the State's witnesses that the infant had been violently shaken but "opined that the injury occurred before [the infant] was brought to Edmunds's home." *Id.*

Edmunds filed a motion for a new trial in 2006, "asserting that there were significant developments in the medical community around 'shaken baby syndrome' in the ten years since her trial that amounts to newly discovered evidence." *Id.* at 593. She presented expert medical testimony from doctors:

> who explained that there is now a significant debate in the medical community as to whether [the infant's] symptoms were necessarily indicative of shaking or shaking combined with head trauma in infants. The experts explained that there was not a significant debate about this issue in the mid-1990s and that the opinions offered in Edmunds's first postconviction motion would have been considered minority or fringe medical opinions. The State presented four medical experts, who testified that the medical evidence available in 1996 was still valid, despite the emergence of a debate about shaking and traumatic head injuries in infants and small children. The State's experts disagreed with the defense experts and maintained that the evidence at trial established that [the infant] had been violently injured while in Edmunds's care.

Id. at 593. The trial court agreed that "Edmunds had presented newly discovered evidence" but concluded that the new evidence did not establish "a reasonable probability of a different result with the new evidence." *Id*. at 593-94.

On appeal, Edmunds contended that "the developments in medical research and literature in the ten years since her trial" was new evidence creating a reasonable probability of a different result in a new trial. *Id.* at 594. The State argued that Edmunds's claims were procedurally barred because she had raised the issue of advances in medical science regarding SBS and lucid intervals in a post-conviction motion in 1999. *Id.* at 594. The court disagreed:

> The problem with the State's argument is that the evidence offered in Edmunds's current postconviction motion is entirely different in character from the evidence offered in her 1997 postconviction motion. We recognize, as the State points out, that the arguments Edmunds raises here (that new expert medical testimony supports the theory that [the infant's] injuries could have occurred without an intentional injury, and that [the infant] could have had a substantial lucid interval following a head trauma, if one occurred) were raised in her 1997 postconviction motion. However, that does not end our inquiry. Although the basic arguments are parallel, the form and nature of the evidence supporting the arguments are dramatically different.
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> The defense experts in the 1997 motion would have offered the existing theories in the medical community, disavowed by the mainstream, that shaking alone could not cause fatal injuries, that a previous brain injury can spontaneously re-bleed, and that an infant can experience a head trauma and have a significant lucid interval. *In contrast, the defense experts who testified for the 2006 postconviction motion explained that in the past ten years, a shift has occurred in the medical community around shaken baby syndrome, so that now the fringe views posited in 1997 are recognized as legitimate and part of a significant debate*. They explained that there has

> been significant development in research and literature that challenges the medical opinions presented at Edmunds's trial.

Id. at 596 (emphasis added).

The *Edmunds* court agreed that such evidence was "newly discovered":

> Edmunds presented evidence that was not discovered until after her conviction, in the form of expert medical testimony, that a significant and legitimate debate in the medical community has developed in the past ten years over whether infants can be fatally injured through shaking alone, whether an infant may suffer head trauma and yet experience a significant lucid interval prior to death, and whether other causes may mimic the symptoms traditionally viewed as indicating shaken baby or shaken impact syndrome. Edmunds could not have been negligent in seeking this evidence, as the record demonstrates that the bulk of the medical research and literature supporting the defense position, and the emergence of the defense theory as a legitimate position in the medical community, only emerged in the ten years following her trial. The evidence is material to an issue in the case because the main issue at trial was the cause of [the infant's] injuries, and the new medical testimony presents an alternate theory for the source of those injuries. This evidence is not merely cumulative, in that it differs from the substance and quality of the defense evidence at trial.
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> The newly discovered evidence in this case shows that there has been a shift in mainstream medical opinion since the time of Edmunds's trial as to the causes of the types of trauma [the infant] exhibited. We recognize . . . that there are now competing medical opinions as to how [the infant's] injuries arose and that the new evidence does not completely dispel the old evidence. Indeed, the debate between the defense and State experts reveals a fierce disagreement between forensic pathologists, who now question whether the symptoms [the infant] displayed indicate intentional head trauma, and pediatricians, who largely adhere to the science as presented at Edmunds's trial.

Id. at 598-99.

In *People v. Bailey*, 144 A.D.3d at 1562-63, undisputed evidence was presented that the two-and-a-half-year old victim had fallen from a bench and hit her head. At trial, the prosecution's expert witnesses testified that short falls are rarely fatal. *People v. Bailey*, 999 N.Y.S.2d 713 (N.Y. Co. Ct. 2014). On review, the court discussed in detail the evidence of the fall and the scientific community's advancements in this arena, concluding that the evidence "significantly, and substantially, undermines" the prosecution's trial testimony. *Id.* at 713. As to causation, the court observed that "[n]ew research into the biomechanics of head injury" including "a significant change in medical science relating to head injuries in children, generally, and the [SBS] hypothesis, in particular," have "reveal[ed] that the doctors who testified" for certain prosecutions "misinterpreted the medical evidence to conclude that shaking, or shaking with impact, was the only mechanism capable of causing [certain victims'] injuries." *Id.* at 724.

