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FILE
IN CLERKS OFFICE
SUPREME COURT, STATE OF WASHINGTON
DATE MAR 2 1 2019
CHIEF JUSTICE

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Susan L. Carlson
Supreme Court Clerk

IN THE SUPREME COURT OF THE STATE OF WASHINGTON

L.M., a minor, by and through his Guardian ad Litem WILLIAM L.E. DUSSAULT, Petitioner, v. LAURA HAMILTON, individually and her marital community; LAURA HAMILTON LICENSED MIDWIFE, a Washington business, Respondents.	NO. 95173-0 EN BANC Filed MAR 2 1 2019

GORDON McCLOUD, J.—L.M. suffered a severe injury during birth and subsequently sued Laura Hamilton, the midwife who delivered him, for negligence. Hamilton prevailed at trial. L.M. now argues that the trial court erred by admitting evidence that natural forces of labor could have caused the injury and testimony from a biomechanical engineer to the same effect. L.M. argues that the trial court should have excluded the evidence under *Frye*[1] and the testimony under ER 702.[2]

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[1] *Frye v. United States*, 54 App. D.C. 46, 293 F. 1013 (1923).

[2] ER 702 provides: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise."

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We affirm. Under *Frye*, the trial court must exclude evidence that is not based on generally accepted science. *Anderson v. Akzo Nobel Coatings, Inc.*, 172 Wn.2d 593, 603, 260 P.3d 857 (2011). And under ER 702, the trial court must exclude testimony from unqualified experts and testimony that is unhelpful to the jury. *Lakey v. Puget Sound Energy, Inc.*, 176 Wn.2d 909, 918, 296 P.3d 860 (2013). Testimony is unhelpful to the jury if it is unreliable, *id.*, or lacks an adequate foundation, *Johnston-Forbes v. Matsunaga*, 181 Wn.2d 346, 357, 333 P.3d 388 (2014).

L.M.'s *Frye* challenge concerns the extent to which the challenged science must be generally accepted. And his ER 702 challenge hinges on the amount of discretion an appellate court grants a trial court under that rule. But before we resolve either issue, we must explore the current state of the challenged science because we review *Frye* challenges de novo. We must also detail what the trial court did because we review ER 702 challenges for abuse of discretion.

FACTUAL AND PROCEDURAL BACKGROUND

1. L.M. was injured during birth and subsequently sued the delivering midwife

On April 4, 2010, Laura Hamilton, a midwife, delivered L.M. Ex. 2 (medical records) at 7; *see also* Clerk's Papers (CP) at 1586. Her notes from the procedure show that she performed an "assisted shoulder delivery" and that L.M.'s right arm was "weak at side." Ex. 2 at 7; *see also* CP at 1586-87.

In his first few months of life, L.M. experienced "complete paralysis" of his upper arm, along with weakness of the entire arm. CP at 1567. In August 2010, exploratory surgery to address the problem revealed substantial injuries to L.M.'s brachial plexus. *Id.*

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The brachial plexus delivers signals from the spinal cord to the arm through a network of nerves. CP at 1569. These nerves can suffer various injuries, the most severe of which are avulsions (where the nerve is torn away from the spinal cord) and ruptures (where the nerve is ripped apart). *Id.* Although most brachial plexus injuries (BPIs) heal in six months, avulsions and ruptures are permanent. CP at 1570; Verbatim Report of Proceedings (VRP) (Oct. 28, 2015) at 27-28 (Test. of Robert DeMott, MD).

L.M.'s BPI is most likely permanent. CP at 1568, 1590. All five of his brachial nerve roots were injured: two were ruptured, one was avulsed, and two were partially avulsed. CP at 1587. To this day, he has limited use of his arm and experiences pain. CP at 1665-68, 1671.

L.M., through his guardian ad litem, sued Hamilton. CP at 1453-58, 1395-1401. He alleged that Hamilton responded negligently to his shoulder dystocia, an emergency in which a baby's shoulder gets stuck during labor. CP at 1556-57, 1573, 1587-90. L.M. claimed that Hamilton used excessive force, or traction, in her effort to free the shoulder. *Id.* He claimed that only excessive traction—and not natural forces of labor (NFOL)—could have caused his ruptures and avulsions. *Id.*

Hamilton argued that she properly delivered L.M. and that NFOL can and did cause L.M.'s BPI. CP at 1848, 2652-53, 2660, 2663-65. She argued that L.M. did not experience shoulder dystocia. VRP (Oct. 23, 2015) at 16 (Test. of Laura Hamilton). To support her defense, Hamilton offered the testimony of several experts, including Dr. Allan Tencer, a biomechanical engineer. CP at 1518-24.

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2. The trial court denied L.M.'s motion to exclude NFOL evidence

A. L.M. moved to exclude NFOL evidence

Before trial, L.M. moved to exclude evidence of the NFOL theory as not generally accepted under *Frye* and not helpful to the trier of fact under ER 702. CP at 1459-60. According to L.M., the relevant scientific community does not generally accept that NFOL can cause "permanent, severe brachial plexus nerve avulsion and rupture," CP at 1482 (boldface omitted), and any suggestion to the contrary is too speculative to be admissible, CP at 1473. L.M. drew support for his argument from two recent New York cases excluding NFOL evidence. CP at 1475-79 (citing *Muhammad v. Fitzpatrick*, 91 A.D.3d 1353, 937 N.Y.S.2d 519 (App. Div. 2012); *Nobre ex rel. Ferraro v. Shanahan*, 42 Misc. 3d 909, 976 N.Y.S.2d 841 (Sup. Ct. 2013)).

He also relied on deposition testimony or declarations from three experts. Dr. Howard Mandel, an obstetrician-gynecologist, stated that "an avulsion or rupture of brachial plexus nerve roots to an otherwise normal baby cannot occur from mere uterine contractions or maternal pushing, the so-called 'forces of nature,' and there are no medical studies or case reports to support that contention." CP at 1590; *see also* CP at 1510 ("You can't get avulsion from stretch. It's just physiologically impossible.").[3] Dr. Mandel

[3] Dr. Mandel cited a publication in which Dr. Michael S. Kreitzer argues that "'there is no direct evidence to support the assumption that [NFOL] can cause permanent injury due to rupture or avulsion.'" CP at 1590-91 (quoting JAMES A. O'LEARY, SHOULDER DYSTOCIA AND BIRTH INJURY PREVENTION AND TREATMENT 202 (3d ed. 2010)); *see also* CP at 1516-17 (making same argument in a letter to an editor). At trial, however, Dr. Mandel conceded that NFOL can cause permanent BPIs. VRP (Oct. 21, 2015) at 119 (Test. of Howard Mandel, MD) ("I believe . . . you can have stretch from [NFOL]," and "[i]f you have a bad stretch injury, the nerves can be permanently damaged.").

