

In the United States Court of Federal Claims

OFFICE OF SPECIAL MASTERS

EMILY TARSELL, as the Executrix *
of the Estate of CHRISTINA *
TARSELL, *
Petitioner, *

No. 10-251V
Special Master Christian J. Moran

Filed: September 25, 2017

v. *

SECRETARY OF HEALTH *
AND HUMAN SERVICES, *
Respondent. *

Entitlement; human papillomavirus
("HPV") vaccine; sudden
death; plausible medical theory;
onset of arrhythmia; challenge-
rechallenge

Mark T. Sadaka, Mark T. Sadaka, LLC, Englewood, NJ, for petitioner;
Ann D. Martin, United States Dep't of Justice, Washington, D.C., for respondent.

PUBLISHED RULING ON REMAND FINDING ENTITLEMENT¹

Emily Tarsell alleges that the human papillomavirus ("HPV") vaccine caused her daughter, Christina, to die unexpectedly. Ms. Tarsell, acting as the executrix of Christina's estate, is seeking compensation pursuant to the National Childhood Vaccine Injury Compensation Program, codified at 42 U.S.C. § 300aa-10 through 34 (2012).

The undersigned previously found that Ms. Tarsell had not met her burden of proof. Decision, 2016 WL 880223 (Fed. Cl. Spec. Mstr. Feb. 16, 2016). However, the Court of Federal Claims vacated the decision and remanded for additional consideration under different legal standards. Opinion and Order, 2017

¹ The E-Government, 44 U.S.C. § 3501 note (2012) (Federal Management and Promotion of Electronic Government Services). Pursuant to Vaccine Rule 18(b), the parties have 14 days to file a motion proposing redaction of medical information or other information described in 42 U.S.C. § 300aa-12(d)(4). Any redactions ordered by the special master will appear in the document posted on the website.

WL 3837363 (Fed. Cl. June 30, 2017). Under the Court-directed legal standards, the undersigned finds that Ms. Tarsell is entitled to compensation.

I. Facts²

The previous actions from judicial officers set forth the facts of Christina's medical history in detail. See Opinion and Order, 2017 WL 3837363; Decision, 2016 WL 880223; and Findings of Fact, 2012 WL 1608741 (Fed. Cl. Spec. Mstr. March 30, 2012). Thus, this Ruling recounts only the most important events in Christina's history.

Christina was born in 1986. In 2004, she was seen for weight gain, fatigue, and potential hypothyroidism. Exhibit 1 at 9-13. In February 2005, tests of Christina's thyroid were normal. Id. at 53. She played sports and, according to the testimony of her mother, she had physical exams to participate in athletics. Tr. 21-22. During her periodic visits with a doctor, her pulse was recorded. For a list of 30 visits in which her pulse was recorded, see Opinion and Order, 2017 WL 38373636, at *17, Appendix A.

On August 22, 2007, Christina saw an internist, Dr. Lafferman. The record from this visit does not record a pulse. However, a review-of-symptoms checkbox for cardiovascular symptoms is marked negative. During this visit, Christina received the first dose of the HPV vaccine. Exhibit 3 at 109-10.

Approximately three weeks later, on September 12, 2007, Christina had a Pre-Participation Physical Evaluation at Bard College, where she was studying. The record indicates that Christina's pulse was 72. The record also includes prompts regarding heart, murmurs, and pulses, which were all marked normal. The record further indicates that Christina reported that her heart does not race or skip beats during exercise. Exhibit 2 at 87-88.

On November 20, 2007, Christina received the second dose of the HPV vaccine in the office of her gynecologist, Julie Jacobsen. Exhibit 3 at 124. On

² After the Court's remand, the undersigned has reviewed Christina's medical records, the reports from Dr. Shoenfeld, Dr. Eldar, Dr. Yeager, and Dr. Phillips, the transcript ("Tr.") of the hearing from November 13-14, 2014, the parties' briefs (before hearing, after hearing, in conjunction with the motion for review, and on remand), and the transcript of the August 18, 2016 oral argument ("Oral Arg. Tr."). The undersigned has also reviewed the literature that the parties cited. Although the undersigned has considered all this evidence and all the arguments, the undersigned does not necessarily cite all the evidence and all the arguments.

November 20, 2007, Christina also returned to Dr. Lafferman. Dr. Lafferman detected an irregular pulse. Exhibit 4 at 136. This discovery occurred approximately three months after Christina received the first dose of the HPV vaccine. Exhibit 3 at 109-10. Christina underwent an electrocardiogram (“EKG”) that showed her heart beat was not normal -- she was having a premature second beat. *Id.* at 142; see also Tr. 62-68, 501-02.

In the following month, Christina again returned to see Dr. Lafferman. The record indicates that once more Christina’s pulse was irregular. Exhibit 4 at 135. Dr. Lafferman sent Christina for another EKG and this second EKG showed the same pattern as the first EKG. Exhibit 4 at 141; Tr. 83 (Dr. Eldar), 504 (Dr. Yeager).³ Dr. Lafferman recommended an echocardiogram.

On the same day as the appointment with Dr. Lafferman, Christina saw Karl Diehn, a specialist in ears, nose and throat. Christina was complaining about chronic nasal congestion and the doctor recommended trying nasal steroids and possibly seeing an allergist. As part of the examination, Dr. Diehn recorded that “The carotid pulses are intact.” Exhibit 5 at 144.