On appeal, the prosecution did "not dispute that the allegedly new evidence is material, is not cumulative and does not merely impeach or contradict the record evidence." 144 A.D.3d at 1563. Rather, the prosecution "contend[ed] that the evidence submitted at the hearing does not constitute newly discovered evidence and would not change the result if a new trial were granted." *Id*. The court disagreed:

> In general, advancements in science and/or medicine may constitute newly discovered evidence (*see People v. Chase*, 8 Misc.3d 1016 [A], 2005 N.Y. Slip Op. 51125[U], *8, 2005 WL 1692330; *People v. Callace*, 151 Misc.2d 464, 466, 573 N.Y.S.2d 137), and we conclude that defendant established, by a preponderance of the evidence (*see* CPL 440.30 [6]), that "a significant and legitimate debate in the medical community has developed in the past ten years over whether infants [and toddlers] can be fatally injured through shaking alone, . . . and whether other causes [such as

> short-distance falls] may mimic the symptoms traditionally viewed as indicating shaken baby or shaken impact syndrome" (*Wisconsin v. Edmunds,* 308 Wis.2d 374, 385–386, 746 N.W.2d 590, 596, *review denied* 308 Wis.2d 612, 749 N.W.2d 663; *cf. People v. Caldavado,* 26 N.Y.3d 1034, 1037, 22 N.Y.S.3d 159, 43 N.E.3d 369; *see generally Cavazos v. Smith,* 565 U.S. 1, 8, 132 S.Ct. 2, 10, 181 L.Ed.2d 311 [Ginsburg, J., dissenting]).
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> We further conclude that defendant established, by a preponderance of the evidence (*see* CPL 440.30[6]), that the newly discovered evidence would probably change the result if a new trial were held today. "A motion to vacate a judgment of conviction upon the ground of newly discovered evidence rests within the discretion of the hearing court . . . The 'court must make its final decision based upon the likely cumulative effect of the new evidence had it been presented at trial'" (*People v. Deacon,* 96 A.D.3d 965, 967, 946 N.Y.S.2d 613, *appeal dismissed* 20 N.Y.3d 1046, 961 N.Y.S.2d 374, 985 N.E.2d 139; *see People v. McFarland,* 108 A.D.3d 1121, 1121, 969 N.Y.S.2d 295, *lv. denied* 24 N.Y.3d 1220, 4 N.Y.S.3d 608, 28 N.E.3d 44). Here, the cumulative effect of the research and findings on retinal hemorrhages, subdural hematomas or hemorrhages and cerebral edemas as presented in SBS/SBIS cases and short-distance fall cases supports the court's ultimate decision that, had this evidence been presented at trial, the verdict would probably have been different (*cf. Caldavado,* 26 N.Y.3d at 1037, 22 N.Y.S.3d 159, 43 N.E.3d 369).

Id. at 1564.

In this case, the circuit court, noting that "there was literature published as early as 1987 questioning whether shaking could procedure forces sufficient to cause the injuries seen in SBS cases," and pointing to Dr. Breitnecker's testimony that Collin's lack of external injuries "doesn't quite fit the pattern of violent, vicious shaking of a baby to produce changes that are described as unusually severe," found "that evidence demonstrating that shaking alone cannot generate the force required to cause the injuries thought to be indicative of SBS is not new because it was a contention throughout trial."

During the hearing, experts testified that modern research contradicts earlier SBS theories, including whether shaking produces forces equivalent to multistory falls and auto accidents. According to Dr. Van Ee, equating acceleration from shaking to multi-story falls or being hit by a speeding car "is absurd [and] scientifically wrong." More modern research indicates that angular accelerations from a one-foot fall onto carpet or impact onto soft surface (like a mattress, or pillow fight with heavy pillow) exceed those produced from shaking alone. Dr. Ophoven testified that the biomechanical scientific literature before 1999 lacked sophisticated methods and models of measuring force, and that later biomechanical research demonstrated that violent shaking of age appropriate models could not generate enough force to cause the kinds of damage related to the SBS diagnosis. This is scientific evidence that "casts doubt upon the validity and admissibility of evidence that was introduced at the time of trial." *Ward*, 221 Md. App. at 162–63; *see also Del Prete v. Thompson*, 10 F.Supp.3d 907, 954–55 (N.D. Ill. 2014) (holding the SBS controversy qualifies as new evidence because the biomechanics studies provided a "newfound basis for skepticism about causation and mechanism"). In short, we are persuaded that the court erred in finding that the biomechanical evidence was not new.