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acknowledged that he had not "done any research on nerve avulsion or specific reading on it in over ten years." CP at 1511. Instead, he relied on his "education, training, and experience and all the reading [he had] ever done." *Id.*

Dr. Stephen Glass, a pediatric neurologist, stated that "[g]iven the character of delivery and given the degree and extent of this severe plexus injury, it is improbable that the 'natural forces' of labor and delivery were solely responsible." CP at 1567-68. He also stated that "avulsion injuries are caused only by application of excessive manual traction of the delivering provider while trying to alleviate the shoulder dystocia." CP at 1573. He concluded, "There are no meaningful scientific studies that have measured the forces necessary to cause a brachial plexus injury compared with the forces exerted by a laboring mother." *Id.*[4]

And Pamela Kelly, a certified midwife, said that in her 30 years of practice, she had "never heard of nor read any medical literature that says avulsion and ruptures of the brachial plexus nerve roots of an otherwise normal newborn can occur by way of the natural forces of nature." CP at 1557 (boldface omitted).

B. Hamilton opposed L.M.'s motion

Hamilton argued that the NFOL theory "is based on generally accepted scientific methodologies, principles, and techniques that have been published in the medical and scientific literature over the last 25 years." CP at 1737. She relied heavily on a survey of

[4] At trial, Dr. Glass conceded that NFOL "probably can contribute to some plexus injuries." VRP (Oct. 22, 2015) at 89 (Test. of Stephen Glass, MD). Dr. Glass also acknowledged that the literature includes case reports of NFOL causing permanent BPIs. *Id.* at 115.

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the medical literature by Dr. Robert DeMott, an obstetrician-gynecologist. CP at 1738-50, 1839-49. That literature shows that NFOL can clearly cause BPI, but it does not describe what *types* of BPI—avulsion, rupture, etc.—this includes. CP at 1842-43. The reason is that the precise subcategory of permanent BPI can be determined only by surgical intervention, and "not all children with permanent injury undergo surgery where the diagnosis of which type is able to be made." CP at 1839; *see also* CP at 1842-43. Dr. DeMott disagreed with L.M.'s framing of the issue as whether the current literature shows that NFOL cause avulsions or ruptures; Dr. DeMott believed the issue should be framed as whether the current literature shows that NFOL cause permanent injuries. CP at 1842-43.

In surveying the literature, Dr. DeMott discussed *Williams Obstetrics*,[5] "one of the preeminent textbooks on obstetrics." CP at 1839-40. He explained that the book reveals the "evolution of the science" regarding NFOL and BPIs. CP at 1839. Although earlier editions of the textbook suggest that BPIs usually result from excessive traction, newer editions recognize that BPIs may also result from NFOL. CP at 1839, 1990, 1993. The newest edition (at the time of trial) notes that "severe" BPIs "may also occur without . . . shoulder dystocia." CP at 1999.

[5] F. GARY CUNNINGHAM ET AL., WILLIAMS OBSTETRICS (21st ed. 2001); F. GARY CUNNINGHAM ET AL., WILLIAMS OBSTETRICS (22d ed. 2005); F. GARY CUNNINGHAM ET AL., WILLIAMS OBSTETRICS (23d ed. 2010); F. GARY CUNNINGHAM ET AL., WILLIAMS OBSTETRICS (24th ed. 2014).

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Dr. DeMott also discussed the fourth edition of *PRECIS: An Update to Obstetrics & Gynecology: Obstetrics*.[6] CP at 1840-41. That book claims that older textbooks state, "without evidence," that BPIs are caused by excessive traction "in the presence of shoulder dystocia." CP at 2006. But "multiple lines of evidence" now suggest that most BPIs are caused by something else. *Id.* The book notes that more than half of BPIs occur in uncomplicated vaginal deliveries and "mathematic and computer-simulated models" suggest that NFOL are "far greater" than clinician-applied traction. *Id.*

Dr. DeMott also referenced several other pieces of literature suggesting that NFOL can cause permanent BPIs. *See* CP at 1843-49. For example, he cited a 2008 case report published in the *American Journal of Obstetrics & Gynecology*.[7] CP at 1843, 2008-10. That case report involved a mother who delivered a baby with one push and without physician traction—"the only role the doctor played was to catch the baby before it went off the table"—yet the baby suffered a permanent BPI. CP at 2009-10.

Finally, Dr. DeMott discussed a 2014 "comprehensive, retrospective" report from the American College of Obstetrics and Gynecologists (ACOG) titled *Neonatal Brachial Plexus Palsy* (ACOG Report or Report).[8] CP at 1841, 1867-1976. That report reflects

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[6] AM. COLL. OF OBSTETRICIANS & GYNECOLOGISTS, PRECIS: AN UPDATE IN OBSTETRICS & GYNECOLOGY: OBSTETRICS (4th ed. 2013).

[7] Henry Lerner, MD & Eva Salamon, MD, *Permanent Brachial Plexus Injury Following Vaginal Delivery without Physician Traction or Shoulder Dystocia*, Am. J. of Obstetrics & Gynecology, Mar. 2008, at e7-8.

[8] AM. COLL. OF OBSTETRICIANS & GYNECOLOGISTS TASK FORCE, NEONATAL BRACHIAL PLEXUS PALSY (2014).

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ACOG's review of published literature, including original research, review articles, and commentaries. CP at 1876. The underlying literature was reviewed for quality. *Id.* The ACOG Report states,

> The task force recognizes that knowledge about NBPP [neonatal brachial plexus palsy or BPI] is continually evolving. What is known at this time with reasonable medical certainty is that NBPP occurs infrequently and can be caused by maternal (endogenous) forces or clinician-applied (exogenous) forces or a combination of both. Similarly, NBPP can occur with or without associated, clinically recognizable shoulder dystocia. Finally, in the presence of shoulder dystocia, all intervention by way of ancillary maneuvers—no matter how expertly performed—will necessarily increase strain on the brachial plexus.