Christina was diagnosed with an episode of gastritis on February 6, 2008. Exhibit 2 at 74.

On February 12, 2008, Christina underwent a transthoracic echocardiogram. The heart structure was found to be normal. Exhibit 4 at 139; see also Tr. 146 (Dr. Eldar), 510-11 (Dr. Yeager). In Dr. Yeager’s opinion, Christina did not have an irregular heart rhythm when the echocardiogram was performed. Tr. 511-12. Christina’s doctors did not recommend a Holter monitor or periodic follow-up.

Christina’s next medical appointment was on June 3, 2008, when she received the third dose of the HPV vaccine. Exhibit 3 at 99.

On June 5, 2008, Christina developed 2-12 dots on the right side of her neck under her ear. Findings of Fact, 2012 WL 1608741, at *4, citing exhibit 15 (affidavit of Tommie Tarsell) ¶ 4. These dots persisted until June 19, 2008. *Id.*,

³ The report from the December 27, 2007 EKG stated Christina had “atrial fibrillation.” The finding that Christina’s premature contractions came from her atria was mistaken. The testifying cardiologists agreed that the contractions actually originated from Christina’s ventricles. Tr. 67-68 (Dr. Eldar), 502 (Dr. Yeager).

citing exhibit 16 (emails between Christina and her father). These dots were not noted in Christina's autopsy. See exhibit 8.

Christina was feeling both dizzy and faint from June 7, 2008 to June 12, 2008. Findings of Fact, 2012 WL 1608741, at *4. While she may have been "tired," no evidence indicates that any fatigue interfered with her activities. Id. at 5.

After returning to her apartment in New York City on June 12, 2008, Christina pursued her routine activities such as working. She died on June 21, 2008, at approximately noon. Findings of Fact, 2012 WL 1608741, at *6.

A medical examiner, Kari Reiber, performed an autopsy. She determined that both the cause of Christina's death and the manner of her death were "undetermined." Exhibit 8 at 158.

Dr. Reiber transmitted tissue samples to the Centers for Disease Control and Prevention (the "CDC"). The CDC's Infectious Disease Pathology Branch performed a microscopic examination of Christina's heart tissue. The results showed that the heart tissue exhibited no "conspicuous inflammatory cell infiltrates." Exhibit 10 at 170.

Dr. Reiber submitted a vaccine adverse event report to the Vaccine Adverse Event Report Service (VAERS). See exhibit 8 at 158. Other people and the manufacturer of the HPV vaccine (Merck & Co.) submitted additional information to VAERS. See, e.g., exhibit 20; exhibit 3 at 104, 105, 107, 108, and 113; exhibit 11; exhibit 21. Although the undersigned has considered this material, a belabored discussion of this correspondence is not needed as the Court did not specifically direct an analysis of this correspondence.

II. Procedural History

Ms. Tarsell initiated this action by filing a petition on April 19, 2010. She periodically filed medical records and affidavits from Christina's family and friends. Due to some uncertainties in this evidence, the undersigned found various facts about Christina's life and death. Findings of Fact, 2012 WL 1608741, at *3-6.

The Findings of Fact served as a predicate for the parties to retain expert witnesses. Ms. Tarsell currently relies upon opinions of Yehuda Shoenfeld, an immunologist, and Michael Eldar, a cardiologist. Dr. Shoenfeld's reports are exhibits 36, 94, 101, 108, 138. The reports from Dr. Eldar are exhibits 100, 107, 140. The Secretary has countered those opinions by retaining Stanley M. Phillips,

an immunologist with training in epidemiology, and Scott Yeager, a cardiologist. Dr. Phillips's reports are exhibits A, UU, and XX. The reports from Dr. Yeager are exhibits FF, VV, ZZ, and OOO.

These four experts as well as Ms. Tarsell testified during a hearing on November 13-14, 2014. The undersigned presided at the hearing and had an opportunity to assess the witnesses during their testimony. These observations contributed to the undersigned's assessment of the relative value of particular points of testimony. See Moberly v. Sec'y of Health & Human Servs., 592 F.3d 1315, 1325 (Fed. Cir. 2010) ("Weighing the persuasiveness of particular evidence often requires a finder of fact to assess the reliability of testimony, including expert testimony, and we have made clear that the special masters have that responsibility in Vaccine Act cases").

The parties filed briefs after the hearing. With respect to the discovery of an arrhythmia in Christina, Ms. Tarsell asserted that Dr. Lafferman's detection of an irregular heartbeat on November 20, 2007, was the first time an irregular heartbeat was found. Pet'r's Posthear'g Br., filed Feb. 17, 2015, at 3, 16-17. Ms. Tarsell also cited to corroborating testimony from Dr. Eldar, who discussed six instances between 2001 and 2006 in which Christina's pulse was measured. Id. at 17, citing Tr. 87 and 165-70. Ms. Tarsell argued that the initial detection of the irregular heartbeat on November 20, 2007, meant that the arrhythmia must have started relatively recently, after the first dose of the HPV vaccine. See id. at 15 ("Christina was a healthy young woman prior to her first Gardasil vaccine. She developed new-onset arrhythmia which did not resolve").