The circuit court also found that the lucid interval evidence was "not new because the possibility that a significant interval could have been between the infliction of injury and the onset of Collin's symptoms was discussed throughout trial." Although it was discussed at trial, the State's experts summarily dismissed the "lucid interval" concept as

invalid based on the then-contemporary research,[31] and dated Collin's injuries contemporaneously with his collapse and admission to the ER, even when the medical records did not necessarily support that conclusion.

Recent research indicates that infants with a subdural hematoma can appear asymptomatic for a period of time prior to collapse. *See* Keith A. Findley et al., *Shaken Baby Syndrome, Abusive Head Trauma, and Actual Innocence: Getting It Right*, 12 Hous. J. Health L. & Pol'y 209, 250-51 ; Scott Denton & Darinka Mileusnic, *Delayed Infant Death Following Accidental Fall*, 24 Am. J. Forensic Med. Pathology 371, 375 (2003). And even assuming that shaking could cause the constellation, the lucid interval hypothesis brings into question the presumption that the last person with the child when critical symptoms appear is medically or legally responsible. *See Del Prete*, 10 F. Supp. 3d at 954–55 (finding that the lucid interval hypothesis pointed away from the defendant being the perpetrator of abuse). For those reasons, the lucid interval evidence also qualifies as newly discovered.

[31] At the 1999 trial, the State's experts testified there would be no period of time ("lucid interval") between Collin's injuries and the emergence of symptoms:

- Dr. Chute: SBS "symptom onset begins almost immediately after violent shaking;" Collin was shaken while in his father's care.
- Dr. Walker: mere twenty to thirty seconds to inflict injury and infant would show symptoms "virtually immediately, certainly within minutes"; Collin injured "a maximum of an hour or two" before his admission to Sinai Hospital; injuries could not have occurred even four hours prior to his admission.
- Dr. Smialek: subdural and epidural bleeding "begins as soon as the blood vessels are ruptured from that disruption of the end of the blood vessels from vigorous shaking. . . . [W]ithin seconds the brain is beginning to swell because of damage to the cells within that brain," and the child would be unconscious "within minutes."

The court also found that evidence that the injuries and conditions associated with SBS can be caused by non-intentional medical conditions, including disease, infection, toxins, stroke and respiratory arrest was "not new because it was raised at trial." More particularly, "[i]t stated that "numerous non-intentional medical conditions, such as pneumonia, staph infection, reaction to vaccines and septicemia, were considered by Collin's treating physician and the expert[] witnesses at trial as causes of Collin's injuries," and that "Collin's treating physician and the experts each engaged in a differential diagnostic process that considered Collin's unique medical history."

Since 1999, scientific and medical literature has identified other natural causes for retinal hemorrhages and the other eye findings seen in Collin. Mr. Jones acknowledges that the conditions themselves are not new, but he contends that the causative relationship with these findings are newly discovered evidence.

We do not disagree that the treating physicians and expert witnesses engaged in a differential diagnosis process that considered Collin's medical history in 1999 that was consistent with the medical literature of that time. Since then, however, medical research has identified a number of other natural causes of retinal hemorrhages and associated eye findings—retinoschisis, perimacular folds, vitreous hemorrhage, and vitreous detachment. Although the natural conditions themselves are not new, their causative relationship with Collin's eye findings is.

Collin's medical history was discussed at the 1999 trial, but when the experts for the State were asked if a particular illness or condition could have caused Collin's

injuries, Dr. Zuckerberg testified that Collin's staph infection and urinary tract infection could not have caused the injuries observed; Dr. Polk said septicemia and thrombocytopenia could not have "cause[d] [the] injuries" to Collin's eyes; and Dr. Zuckerberg ruled out Collin's respiratory illness "almost immediately." Dr. Chute, when asked directly whether "[o]ther than shaking or trauma as the result of shaking, did you see any other evidence of some external force or external trauma that could have caused [Collin's] injuries," responded "No."

In 2018, Mr. Jones's experts testified that, since 2001, research has identified non-SBS causes for Collin's constellation, and that HIE, triggered by aspiration or infection and accompanied by DIC, was the cause of Collin's death, not SBS. And while it was known at trial that Collin had tested positive for bacteria, it was not discussed as a potential cause of Collin's constellation. There is medical research now that supports coagulopathy and infections causing the constellation found in Collin. This evidence would be particularly important in this case because of Collin's history of illness, hospitalization, and an absence of external injuries.