CP at 1882. The Report also shows that NFOL can cause permanent BPIs, noting that injuries have "been shown to occur entirely unrelated to traction, with studies demonstrating cases of both transient and persistent NBPP in fetuses delivered vaginally without clinically evident shoulder dystocia or fetuses delivered by cesarean without shoulder dystocia." CP at 1899; *see also* CP at 1910 ("No published clinical or experimental data exist to support the contention that the presence of persistent (as compared to transient) NBPP implies the application of excessive force by the birth attendant."). The Report, however, notes that "more investigation" is necessary. CP at 1916.

The ACOG Report has been endorsed by several professional organizations, including the American Academy of Pediatrics, the American College of Nurse-Midwives, and the American Gynecological & Obstetrical Society. CP at 1878.[9]

[9] It has also been endorsed by the American Academy of Physical Medicine and Rehabilitation, the American Society for Reproductive Medicine, the Child Neurology

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C. The trial court initially granted L.M.'s motion to exclude NFOL evidence

At first, the trial court granted L.M.'s motion. CP at 2622-26. The court held that under ER 702, the NFOL theory was too speculative on causation because it fails to explain how natural forces cause avulsions and ruptures. CP at 2289-91. The court also rejected the NFOL theory under *Frye*, holding that the scientific community has not reached a "consensus" on whether "the permanent avulsion injuries can be caused by natural forces." CP at 2290 (excerpt of court's Sept. 18, 2015 oral ruling).

D. On reconsideration, the trial court admitted NFOL evidence

Hamilton moved for reconsideration. CP at 2920. She listed all the courts that had previously allowed NFOL evidence. CP at 2938-46 (citing cases). She also filed additional expert declarations. Dr. DeMott stated that a consensus of the relevant scientific community now accepts "that [NFOL] can cause permanent [BPI], including brachial nerve avulsion and rupture." CP at 2667-68. Dr. Elizabeth Sanford, another obstetrician-gynecologist, stated that the obstetric community "agree[s] that permanent brachial plexus injuries can be caused by [NFOL]" and that "[p]ermanent injuries include brachial plexus

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Society, the Japan Society of Obstetrics and Gynecology, the Royal Australian and New Zealand College of Obstetricians and Gynaecologists, the Society for Maternal-Fetal Medicine, and the Society of Obstetricians and Gynaecologists of Canada. CP at 1878. And the March of Dimes Foundation and the Royal College of Obstetricians and Gynaecologists have offered their full support. *Id.*

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ruptures and avulsions." CP at 2663.[10] Dr. Thomas Collins, a neurologist, stated that "[t]here is a general consensus in the medical community that permanent brachial plexus injury can occur due to [NFOL]" and that "[t]here is no specifically identified research study that supports the contention that rupture and avulsion of nerves only occurs with excessive traction." CP at 2674. Beth Coyote, a midwife, agreed. CP at 2652-53.

The trial court then reversed its prior ruling. CP at 3246-47. Regarding *Frye*, the trial court noted that an expert's "ultimate opinion" on causation "does not have to be generally accepted so long as [his or her] . . . opinions are based on accepted methodology." VRP (Oct. 12, 2015) at 26 (motion hearing). That *Frye* standard, the trial court held, was satisfied in this case. *Id.* at 29. Regarding ER 702, the trial court ruled that NFOL evidence had sufficient foundation to be helpful to the jury. *See id.* at 27-30. It explained that any gaps in the science result from appropriate "ethical considerations": researchers cannot experiment on babies to determine the force required to cause an avulsion. *Id.* at 28-29.[11] Instead, researchers must rely on peer-reviewed and published literature. *Id.* at 29. That literature shows that NFOL can cause severe BPIs. *Id.* at 27-30. The trial court held that this is "sufficient to bridge that analytical gap between the natural forces theory and the injury" and reach the jury. *Id.* at 29.

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[10] In an earlier declaration, Dr. Sanford had noted that the medical literature is limited. CP at 1529 ("there's still quite a bit that we need to find out"), 1530 ("the literature does not very specifically state" how NFOL cause permanent BPIs).

[11] At trial, Dr. Mandel, L.M.'s expert, elaborated on the ethical dilemma facing researchers: it "would be criminal to cause avulsion just to prove a medical point." VRP (Oct. 21, 2015) at 90 (Test. of Howard Mandel, MD). "Why would you want to hurt a baby?" *Id.* at 91.

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3. The trial court allowed Dr. Tencer to testify

The other pretrial issue before us is whether Dr. Tencer should have been allowed to testify about the internal (endogenous) and external (exogenous) forces involved in childbirth. CP at 2358, 2374-76. Dr. Tencer has testified approximately 250 times, but mostly in cases involving car crashes. VRP (Oct. 27, 2015) at 9 (Test. of Allan Tencer, PhD). Prior to this case, he had never testified in a case involving labor and delivery. *Id.* He holds a doctorate in mechanical engineering, and until recently, he taught orthopedics and sports medicine, as well as mechanical engineering, at the University of Washington. CP at 2372-73. Dr. Tencer does not hold a medical degree. CP at 2380. Nor has he received specialized training in the mechanics of childbirth. CP at 2372-73, 2380-81. He has, however, researched the strength of the spinal cord and nerve roots. CP at 2373; *see also* VRP (Oct. 27, 2015) at 5-7 (Test. of Allan Tencer, PhD). And to prepare for this case, he studied the latest science on the biomechanics of childbirth, including the ACOG Report. CP at 2372-78; VRP (Oct. 12, 2015) at 31-32.

In his declaration, Dr. Tencer concluded that "[f]rom a biomechanical forces perspective, it is not possible to differentiate whether the brachial plexus nerve damage suffered by [L.M.] resulted from exogenous, endogenous or some combination of both forces." CP at 2376. He reached this conclusion after reviewing the current science on the forces, including NFOL, at play. CP at 2373-76.

L.M. opposed, arguing that Dr. Tencer, who "is not an obstetrician or a midwife," "is testifying far outside his expertise." CP at 3180. He also criticized Dr. Tencer's proposed testimony as speculative and misleading because Dr. Tencer misinterpreted and

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drew "hasty generalization[s]" from the underlying literature. CP at 3180-84. For example, L.M. claimed that Dr. Tencer "proposes to testify regarding forces that his own published sources say are not possible." CP at 3180.