In his brief, the Secretary did not contest the assertion that Dr. Lafferman's November 20, 2007 detection was the first time a doctor detected an irregular heartbeat. However, the Secretary disagreed with the petitioner's reasoning that emphasized the significance of this discovery. Citing testimony from both Dr. Yeager and Dr. Eldar, the Secretary commented that asymptomatic ventricular premature contractions would involve periods of time throughout the day when the patient is in abnormal rhythm and periods when the patient is in normal rhythm. Resp't's Posthear'g Br., filed April 17, 2015, at 19-20. Therefore, this condition could well have predated its discovery.

The undersigned issued a decision on February 16, 2016, finding that Ms. Tarsell had failed to meet her burden of proof for all three prongs set forth in Althen v. Sec'y of Health & Human Servs., 418 F.3d 1274, 1278 (Fed. Cir. 2005). The lynchpin of the analysis was that Ms. Tarsell had failed to establish, on a more

likely than not basis, that Christina's arrhythmia started after the first dose of the HPV vaccine. 2016 WL 880223, at *7-8.

Ms. Tarsell filed a motion for review. The judge to whom the case was assigned heard oral argument on August 18, 2016. Later, the case was transferred to a different judge. The judge issued an Opinion and Order on June 30, 2017, granting the motion for review. 2017 WL 3837363. In short, the judge required a reanalysis of all three Althen prongs, setting forth additional legal principles to be considered under Althen prongs 1 and 3.

After remand, the parties were given an opportunity to file briefs that were restricted to prong 3. The Secretary filed his remand brief on August 11, 2017, and Ms. Tarsell responded on August 18, 2017. The filing of those submissions makes the case ready for adjudication again.

III. Analysis

The Court's Opinion and Order requires a re-examination of the evidence for each of the Althen prongs. For each prong, the pertinent portion of the February 16, 2016 Decision is briefly summarized for context. Then, the Court's correction and instructions are noted. Finally, the parties' evidence along with their arguments is evaluated.

A. Prong 1: Medical Theory

Citing Moberly, 592 F.3d at 1322; M.S.B. by Bast v. Sec'y of Health & Human Servs., 117 Fed. Cl. 104, 123 (2014), appeal dismissed, 579 F. App'x 1001 (Fed. Cir. 2014); and Taylor v. Sec'y of Health & Human Servs., 108 Fed. Cl. 807, 819 (2013), the undersigned stated that Ms. Tarsell's burden with respect to the first prong of Althen is to present a theory that is "more likely than not." Decision, 2016 WL 880223, at *15. The undersigned noted that Dr. Shoenfeld described his theory as "plausible." Id. at *16, quoting Tr. 268. For this reason and for other reasons set forth in the Decision, the undersigned found that Ms. Tarsell had not satisfied her burden of proof.

The Court disagreed with the Decision's description of the burden of proof. Citing Andreu v. Sec'y of Health & Human Servs., 569 F.3d 1367, 1375 (Fed. Cir. 2009); Doe/11 v. Sec'y of Health & Human Servs., 87 Fed. Cl. 1, 5 (2009), aff'd, 601 F.3d 1349 (Fed. Cir. 2010); and Doe 93 v. Sec'y of Health & Human Servs., 98 Fed. Cl. 553, 566-67 (2011), the Court held that a petitioner satisfies her obligation to present a medical theory by presenting a theory that is "plausible." Opinion and Order, 2017 WL 3837363, at *10. This interpretation of the law is

binding in this case. Hanlon v. Sec'y of Health & Human Servs., 40 Fed. Cl. 625, 630 (1998), aff'd in non-relevant part, 191 F.3d 1344 (Fed. Cir. 1999).

The ensuing question is: what does “plausible” mean? Because the Court held that obligating the petitioner to establish a theory that is more likely than not imposed too high a burden, “plausible” must mean something less than more likely than not. Some guidance can be found in the Supreme Court’s interpretation of Federal Rule of Civil Procedure 8(a)(2). In determining that a well-pleaded complaint must “state a claim to relief that is plausible on its face,” the Supreme Court stated that “[t]he plausibility standard is not akin to a ‘probability requirement,’ but it asks for more than a sheer possibility that a defendant has acted unlawfully.” Ashcroft v. Iqbal, 556 U.S. 662, 678 (2009). The Federal Circuit, in turn, has cited the plausibility standard in evaluating complaints alleging patent infringement. See McZeal v. Sprint Nextel Corp., 501 F.3d 1354, 1357 (Fed. Cir. 2007); see also Hibbard v. Sec’y of Health & Human Servs., 698 F.3d 1355, 1366 (Fed. Cir. 2012) (noting that “[i]n the recent en banc decision in Cloer v. Secretary of Health & Human Services [654 F.3d 1320, 1333 n.4 (Fed. Cir. 2010) (en banc)] the court once again made clear that Althen does not lessen the ultimate burden of proof on a petitioner to show actual causation by a preponderance of the evidence. In Cloer, the court characterized Althen as setting forth ‘three pleading requirements for a non-Table injury petition’”).

Additional guidance about the meaning of the term “plausible” might be found by consulting dictionaries. See Hervey v. Sec’y of Health & Human Servs., 88 F.3d 1001, 1002 (Fed. Cir. 1996) (using a dictionary to define a term in the Vaccine Act). Unfortunately, dictionary entries for “plausible” include definitions offering both positive and negative connotations, suggesting that a plausible proposition may reasonably be met with either credulity or incredulity. For example, The American Heritage Dictionary defines plausible both as “seemingly or apparently valid, likely or acceptable,” and as “given a deceptive impression of truth, acceptability, or reliability.” The American Heritage Dictionary 950 (2nd Coll. Ed.).