The circuit court's finding that "the majority of [Mr. Jones's] allegedly newly discovered evidence was [] discussed at his 1999 trial" ignores the stated conclusions of the State's key experts that only SBS could explain the constellation in Collin. Dr. Zuckerberg testified that Collin's brain bleeding "only could have occurred from trauma from shaking or falling." In regard to the retinal findings, he stated that these finding could only "occur from shaking, with severe acceleration/deceleration injury, much like

getting hit by a car at sixty miles an hour." Dr. Polk, with whom the circuit court was "very impressed," testified that he could "imagine no possible cause other than violent shaking to cause these injuries" referring to retinal and vitreous hemorrhages, traumatic retinoschisis, circular perimacular retinal fold, vitreous base detachment. And because of the extent of the hemorrhage, he opined that "[t]hat finding in an infant, to my knowledge, is virtually pathognomonic, meaning is virtually diagnostic of violent shaking."

As the State noted in its closing argument, even Mr. Jones's trial expert Dr. Breitnecker, who questioned the SBS diagnosis, conceded "[t]hat there was some trauma, I can't deny, because I didn't find any good cause in the literature for that separation at the macular fold other than trauma."[32] That was true because in 1999 the literature had not developed and the court was hearing only one side of the "triad of symptoms" debate.

Now, as we stated in *Sissoko*, there is a "present controversy over abusive head trauma" advanced by "a minority of physicians and other scientists" based on the "biomechanics of shaking, coupled with evidence that the confluence of subdural hematomas, retinal hemorrhages, and brain swelling is not unique to abusive head trauma." 236 Md. App. at 717, 725. They posit that it is "impossible to reliably conclude that any particular child's injuries or death were caused by inflicted (non-accidental) trauma, as opposed to accidental trauma or medical causes, such as clotting disorders. Nevertheless, they do not dispute that the presence of subdural hematomas, retinal

[32] In its closing, the State argued that "even Dr. Breitnecker says there has to be shaking."

hemorrhages, and encephalopathy is consistent with abusive head trauma." *Id.* at 725. But there is a "consensus [] that no single finding or combination of findings is pathognomonic [diagnostic] for abusive head trauma." *Id*. at 723. This enhanced medical debate was not discussed at the 1999 trial because it had not developed at that time.

The circuit court found that "[n]o study has been conducted that refutes the premise that shaking can cause the symptoms present in Collin . . . even when the symptoms present without external evidence of trauma." That is true, but it was not necessary that the newly discovered evidence refute that premise or even "probably produce an acquittal." *Love v. State*, 95 Md. App. 420, 431 (1993) (citation omitted). The issue is whether the new evidence established a substantial or significant *possibility* of a different result at trial. That standard is less demanding than "probable" and substantially less demanding than the "beyond a reasonable doubt" standard required of the ultimate factfinder. *See McGhie*, 449 Md. at 510.

In sum, Mr. Jones presented newly discovered evidence that was not discovered until after his conviction. Since 1999, scientific and medical literature has identified other natural causes of retinal hemorrhages and other eye findings as seen in Collin. Evidence that changes the 1999 understanding of those medical conditions in relation to the injuries and conditions associated with SBS qualifies as newly discovered. The current research shows that (i) subdural hematoma, (ii) retinal hemorrhage, and (iii) cerebral edema are attributable to a wide variety of both natural and accidental causes. Because Collin's medical conditions were quickly dismissed as potential causes of the

constellation of symptoms that Collin presented, such evidence would be especially important when there is a history of illness, hospitalization, and an absence of external injuries.

We recognize, as did the courts in *Sissoko* and *Edmunds*, that the competing medical opinions regarding SBS do not completely dispel the old evidence and that Mr. Jones's experts are in the minority. But the current controversy or debate within the scientific community and "the new studies [are] significantly more critical" of the SBS hypothesis than previous studies. *Ward*, 221 Md. App. at 516-17. We are persuaded that, if a factfinder, be it a jury or judge, would hear the competing professional medical opinions, there is a substantial or significant possibility of a different result. Accordingly, we reverse and remand the case with instructions to the circuit court to grant the petition for writ of actual innocence and conduct further proceedings consistent with this opinion.[33]

JUDGMENT OF THE CIRCUIT COURT FOR BALTIMORE COUNTY REVERSED. CASE REMANDED TO THAT COURT WITH INSTRUCTIONS TO GRANT THE PETITION FOR WRIT OF ACTUAL INNOCENCE AND CONDUCT FURTHER PROCEEDINGS CONSISTENT WITH THIS OPINION. COSTS TO BE PAID BY APPELLEE.

[33] After the original version of this opinion was filed, the State filed a motion for reconsideration. After considering of the State's motion and Mr. Jones's response, we denied the motion by separate order. However, we have withdrawn our previous opinion and reissued it with a modified last sentence, a modified mandate, and a correction to a typographical error in the second line of the last paragraph on page 42.