The trial court ruled that Dr. Tencer could testify. VRP (Oct. 12, 2015) at 37-38. The court found that he was qualified and that his testimony would help the jury understand the forces at play, thus satisfying ER 702's prerequisites to admissibility. *Id.* at 37. And it ruled that L.M. could challenge Dr. Tencer's interpretation of the underlying literature through cross-examination. *Id.* But it barred Dr. Tencer from testifying about specific causation in L.M.'s case. *Id.* at 34, 37. The court stated that if Dr. Tencer ignored this limitation, it would "expect an immediate objection which will be sustained." *Id.* at 37-38.[12]

4. The jury found that Hamilton was not negligent, and L.M. now appeals

The jury found that Hamilton was not negligent. CP at 4814. L.M. appealed the pretrial decisions to admit NFOL evidence and to allow Dr. Tencer to testify. CP at 4753. The Court of Appeals affirmed. *L.M. v. Hamilton*, 200 Wn. App. 535, 402 P.3d 870 (2017).

We granted review and also affirm. *L.M. v. Hamilton*, 191 Wn.2d 1011 (2018).

ANALYSIS

The courts serve the gatekeeping function of keeping out "unreliable, untested, or junk science." *Anderson*, 172 Wn.2d at 606 (citing 5B KARL B. TEGLAND, WASHINGTON

[12] At trial, defense counsel asked Dr. Tencer whether, in his opinion, NFOL can "cause the rupture and avulsion of a brachial plexus." VRP (Oct. 27, 2015) at 22 (Test. of Allan Tencer, PhD). Dr. Tencer responded, "It certainly appears so." *Id.* Plaintiff's counsel did not object. *See id.*

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PRACTICE: EVIDENCE LAW & PRACTICE § 702.18, at 81 (5th ed. 2007)). L.M. now argues that the trial court's decision to admit NFOL evidence violated *Frye* and its decision to allow Dr. Tencer to testify violated ER 702. We must determine whether the trial court properly discharged its gatekeeping function.

1. The NFOL theory is not based on novel science and thus does not violate *Frye*

A. This court reviews Frye *issues de novo*

We review the trial court's *Frye* ruling de novo. *Lakey*, 176 Wn.2d at 919 (citing *Anderson*, 172 Wn.2d at 600). The court also reviews de novo a trial court's decision, made outside of a *Frye* hearing, that the scientific community generally accepts the science at issue and thus that no *Frye* hearing is necessary. *State v. Gregory*, 158 Wn.2d 759, 830, 147 P.3d 1201 (2006), *overruled on other grounds by State v. W.R.*, 181 Wn.2d 757, 336 P.3d 1134 (2014).[13]

B. Frye *does not bar Hamilton's experts from opining that NFOL caused L.M.'s avulsions and ruptures*

Frye requires experts to base their conclusions on generally accepted science. *Anderson*, 172 Wn.2d at 603. The relevant scientific community must generally accept both "'the underlying theory'" and the "'techniques, experiments, or studies'" applying

[13] Hamilton argues that L.M. waived his *Frye* challenge by failing to request a *Frye* hearing below. While it is true that L.M. did not request an evidentiary hearing or in-court testimony on the *Frye* issue, CP at 1460, L.M. made *Frye* arguments at the trial court, including that the scientific community does not generally accept the NFOL theory, *e.g.*, CP at 1475-83, 3221. And the trial court ultimately ruled on the *Frye* issue. VRP (Oct. 12, 2015) at 26-30. L.M. therefore preserved the issue. *Cf. Johnston-Forbes*, 181 Wn.2d at 356 (holding that "'a party who fails to seek a *Frye* hearing below does not preserve this evidentiary challenge for review'" (quoting *Johnston-Forbes v. Matsunaga*, 177 Wn. App. 402, 408, 311 P.3d 1260 (2013)).

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that theory. *Id.* (quoting *State v. Riker*, 123 Wn.2d 351, 359, 869 P.2d 43 (1994)). The techniques, experiments, or studies must be "'capable of producing reliable results.'" *Id.* (quoting *Riker*, 123 Wn.2d at 359). The scientific community does not have to be unanimous; the court should exclude the expert's opinion only "'[i]f there is a *significant* dispute among *qualified* scientists.'" *Id.* (internal quotation marks omitted) (quoting *Gregory*, 158 Wn.2d at 829).

"[T]he application of accepted techniques to reach novel conclusions does not raise *Frye* concerns." *Lakey*, 176 Wn.2d at 919. "*Frye* does not require every deduction drawn from generally accepted theories to be generally accepted." *Anderson*, 172 Wn.2d at 611. "Other evidentiary requirements provide additional protections from deductions that are mere speculation." *Id.* (citing ER 104(a); ER 401; ER 403); *see also id.* at 603 ("'Once a methodology is accepted in the scientific community, then application of the science to a particular case is a matter of weight and admissibility under ER 702.'" (quoting *Gregory*, 158 Wn.2d at 829-30 (citing ER 702))).

For example, in *Anderson*, Julie Anderson gave birth to a son, who was later diagnosed with various "medical abnormalities." *Anderson*, 172 Wn.2d at 598. A doctor opined that the son's abnormalities were likely due to Anderson's exposure to paint at work while she was pregnant. *Id.* An expert agreed with the doctor and was willing to testify that the employer's paint caused the son's birth defects. *Id.*

The trial court excluded the expert's testimony under *Frye* because, at least at that time, no member of the relevant scientific community had researched whether "the *specific* type of organic solvents" in the employer's paint could cause "the *specific* type of birth

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defects at issue." *Id.* at 605 (emphasis added). The trial court held that *Frye* requires a "consensus of scientific opinion on the issue of specific causation." *Id.*

This court reversed. *Id.* We reiterated that trial courts should admit evidence under *Frye* if the scientific community generally accepts the science underlying an expert's conclusion; the scientific community does not also have to generally accept the expert's theory of specific causation. *See id.* at 609. It was sufficient for Anderson to "present[] evidence that tended to show it is generally accepted by the scientific community that toxic solvents *like the ones* to which Anderson was exposed . . . *may* damage the developing brain of a fetus within the uterus." *Id.* at 610 (emphasis added). Anderson did not have to "establish that the specific causal connection between the specific toxic organic solvents to which she was exposed and the specific . . . birth defect is generally accepted." *Id.* at 611. Requiring "'general acceptance' of each discrete and ever more specific part of an expert opinion" would place "virtually all opinions based upon scientific data" into "some part of the scientific twilight zone." *Id.* Because the court found nothing novel about the science underlying the expert's testimony, it held that the testimony did not implicate *Frye*. *Id.* at 611-12.