In one prior Vaccine Act case, a special master faced precisely this difficulty. See Hargrove v. Sec’y Health & Human Servs., No. 05-0694V, 2009 WL 1220986, at *28 (Fed. Cl. Spec. Mstr. April 14, 2009) (noting that in both its positive and negative connotations, plausible “does not mean anything close to certain; it does not even mean probable”). In that case, the special master rejected as disingenuous one expert’s statement that “anything is plausible.” Id. at *28. Instead, the special master concluded that “plausibility’s import is carried in the ‘could’ proposition.” Id. This is consistent with the presiding Judge’s instruction

in this case that the undersigned “assess whether Petitioner provided a biologically plausible theory without requiring Petitioner to demonstrate that particularized manifestations of this theory actually occurred.” Opinion and Order, 2017 WL 3837363, at *12.

Under a legal standard in which a petitioner must present a “plausible” theory, Ms. Tarsell has met her burden of proof. Her theory, jointly presented by Dr. Shoenfeld and Dr. Eldar, is conceivably true. Indeed, as previously noted, respondent’s experts conceded a number of significant points, including *inter alia*, that molecular mimicry is itself plausible (Tr. 421 (Dr. Phillips)), that the HPV vaccine contains the same LQAGL pentamer as located in the L-type calcium channel (Tr. 389-90, 394-97 (Dr. Phillips)), that increased amounts of intracellular calcium can lead to arrhythmia (Tr. 556 (Dr. Yeager)), and that arrhythmia can be caused by autoantibodies (Tr. 556 (Dr. Yeager)). Opinion and Order, 2017 WL 3837363, at *11; Decision, 2016 WL 880223, at *10-16. While the Secretary’s experts, Dr. Phillips and Dr. Yeager, presented several reasons why the theory was unlikely to be probable,⁴ the Secretary does not argue that the theory is impossible. See Oral Arg. Tr. 103.

B. Prong 3: Timing

1. Preliminary Comments

Citing Bazan v. Sec’y of Health & Human Servs., 539 F.3d 1347, 1353-54 (Fed. Cir. 2008), and Hopkins v. Sec’y of Health & Human Servs., 84 Fed. Cl. 517, 524-27 (2008), the undersigned stated that Ms. Tarsell “bears the burden of establishing when Christina’s disease began.” Decision, 2016 WL 880223, at *8. To elaborate, in Bazan, “the proximate temporal relationship prong requires preponderant proof that the onset of symptoms occurred within a timeframe for which, given the medical understanding of the disorder’s etiology, it is medically acceptable to infer causation-in-fact.” 539 F.3d at 1352. Citing the testimony of both Dr. Eldar and Dr. Yeager, the undersigned found that the onset of Christina’s arrhythmia was unknown. Decision, 2016 WL 880223, at *7-8. Dr. Eldar stated:

⁴ The February 16, 2016 Decision set forth those reasons. However, the Court indicated that these reasons “do not go to the biological plausibility of Petitioner’s theory.” Opinion and Order, 2017 WL 3837363, at *12. Thus, a recitation of the previously rejected reasons in a decision on remand would be inappropriate. See Contreras v. Sec’y of Health & Human Servs., 844 F.3d 1363, 1369 (Fed. Cir. 2017) (noting that the undersigned “maintained an erroneous viewpoint throughout this case, despite instructions to the contrary”).

“I cannot say exactly when [Christina’s arrhythmia] started.” Tr. 120. Similarly, Dr. Yeager testified “I don’t think I can date when she began having cardiac arrhythmia.” Tr. 493.

The Court also disagreed with this interpretation. Relying primarily upon W.C. v. Sec’y of Health & Human Servs., 704 F.3d 1352, 1359 (Fed. Cir. 2013), the Court determined that the undersigned should have first determined whether it was “more likely than not” that “Christina’s cardiac arrhythmia” “predated her first Gardasil vaccine.” Opinion and Order, 2017 WL 3837363, at *8-9.

The undersigned respectfully submits that the Court’s formulation of prong 3 may alter the burden of proof. Cf. Resp’t’s Post-Remand Br., filed Aug. 11, 2017, at 3 (advising “not to alleviate petitioner of her burden under prong three, as that would be contrary to law”). Respondent persuasively cautions against giving “undue weight to the absence of evidence and improperly reliev[ing] petitioner of proving her case by a preponderance of the evidence.” Id.; see also Doyle v. Sec’y of Health & Human Servs., 92 Fed. Cl. 1, 4 (2010) (denying a motion for review where a special master found that petitioner had not satisfied Althen prong 3 because petitioner’s expert admitted that onset of petitioner’s condition was insidious and he could not determine whether onset was prior to vaccination). Regardless, the undersigned is obligated to implement the Court’s instruction. Hanlon, 40 Fed. Cl. at 630; see also Strickland v. United States, 423 F.3d 1335, 1338 & n. 3 (Fed. Cir. 2005) (noting that when the Court of Federal Claims believes a Federal Circuit case is inconsistent with an intervening Supreme Court case, the Court of Federal Claims is obligated to note the conflict but follow the Federal Circuit case).

2. Etiology of Arrhythmia

The Court directed the undersigned to consider the “etiology” of arrhythmia. Etiology means the science of studying the cause of a disease. The parties provided no commentary on this aspect of the Court’s order in their post-remand briefs.