In this case, Hamilton argues that the scientific community generally accepts that NFOL could have caused L.M.'s BPI. Although the literature is silent as to avulsions and ruptures, she argues, it does say that NFOL can cause permanent BPIs. And because the category of permanent BPIs includes avulsions and ruptures, Hamilton argues that NFOL could have caused L.M.'s BPI.

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Meanwhile, L.M. argues that the relevant scientific community does not generally accept that NFOL can cause his *specific* BPI—rupture and avulsion at all five nerve roots. He notes that the literature is silent as to whether NFOL can cause such a severe BPI. Although L.M.'s own experts recognize that the literature suggests that NFOL can cause permanent BPIs, they disagree over what types of permanent BPIs (e.g., severe stretching, avulsions, ruptures) this includes.

Anderson resolves this dispute: "*Frye* does not require every deduction drawn from generally accepted theories to be generally accepted." 172 Wn.2d at 611. For *Frye* purposes, Hamilton does not have to prove that the relevant scientific community generally accepts that NFOL could have caused L.M.'s ruptures and avulsions—much like Anderson did not have to prove general acceptance of "the specific causal connection" in her case. It is sufficient for Hamilton to draw such a deduction from generally accepted science. Here, Hamilton's experts note that the science shows that NFOL can cause permanent BPIs. From this they deduce that NFOL can cause avulsions and ruptures, both of which are types of permanent BPIs. So long as the science underlying this deduction is generally accepted, *Frye* is satisfied.

Requiring general acceptance of "each discrete and ever more specific part of an expert opinion" (e.g., requiring general acceptance that NFOL can cause *specific types* of permanent BPIs) would place "virtually all opinions based upon scientific data" into "some part of the scientific twilight zone." *Id.* Other evidentiary rules—not *Frye* and not at issue here—bar deductions that are too speculative.

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In sum, Hamilton must show that her experts based their opinions on generally accepted science.

C. Hamilton's experts based their opinions on generally accepted science

Hamilton's experts testified that NFOL caused L.M.'s avulsions and ruptures. They based this testimony on the underlying theory that NFOL can cause permanent BPIs and on the literature surrounding that theory. To determine whether this satisfies *Frye*, we look to "a number of sources," including the "record, available literature, and the cases of other jurisdictions." *State v. Baity*, 140 Wn.2d 1, 10, 991 P.2d 1151 (2000) (citing *State v. Cauthron*, 120 Wn.2d 879, 888, 846 P.2d 502 (1993)).

These sources reveal a generally accepted theory: NFOL can cause permanent BPIs. This theory has developed from retrospective analyses of data and experiments that rely on modeling, rather than on prospective experiments, because researchers cannot ethically perform experiments on infants to determine exactly how much force causes the various types of BPIs. Although the ethical limitations prevent researchers from performing some studies, it does not follow that the studies they can perform are incapable of producing reliable results. Nor does it matter, for *Frye* purposes, that more investigation and research in the future will likely lead to even better results. What matters is that the theory is generally accepted and that the techniques, experiments, and studies applying that theory are also generally accepted and capable of producing reliable results. And that is clearly the case here. The ACOG Report, for example, reviewed published literature, which was reviewed for quality, and has been endorsed by several prominent organizations from around the world.

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L.M. fails to show that there is a significant dispute among scientists. In fact, L.M.'s *own experts* recognize that the literature suggests that NFOL can cause permanent BPIs. *See* VRP (Oct. 21, 2015) at 119 (Test. of Howard Mandel, MD); VRP (Oct. 22, 2015) at 115 (Test. of Stephen Glass, MD). Moreover, at the trial court, all of L.M.'s cited literature suggesting otherwise was authored by one person, Dr. Michael S. Kreitzer, and was published before the ACOG Report. In his supplemental brief before this court, L.M. does include two additional publications not authored by Dr. Kreitzer. Suppl. Br. of Pet'r at 15-16. But neither publication reveals a significant dispute in the scientific community. In fact, the first acknowledges that excessive traction is not the only possible cause of BPIs:

> There is enough evidence that BPI can occur in the absence of shoulder dystocia to conclude that not every injury is the consequence of excessive force applied by the obstetrician or midwife. Moreover, it seems equally clear that BPI can occur in association with shoulder dystocia even when the complication has been managed optimally. The weight of the available information suggests, however, that inopportune medical intervention is probably a factor in most injuries.

Id. App. 1 at 001 (internal citations omitted). And the second appears to answer the *Frye* inquiry in favor of Hamilton: "[A]mong American obstetricians the idea that most injuries develop '*in utero*' spontaneously *has gained wide acceptance*." *Id.* App. 2 at 006 (second emphasis added).[14]

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[14] The author goes on to argue that American obstetricians favor the NFOL theory because the "idea offers a firm ground for defending malpractice claims." Suppl. Br. of Pet'r App. 2 at 006; *see also Taber v. Roush*, 316 S.W.3d 139, 180 (Tex. App. 2010) (Anderson, J., dissenting) ("I believe that much of [the literature] was motivated in no small part by concerns over the amount of litigation involving brachial plexus injuries and the lack of a viable defensive theory in the face of the only generally accepted cause of those injuries: excessive traction by the delivering physician."). And L.M. notes that "[s]ome of the articles reference litigation as a consideration." Pet. for Review at 11.

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Other jurisdictions agree. L.M. points us to only one court that has excluded NFOL evidence in a BPI case under *Frye*. That court, from New York, affirmed a lower court's holding that the NFOL theory is "a novel theory subject to a *Frye* analysis" and is "not generally accepted within the relevant medical community." *Muhammad*, 91 A.D.3d at 1354. But the court applied an abuse of discretion standard, rather than conduct de novo review, and provided almost no reasoning. *Id.* And in a similar case, another New York court distinguished *Muhammad* and held that defendants' NFOL theory satisfied the *Frye* standard. *Nobre*, 42 Misc. 3d at 924-25.[15] There, the court reasoned that it could not "conceive how a theory that has been studied, tested and debated for more than twenty years can be deemed to be novel." *Id.* at 922.[16] Other *Frye* jurisdictions have reached a similar conclusion. *E.g.*, *Ruffin ex rel. Sanders v. Boler*, 384 Ill. App. 3d 7, 22-25, 890 N.E.2d 1174, (2008).

But even if litigation motivated the science, it does not necessarily follow that the scientists manipulated the techniques, experiments, or studies to reach a desired result. Moreover, 10 professional organizations—from around the world—endorsed the 2014 ACOG Report. Finally, L.M. had every opportunity to draw out potential biases of the cited medical literature during cross-examination of Hamilton's experts—and in fact did so. *E.g.*, VRP (Oct. 28, 2015) at 61-64 (Test. of Robert DeMott, MD).

[15] The *Nobre* court distinguished *Muhammad* in part because *Muhammad* involved "at least a partial avulsion," while *Nobre* involved "no rupture or avulsion." 42 Misc. 3d at 924. But it also distinguished *Muhammad* because the *Muhammad* court conducted a more limited review of the medical literature. *Id.* at 924-25.

[16] The court in *Nobre* went on to exclude the theory for lack of foundation. *Id.* at 924-30.

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In sum, Hamilton's experts concluded that NFOL caused L.M.'s avulsions and ruptures, and they based this conclusion on generally accepted science. Because *Frye* is not implicated, we affirm the trial court's *Frye* determination to deny L.M.'s motion to exclude evidence of the NFOL theory.

2. The trial court did not abuse its discretion by allowing Dr. Tencer to testify

"The trial court must exclude expert testimony involving scientific evidence unless the testimony satisfies . . . ER 702." *Lakey*, 176 Wn.2d at 918 (citing *State v. Copeland*, 130 Wn.2d 244, 255-56, 922 P.2d 1304 (1996)). Expert testimony satisfies ER 702 if (1) "the witness qualifies as an expert," and (2) "the testimony will assist the trier of fact." *Id.* (citing *Cauthron*, 120 Wn.2d at 890 (citing ER 702)).[17]

We review for abuse of discretion the trial court's admission of expert testimony under ER 702. *Lakey*, 176 Wn.2d at 919 (citing *State v. Yates*, 161 Wn.2d 714, 762, 168 P.3d 359 (2007)). "A trial court abuses its discretion by issuing manifestly unreasonable rulings or rulings based on untenable grounds, such as a ruling contrary to law." *Id.* (citing *Wash. State Physicians Ins. Exch. & Ass'n v. Fisons Corp.*, 122 Wn.2d 299, 339, 858 P.2d 1054 (1993)). A reviewing court may not hold that a trial court abused its discretion

[17] In recent years, we have occasionally expressed a three-part test in which we also require the expert to rely on generally accepted theories. *Gilmore v. Jefferson County Pub. Transp. Benefit Area*, 190 Wn.2d 483, 495, 415 P.3d 212 (2018); *Johnston-Forbes*, 181 Wn.2d at 352; *In re Pers. Restraint of Morris*, 176 Wn.2d 157, 168-69, 288 P.3d 1140 (2012); *In re Marriage of Katare*, 175 Wn.2d 23, 38, 283 P.3d 546 (2012). But that additional general acceptance part is really a *Frye* determination. "Because we review a *Frye* determination de novo, but review issues under ER 702 only for abuse of discretion, we find it inappropriate to include a *Frye* determination as part of the test for proper admissibility of expert testimony under ER 702." *Cauthron*, 120 Wn.2d at 890 n.4.

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"'simply because it would have decided the case differently.'" *Gilmore v. Jefferson County Pub. Transp. Benefit Area*, 190 Wn.2d 483, 494, 415 P.3d 212 (2018) (quoting *State v. Salgado-Mendoza*, 189 Wn.2d 420, 427, 403 P.3d 45 (2017)). To find abuse of discretion, a court "'must be convinced that "'*no reasonable person* would take the view adopted by the trial court.'"'" *Id.* (emphasis added) (quoting *Salgado-Mendoza*, 189 Wn.2d at 427 (quoting *State v. Perez-Cervantes*, 141 Wn.2d 468, 475, 6 P.3d 1160 (2000) (quoting *State v. Huelett*, 92 Wn.2d 967, 969, 603 P.2d 1258 (1979)))). "'[I]f the basis for admission of the evidence is fairly debatable,'" a court "'will not disturb the trial court's ruling.'" *Id.* (internal quotations omitted) (quoting *Grp. Health Coop. of Puget Sound, Inc. v. Dep't of Revenue*, 106 Wn.2d 391, 398, 722 P.2d 787 (1986)).

A. The trial court did not abuse its discretion in ruling that Dr. Tencer was qualified to testify

A witness may qualify as an expert "by knowledge, skill, experience, training, or education." ER 702. "An expert may not testify about information outside his area of expertise." *In re Marriage of Katare*, 175 Wn.2d 23, 38, 283 P.3d 546 (2012) (citing *Queen City Farms, Inc. v. Cent. Nat'l Ins. Co. of Omaha*, 126 Wn.2d 50, 104, 882 P.2d 703, 891 P.2d 718 (1994) (plurality opinion)). When determining whether a witness is an expert, courts should look beyond academic credentials. *Harris v. Robert C. Groth, MD, Inc.*, 99 Wn.2d 438, 449-50, 663 P.2d 113 (1983). For example, depending on the circumstance, a nonphysician might be qualified to testify in a medical malpractice action. *Id.* "'[T]he line between chemistry, biology, and medicine is too indefinite to admit of a practicable separation of topics and witnesses.'" *Id.* at 450 (quoting 2 JOHN HENRY WIGMORE,

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EVIDENCE IN TRIALS AT COMMON LAW § 569, at 790 (rev. 1979)). But when making the determination, courts must consider whether the expert has "'sufficient expertise in the relevant specialty.'" *Frausto v. Yakima HMA, LLC*, 188 Wn.2d 227, 232, 393 P.3d 776 (2017) (quoting *Young v. Key Pharm., Inc.*, 112 Wn.2d 216, 229, 770 P.2d 182 (1989)).