The undersigned’s review of the testimony has identified relatively little testimony from the experts about the cause of arrhythmia. Some arrhythmias are associated with structural defects of the heart, such as a heart after a myocardial infarction or a diseased myocardium. Tr. 159-60 (Dr. Eldar). However, Christina’s heart did not have any obvious structural defects. See exhibit 4 at 139 (echocardiogram), exhibit 8 at 158 (autopsy) and exhibit 10 at 170 (CDC testing). Thus, these structural causes to arrhythmias are not relevant.

Non-structural causes for arrhythmias include antibodies attacking the channel of the heart. Tr. 91-94 (Dr. Eldar). These antibodies typically arise in the context of autoimmune disease, such as lupus, type 1 diabetes, and Chagas' disease. Exhibit ZZ (Dr. Yeager's report) at 1. Dr. Eldar and his team discovered another type of arrhythmia that is not caused by a channelopathy. Tr. 31-32, 160. Two other diseases, Brugada syndrome and Timothy syndrome, also cause disturbed rhythms and the origins of Brugada syndrome and Timothy syndrome are genetic.⁵ Due to the need to glean information about the causes of arrhythmia from testimony on other topics, the foregoing list of known causes to arrhythmia is probably incomplete. Cf. Tr. 115 (Dr. Eldar's testimony that research is likely to discover more genetic causes for arrhythmia in the future), 514 (Dr. Yeager also indicating that channelopathies are "yet to be discovered").

Although the "etiology" of a disease is distinct from the disease's presentation, the Court also directed the undersigned to consider how arrhythmias present. The incidence of arrhythmias increases as the person ages as part of the aging process. Tr. 500-01 (Dr. Yeager). Newborns are very unlikely to have any arrhythmias. Tr. 500 (Dr. Yeager); see also exhibit 36 (Dr. Shoenfeld's report) at 5. Nearly all octogenarians have arrhythmias. Tr. 500. Between these groups and most similar to Christina are teen-agers. Approximately one-third or more of teen-agers "have some ventricular ectopy, some fairly impressive ventricular ectopy, even though they are perfectly healthy." Tr. 500; accord exhibit OO (M.E. Alexander and C.I. Berul, "Ventricular Arrhythmias: When to Worry," 21 *Pediatr. Cardiol.* 532 (2000)) at 532 ("Without apparent heart disease, isolated premature ventricular contractions (PVCs) are seen in . . . 20% to 35% of adolescents").⁶

⁵ Both Dr. Eldar and Dr. Yeager recommended testing Christina's surviving relatives for potential genetic causes to her arrhythmia. Tr. 159, 506-07, 517. However, this genetic testing was not done.

⁶ Dr. Yeager disclosed his opinion that adolescents frequently experience arrhythmias in his first report, filed May 2, 2014. Exhibit FF at 5-6. Dr. Eldar, in his response to Dr. Yeager, concurred with a caveat. Quoting Dr. Yeager's assertion that patients with ventricular premature complexes are "usually felt to be at quite low risk, and may even be cleared for competitive athletics," Dr. Eldar stated that the claim that Christina's type of arrhythmia (a ventricular premature complex originating from the right ventricular outflow tract) is common in adolescents "is true for many cases of RVOT VPCs [but] definitely not true for all of them." Exhibit 100 at 6 (quoting exhibit FF at 6); accord Tr. 74.

Dr. Yeager aptly summarized the challenge in determining when arrhythmia starts. He stated:

So, sometime between infancy and adulthood and as you get older, there tends to be more and more ventricular ectopy discovered. Obviously, in everybody, it starts sometime. They're not aware . . . and we're [doctors are] not aware of it, generally it doesn't even get documented in their medical records. . . . So, there's a lot of ventricular ectopy in the background of healthy, normal people, and in general it's impossible for us to say exactly when it starts.

Tr. 500.

On cross-examination, Dr. Yeager emphasized that arrhythmia is not an “all or nothing” condition. Tr. 538. A person can have 20 minutes of bigeminy and then a few hours of normal rhythm. Tr. 540. In one study, patients with severe symptomatic arrhythmia wore Holter monitors and, in these patients, abnormal beats were found approximately 17 percent of the time. Tr. 496-97 (Dr. Yeager) (interpreting exhibit 106 (Takashi Noda et al., Malignant Entity of Idiopathic Ventricular Fibrillation and Polymorphic Ventricular Tachycardia Initiated by Premature Extrasystoles Originating from the Right Ventricular Outflow Tract, 46(7) J. Amer. Coll. Cardiology 1288 (2005)). When the Noda article was brought to Dr. Eldar's attention, he did not dispute Dr. Yeager's opinion. See Tr. 564-65.

The variation in heart rhythm among people who are known to have arrhythmia is demonstrated in Christina's case. On December 27, 2010, which was the day Dr. Lafferman detected a second irregular heart beat (exhibit 4 at 135) and Christina's second EKG was abnormal (exhibit 4 at 141), Christina also saw Dr. Diehn. As part of his physical examination, Dr. Diehn noted that her “carotid pulses are intact.” Exhibit 5 at 144. Dr. Shoefeld and Dr. Eldar were adamant that anyone with medical training should be able to detect Christina's type of arrhythmia when taking a pulse. Tr. 89, 165, 169. Dr. Yeager concurred. Tr. 541. Thus, a reasonable inference from the lack of notation from Dr. Diehn is that Christina was not having an irregular pulse when he tested her.