Parties often call Dr. Tencer to testify as an expert, typically in cases involving automobile collisions. Sometimes his testimony has been admissible, sometimes it has not. In *Stedman v. Cooper*, for example, the trial court barred Dr. Tencer from testifying. 172 Wn. App. 9, 13, 292 P.3d 764 (2012). Applying an abuse of discretion standard, the Court of Appeals affirmed, holding that Dr. Tencer's "clear message was that Stedman could not have been injured in the accident because the force of the impact was too small." *Id.* at 20. In *Ma'ele v. Arrington*, in contrast, the trial court admitted Dr. Tencer's testimony. 111 Wn. App. 557, 560, 45 P.3d 557 (2002). Like in *Stedman*, Dr. Tencer "expressed no opinion about Ma'ele's symptoms or possible diagnosis from those symptoms." *Id.* at 564. Applying an abuse of discretion standard, the Court of Appeals affirmed, stating that the jury was "entitled to infer" from Dr. Tencer's testimony that Ma'ele was injured in the crash. *Id.* 563-64.

The apparent inconsistency between *Stedman* and *Ma'ele* is due to the abuse of discretion standard. *Johnston-Forbes*, 181 Wn.2d at 353. "'The broad standard of abuse of discretion means that courts can reasonably reach different conclusions about whether, and to what extent, an expert's testimony will be helpful to the jury in a particular case.'" *Id.* at 353-54 (quoting *Stedman*, 172 Wn. App. at 18). The broad standard also means that courts can reasonably reach different conclusions about whether an expert is qualified.

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In this case, L.M. argues that Dr. Tencer was not qualified to testify at all because he lacked expertise in the forces of childbirth. On the one hand, courts must determine whether an expert has "sufficient expertise in the relevant specialty." *Frausto*, 188 Wn.2d at 232. Dr. Tencer does not have remarkable expertise in the biomechanics of childbirth; until his retirement, he taught orthopedics and sports medicine. But on the other hand, the evidence rules say that a witness may qualify as an expert "by knowledge, skill, experience, training, *or* education." ER 702 (emphasis added). Although Dr. Tencer is not specially trained in the biomechanics of childbirth, he is highly qualified to testify about biomechanical forces in general. He has also personally researched the spine. CP at 2372-73. And to prepare for this case, he looked at the latest science regarding the biomechanics of childbirth. *Id.* at 2372-78; VRP (Oct. 12, 2015) at 31-32. As the ACOG Report notes, "biomechanics is a means through which the causes of [BPIs] have been and continue to be investigated and understood." CP at 2424. Dr. Tencer, a biomechanical engineer, is able to read the latest science, learn the forces at play, and apply that new knowledge to what he already knows about the spine.

This is a close call. But "'[i]f the basis for admission of the evidence is fairly debatable,'" a court "'will not disturb the trial court's ruling.'" *Gilmore*, 190 Wn.2d at 494 (internal quotation marks omitted) (quoting *Grp. Health Coop.*, 106 Wn.2d at 398). The trial court did not abuse its discretion in ruling that Dr. Tencer was qualified to provide biomechanical testimony.

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B. The trial court did not abuse its discretion in finding that Dr. Tencer's testimony was helpful to a jury

Courts find an expert's testimony to be helpful if it helps "the jury's understanding of a matter outside the competence of an ordinary layperson." *Reese v. Stroh*, 128 Wn.2d 300, 308, 907 P.2d 282 (1995) (citing *State v. Ciskie*, 110 Wn.2d 263, 279, 751 P.2d 1165 (1988); *Riggins v. Bechtel Power Corp.*, 44 Wn. App 244, 254, 722 P.2d 819 (1986)). "Unreliable testimony does not assist the trier of fact." *Lakey*, 176 Wn.2d at 918 (citing *Anderson*, 172 Wn.2d at 600). Neither does testimony lacking an adequate foundation. *Johnston-Forbes*, 181 Wn.2d at 357; *Walker v. State*, 121 Wn.2d 214, 218, 848 P.2d 721 (1993). "It is the proper function of the trial court to scrutinize the expert's underlying information and determine whether it is sufficient to form an opinion on the relevant issue." *Johnston-Forbes*, 181 Wn.2d at 357.

Quantifying the forces of labor is obviously outside the competence of an ordinary layperson. Instead, L.M. argues that Dr. Tencer used data inappropriately to reach a preordained conclusion. Pet. for Review at 17. L.M. takes issue with Dr. Tencer's testimony regarding the force necessary to injure the brachial plexus because "virtually all the medical literature states that this force is not known and cannot be known," *Id.* at 2; *see also id.* at 18. But that force is difficult or even impossible to know in large part because of ethical considerations, and the trial court was aware of this. VRP (Oct. 12, 2015) at 28-29. Although the ethical considerations leave an analytical gap in the science, the trial court found the analytical gap satisfactorily "bridge[d]" by the current literature showing that NFOL can cause *permanent* BPIs. *Id.* at 29. The trial court ruled that any concerns

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over Dr. Tencer's use of the data and any other concerns over the literature would make "excellent arguments for cross-examination." *Id.* at 37.

The trial court's thoughtful review of the helpfulness prong was not manifestly unreasonable and thus was not an abuse of discretion.

CONCLUSION

We affirm the trial court and hold that (1) it correctly admitted NFOL evidence under *Frye* and (2) it did not abuse its discretion by allowing Dr. Tencer to testify.

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Gordon McCloud, J.

WE CONCUR:

Fairhurst, C.J.

Wiggins, J.

Madsen, J.

Owens, J.

Hunt, J.P.T.

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GONZÁLEZ, J. (concurring in result only)—Allan Tencer, PhD, should not have testified in this case. The trial court committed error in allowing him to testify. I respectfully disagree with the majority's assertion that this is a close call. However, because I believe that the error was ultimately harmless, I concur.