A second example from Christina's life is her echocardiogram. Dr. Yeager presented persuasive testimony, which Dr. Eldar did not challenge, that instances of irregular rhythm would normally be noted during an echocardiogram. Tr. 511,

552-53. Again, the lack of a notation on the report of the echocardiogram tends to show that Christina was not experiencing arrhythmia during the echocardiogram.

The variation in heart rates is an important factor in trying to determine when Christina's arrhythmia began. A notation that a person had a normal pulse simply shows that "the patient probably was not having a significant arrhythmia during those few seconds of auscultation." Exhibit OOO (Dr. Yeager) at 3 (emphasis added); accord Tr. 496 (Dr. Yeager). As Dr. Shoenfeld stated, albeit in a different context, one should not start with the "absence of evidence" and conclude that there is "evidence of absence." Exhibit 36 at 4.

Without citing any evidence, Ms. Tarsell argues what the standard of care dictates for Christina's treating doctors. Pet'r's Br. on Remand, filed Aug. 18, 2017, at 2. The gist of the argument seems to be that because Christina's pulse was recorded as normal, her heart rate was always normal. Otherwise, the doctors would have acted differently. The undersigned accepts the proposition that when doctors detect an abnormal pulse, the doctors are likely to refer the patient for additional testing. After all, Dr. Lafferman followed this practice when she detected an abnormal pulse in Christina.

However, a doctor's ability to respond to an abnormal pulse depends upon the doctor's ability to detect an abnormal pulse. Here, the persuasive evidence indicates that doctors have a relatively small opportunity to catch abnormal pulses.⁷ Dr. Eldar or Dr. Yeager could have explained why people in doctor's offices record pulses when the recording provides information about the patient's heart rate for a short amount of time, probably one minute or less. In the undersigned's view, Ms. Tarsell overstates the weight that should be given to the series of normal pulse readings.

3. The Court's First Question: Is It Likely That Christina's Arrhythmia Began before the First HPV Vaccination?

The undersigned's February 2, 2016 decision found that it was not possible to determine when Christina's arrhythmia started because the testifying cardiologists could not say when it started. Decision, 2016 WL 880223, at *7-8. Upon further review, the evidence about the relative commonness of arrhythmia

⁷ Conceivably, if a patient reported feeling a racing heart, a doctor might investigate this symptom through methods longer than taking a pulse. However, there is no record of Christina complaining about her heart even after Dr. Lafferman detected her abnormal pulse.

among adolescents has some value in suggesting that Christina's arrhythmia actually started years before the vaccination. The undersigned realizes that Christina generally did not complain about symptoms associated with arrhythmia, such as dizziness or fatigue. But, many people with arrhythmia do not report any problems. Tr. 329 (Dr. Shoenfeld: "you can have arrhythmia and be asymptomatic"). Christina was one of those people because even after she was detected to have an irregular heartbeat, she did not report problems to medical personnel. Tr. 120 (Dr. Eldar), 496 (Dr. Yeager).

Despite the potential value of the evidence that adolescents often experience arrhythmia, the undersigned feels constrained by the initial finding. Having found that the onset of Christina's arrhythmia could not be determined on a more-likely-than-not basis, the undersigned believes that finding (a) the onset is ascertainable, and (b) the onset occurred before vaccination would be fundamentally unfair to Ms. Tarsell. Such a switch in position might suggest a bias against Ms. Tarsell.

The undersigned has considered the list of medical appointments during which Christina's pulse was recorded. As previously noted, Dr. Shoenfeld and Dr. Eldar repeatedly stated that when a doctor or nurse takes a pulse, he or she would be able to detect the irregular heart beat if Christina were experiencing arrhythmia. The assertion is accepted. But, Ms. Tarsell and her experts appear to overlook the condition: "if Christina were experiencing arrhythmia" when her pulse was being checked. Because the evidence persuasively shows that people with arrhythmia experience the irregular heart beat for only a small percent of the time, the likelihood of detecting an irregular heartbeat that is not associated with any symptoms is small.⁸

Dr. Yeager added an additional complication in trying to draw an inference from a doctor's or nurse's notation of a normal pulse. While a doctor or a nurse could feel an irregular pulse when the doctor or nurse touched the patient or listened to the patient's heart, Dr. Yeager explained that many doctor's offices obtain blood pressure and pulse by using a machine called Dynamaps. Tr. 494-95. According to Dr. Yeager, the machine can present the information about the pulse

⁸ Petitioner argues that "[a]s the number of tests increase the chance of finding Christina's arrhythmia, if it existed at all, goes up" and that "as the number of physical evaluations increase, the risk of non-detection of an arrhythmia falls markedly." Pet. Post-Remand Br., filed Aug. 18, 2017, at 2-3. However, petitioner based this argument on the proportion of arrhythmia sufferers that are symptomatic rather than on the proportion of the day that any given arrhythmia sufferer is symptomatic.

“irrespective of heart rhythm.” Tr. 495. Dr. Eldar disagreed, stating that the electronic devices in his hospital will read “error,” when the pulse is irregular. Tr. 566.

Dr. Yeager’s point would be stronger if two questions had been explored. First, how did Christina’s doctors and nurses obtain the information about her pulse? Did they use a stethoscope or touch Christina? Or, did they use an automated machine. Second, if a machine were used, would the machine indicate a person was having an irregular pulse? Although the undersigned has considered the entire record, the most valuable evidence is the testimony from the two cardiologists that the onset of Christina’s arrhythmia is not known. Nonetheless, Christina’s routine medical care consistent with her age and condition failed to detect any evidence of arrhythmia before the vaccination and her arrhythmia was indisputably discovered after vaccination. In this situation, the answer to the Court’s question is: It is not more-likely-than-not that Christina’s arrhythmia started before the vaccination.⁹

4. The Court’s Second Question: Did Christina’s Arrhythmia and Cardiac Arrest Occur within a Medically Appropriate Time after her Vaccines?

Logically, because the undersigned does not find that preponderant evidence supports a finding that Christina’s arrhythmia started before the vaccination, Christina’s arrhythmia must have started after vaccination. This deduction leads to the Court’s second instruction set forth in the heading above. The Court’s direction actually contains two sub-parts: what is a medically appropriate time after vaccination for arrhythmia and/or cardiac arrest to occur, and when did Christina’s arrhythmia and/or cardiac arrest occur? See Shapiro v. Sec’y of Health & Human Servs., 101 Fed. Cl. 532, 542-43 (2011), recons. denied after remand on other grounds, 105 Fed. Cl. 353 (2012), aff’d without op., 503 Fed. App’x 952 (Fed. Cir. 2013).

⁹ The Court’s wording of the question affects the outcome. If the Court had alternatively directed the undersigned to determine the opposite, i.e. “Whether it is more-likely-than-not that Christina’s arrhythmia started after the vaccination,” the undersigned likewise would have been compelled by evidence, taken as a whole, to say “No.”

a) Medically Appropriate Interval

Compared to the question of when Christina's arrhythmia began, the question of the medically appropriate interval received much less attention from the parties and their experts. Because the first reports from Dr. Shoenfeld did not discuss this topic, the undersigned directed Ms. Tarsell to file a supplemental report from him "on the topic of a medically acceptable timeframe between vaccination and the onset of cardiac arrhythmia." Order, issued Jan. 27, 2014.

Dr. Shoenfeld's ensuing report from February 21, 2014 is, therefore, important because he was specifically directed to answer a question that the Court eventually posed in the Opinion and Order. Relying in part upon the Slade article, Dr. Shoenfeld stated that to be proximately related to a vaccination, a death following vaccination should occur within approximately one month. Exhibit 94 at 1-2. A close reading of Dr. Shoenfeld's report indicates that he, intentionally or unintentionally, did not directly answer the question about the medically appropriate interval between vaccination and arrhythmia.

In his testimony on direct examination, Dr. Shoenfeld was also not clear about the medically acceptable interval between vaccination and the onset of arrhythmia. He stated that at least after an initial vaccination, the immune response comes "between two to three weeks." Tr. 211. He stated that "two weeks is too early" for a vaccination to cause arrhythmia. Dr. Shoenfeld also stated that for a booster vaccination that elicits a recall response, the reaction can take place more quickly – "a week or ten days." Tr. 210-11.

Dr. Shoenfeld further stated: "sometimes, after the first vaccine, you don't expect autoimmune disease. It's usually after the second and the third." Tr. 242-43. He continued: "You may get sometimes allergic reaction, and sometimes you can get already the autoimmune disease. . . . So, not necessarily after the first vaccine we should get it. Usually, it will be, I would say, in proximity, which might be between two, three weeks to one month, two months, that we will get the high titers of if [sic] autoantibodies were produced." Tr. 243-44. Later, he added: "the diagram that represents the production of the immunoglobulin is usually three weeks. . . . So, for an immunologist, the three weeks is, I would say, the optimal. I can explain shorter or longer periods by different schedules of immunization, by different ways, but the three weeks is, I believe, optimal." Tr. 249.

On redirect examination, which occurred the following day, Dr. Shoenfeld again testified that his proposed mechanism for inducing arrhythmia "takes at least

three weeks, but you need to mount a high titer.” Tr. 328. He also stated that for a booster dose of the vaccine, the reaction takes place in fewer days. Tr. 329-30.

As part of Dr. Phillips’s testimony, the undersigned asked about the timing for molecular mimicry. Dr. Phillips responded:

You know, honestly, I don't think I can give you an accurate measurement. I think it could be all over the place. I mean, if you induce an experimental autoimmune reaction, say, in an experimental animal using adjuvants and so on, you can have manifestations in as short a period of time as seven to ten days.

If you suggest that the autoimmune manifestations are related to the maximum titer, then there’s been studies in the test tube which will show that you can start making antibodies in as short a period of time as four to five days, but that’s IgG, and then Ig -- or M, and then IgG, within a week to ten days, and that in vivo the antibodies will tend to peak around six weeks to three months after you've been exposed.

Tr. 465.

The undersigned finds Dr. Phillips’s testimony that an autoimmune reaction can take place in as short as seven days persuasive. The undersigned specifically rejects Dr. Shoenfeld’s statement that his proposed mechanism takes at least three weeks.