Tencer is not qualified to testify about the forces involved in childbirth. *See In re Marriage of Katare*, 175 Wn.2d 23, 38, 283 P.3d 546 (2012) ("An expert may not testify about information outside his area of expertise." (citing *Queen City Farms, Inc. v. Cent. Nat'l Ins. Co. of Omaha*, 126 Wn.2d 50, 104, 882 P.2d 703, 891 P.2d 718 (1994) (plurality opinion))). Tencer is a biomechanical engineer with a background in the forces involved in automobile accidents and the effect such forces may have on the human body. While it may not be error to admit his expert testimony in automobile accident cases, it is error under these facts. *Compare Johnston-Forbes v. Matsunaga*, 181 Wn.2d 346, 355, 333 P.3d 388 (2014) (affirming the limited admission of Tencer's testimony in an automobile accident case), *with Gilmore v. Jefferson County Pub. Trans. Benefit Area*, 190 Wn.2d 483, 498, 415 P.3d 212 (2018) (affirming the exclusion of Tencer's

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testimony in an automobile accident case because "it would create unreasonable inferences, and confuse and mislead the jury").

The majority appears to accept that being a biomechanical engineer qualifies Tencer to abstractly discuss the forces involved in childbirth. But finding that an expert is qualified requires more than a highly educated person's cursory review of relevant data; "'[t]he scope of the expert's knowledge'" governs. *Frausto v. Yakima HMA, LLC*, 188 Wn.2d 227, 234, 393 P.3d 776 (2017) (alteration in original) (quoting *Hill v. Sacred Heart Med. Ctr.*, 143 Wn. App. 438, 447, 177 P.3d 1152 (2008)). In *Frausto*, we explained that whether a nurse "has the requisite specialized knowledge to qualify as an expert on causation" depends on the nurse's "particular scope of practice and expertise." *Id.* at 243. Tencer admits to having no scope of practice and expertise regarding the forces involved in childbirth. He admitted this on direct examination:

> Q: Have you ever done a labor and delivery case before this one?
> A: No, I have not.

Verbatim Report of Proceedings (VRP) (Oct. 27, 2015) at 9. And again on cross-examination. *Id.* at 26 ("I've never been involved in labor and delivery."). Further, there is no indication that Tencer's general work regarding the human spine directly translates to the specific circumstances involved in neonatal brachial plexus injuries.

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The majority's reasoning that Tencer, as "a biomechanical engineer, is able to read the latest science, learn the forces at play, and apply that new knowledge to what he already knows about the spine" is erroneous, dangerous, and presumptuous. Majority at 27. Tencer's review of a single report discussing the forces involved in childbirth does not qualify him to testify. Allowing him to testify runs contrary to our focus on the expert's relevant experience. *See, e.g.*, *Katare*, 175 Wn.2d at 38-39 (holding an attorney with "17 years of experience in the field of child abduction" cases was qualified to testify about risk factors for child abductions). In other words, under the majority's reasoning, any attorney who reads a paper on child abductions in preparation for trial would be qualified to testify as a child abduction expert.

Further, Tencer puts forward an improperly speculative opinion based on insufficient underlying data that "he looked at." *See* majority at 26 ("And to prepare for this case, he looked at the latest science regarding the biomechanics of childbirth."). This is simply not enough. "[C]ourts must scrutinize the expert's underlying information . . . to ensure that the opinion is *not mere speculation, conjecture, or misleading*." *Johnston-Forbes*, 181 Wn.2d at 358 (emphasis added) (citing *Stedman v. Cooper*, 172 Wn. App. 9, 18, 292 P.3d 764 (2012)). The report Tencer relies on expressly concludes that "there are no data to quantify the

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threshold pressures needed to induce traction versus compression related nerve injury." Clerk's Papers at 3204. That report warns that

> the assumptions in this study used to calculate the maternal expulsive efforts were actually generated under normal conditions rather than during an obstructive process . . . . [which] suggests that these data may have underestimated those maternally derived forces and that during a shoulder dystocia event there may be an even greater divergence of attributable forces between endogenous and exogenous sources.

Id. Thus, Tencer's opinions regarding the comparative forces involved in childbirth, as they relate to the primary contested issue in this case—causation—cannot be supported by the very information on which his opinion is purportedly based.[1]

The trial court barred Tencer from opining directly on the issue of causation but ruled that he could testify generally to help the jury understand the forces at play. But general "[s]cientific evidence that does not help the trier of fact resolve any issue of fact . . . does not meet the requirements of

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[1] The majority acknowledges this "analytical gap" in the underlying data but appears to confuse the trial court's *Frye* determination about the general acceptance of the science undergirding the natural forces of labor theory with the determination of whether Tencer's specific testimony was based on sufficient underlying data. *See* majority at 28; *Frye v. United States*, 54 App. D.C. 46, 293 F. 1013 (1923). Even if the science generally allows for a medical causation opinion, it does not support the conclusion that Tencer could adequately testify, particularly when his nonmedical expert opinion was offered to induce an inference about medical causation. *See Stedman*, 172 Wn. App. at 20 (trial court excluding Tencer's testimony in automobile accident—and upheld on appeal—because his "clear message" was causation).

It should also be noted that the majority's affirmation of the trial court's *Frye* determination in this case—finding that the natural forces of labor theory is currently generally accepted in the scientific community—does not foreclose the possibility of a successful challenge to the theory at a future *Frye* hearing, as the underlying science continues to develop.

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ER 702." *State v. Greene*, 139 Wn.2d 64, 73, 984 P.2d 1024 (1999) (citing *Reese v. Stroh*, 128 Wn.2d 300, 311, 907 P.2d 282 (1995) (Johnson, J., concurring)). Here, the primary issue in dispute at trial was causation, which Tencer was specifically prohibited from testifying about. The specific "forces at play" in this case were not known, and Tencer never considered those specific forces in forming his opinion testimony.[2]

Additionally, despite being expressly prohibited from testifying about medical causation, it appears Tencer's testimony informed a medical causation inference. *See Stedman*, 172 Wn. App. at 20. Nonetheless, whatever effect Tencer's improper testimony may have had on the jury's medical causation determination, it was likely insignificant when compared to the medical causation evidence admitted through otherwise qualified medical experts. *See Brown v. Spokane County Fire Prot. Dist. No. 1*, 100 Wn.2d 188, 196, 668 P.2d 571 (1983) ("We find that the evidence, being merely cumulative in nature, was harmless error."). Therefore, Tencer's testimony was ultimately harmless and I concur in result.

[2] At trial, Tencer confirmed that "nobody measured the force in Ms. Hamilton's hands if she used any in facilitating [L.M.]'s birth." VRP (Oct. 27, 2015) at 16. Additionally, in his discussion of the average endogenous forces involved in labor, Tencer emphasized "that these numbers don't apply specifically to this case." *Id.* at 15.

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