The undersigned has heard from many immunologists – including Dr. Shoenfeld -- that an appropriate time for an adverse reaction via molecular mimicry is 5-42 days. E.g. Simanski v. Sec’y of Health & Human Servs., No. 03-103V, 2010 WL 2292200, at *17 (Fed. Cl. Spec. Mstr. May 13, 2010)) (Dr. Shoenfeld acknowledging in a case where he raised molecular mimicry that the appropriate interval for Guillain-Barre Syndrome is between 5 and 21 days and opining that a four day onset was “conceivable”), mot. for rev. den’d, 96 Fed. Cl. 588 (2010), vacated and remanded on other grounds, 671 F.3d 1368 (Fed. Cir. 2012). Indeed, Dr. Shoenfeld has previously offered opinions that effectively suggest that timing does not even matter at all. See Johnson v. Sec’y of Health & Human Servs., No. 10-578V, 2016 WL 4917548, at *10 (Fed. Cl. Spec. Mstr. Aug. 18, 2016) (explaining that “[p]etitioner attempts to point to Dr. Shoenfeld’s

argument that the timing does not matter so long as it occurred after the vaccine.”); see also Hennessy v. Sec’y of Health & Human Servs., 91 Fed. Cl. 126, 142 (2010) (observing that Dr. Shoenfeld’s theory would nullify Althen prong 3 by encompassing “nearly any conceivable timing” from immediately after vaccination until years later).

If Dr. Shoenfeld were correct that three weeks is not a medically-appropriate amount of time to form an autoimmune reaction via molecular mimicry, then petitioners whose autoimmune disease became manifest within three weeks of an initial vaccination would not prevail in those other cases. The undersigned’s experience informs the determination that Dr. Shoenfeld is not credible when he limits autoimmune reactions after the first dose of a vaccination to starting after three weeks.

Although the undersigned credits Dr. Phillips testimony that a molecular mimicry reaction may take place after seven days, the outer limit for the medically appropriate interval is less clear. Dr. Shoenfeld seems to say that antibodies might be produced for “two months.” Tr. 244. Dr. Phillips extends the time for antibody production to “six weeks to three months.” Tr. 465. Neither expert explained the basis for their assertion. While Dr. Phillips’s estimate of three months seems long in the undersigned’s experience, the undersigned will accept that range in this case.

b) When Did Christina’s Arrhythmia and Cardiac Arrest Occur?

Having found that the medically appropriate interval is between seven days and three months from the date of an initial (not booster) dose of a vaccine, the undersigned next must determine whether the onset of Christina’s arrhythmia occurred in this window. The undersigned finds that it did because, and only because, the previous finding indicates that preponderant evidence does not support the finding that the arrhythmia started before the vaccination.

Starting from the assumption that Christina’s arrhythmia started after the August 22, 2007 vaccination, her arrhythmia must have begun by November 20, 2007, when Dr. Lafferman first detected the arrhythmia. This is a period of 90 days, which almost entirely overlaps with the medically acceptable range of seven days to three months.

In reaching this finding, the undersigned has considered that Christina’s pulse was recorded without any notation of any abnormality on September 12, 2007. Exhibit 2 at 82, 87-88. According to Dr. Shoenfeld’s logic, the lack of a

notation of an irregular heartbeat means that Christina was not suffering from arrhythmia. From the undersigned's observation of Dr. Shoenfeld during his testimony, Dr. Shoenfeld appeared to construct an unpersuasive reason to justify the lack of arrhythmia 21 days after vaccination. See Tr. 210-11.

However, the undersigned has already rejected this reasoning. The recording of Christina's pulse on September 12, 2007, provides information about her pulse while her pulse was being checked. The medical record does not say what her pulse was at other hours of September 12, 2007. Even Christina's report that she does not feel her heart racing during exercise provides little information because, as Dr. Yeager explained, people can have arrhythmia without symptoms. Tr. 547; accord Tr. 119 (Dr. Eldar).

Under the assumption that Christina's arrhythmia started after the vaccination only, the undersigned finds that her arrhythmia began within a time that is medically appropriate to infer causation. Thus, the remaining question concerns the timing of her cardiac arrest.

Here, the sequence of events is clearer. Christina received the third dose of the HPV vaccination on June 3, 2008. The undersigned found that she died on June 21, 2008. Findings of Fact, 2012 WL 1608741, at *6. The interval is 18 days. This interval fits within the medically acceptable range.

5. Summary of Prong Three

After following the Court's instructions with regard to the method of analyzing the issues, the undersigned finds that Ms. Tarsell has met her burden with respect to prong three.

C. Prong 2: Logical Sequence of Cause and Effect

Finding that Ms. Tarsell has met her burden with respect to prongs 1 and 3 does not end the analysis because to receive compensation, Ms. Tarsell also must establish that the second prong of Althen: "a logical sequence of cause and effect showing that the vaccination was the reason for the injury." Althen, 418 F.3d at 1278. The Federal Circuit has stated that the second prong "is not without meaning." Capizzano v. Sec'y of Health & Human Servs., 440 F.3d 1317, 1327 (Fed. Cir. 2006).

The February 16, 2016 Decision found that Ms. Tarsell did not meet her burden of proof on this issue. The undersigned determined because of the lack of knowledge about when Christina's arrhythmia began, Ms. Tarsell did not establish

that Christina's case met the challenge-rechallenge paradigm. The undersigned also credited Dr. Phillip's testimony that there was no evidence that Christina reacted in a way that Dr. Shoenfeld's and Dr. Eldar's theory predicted. Finally, the undersigned did not see support from treating doctors. 2016 WL 880223, at *17-18.

The Court's Opinion and Order ruled that the undersigned did not consider all the evidence of record because the Decision did not cite all the evidence. 2017 WL 3837363, at *13. Thus, the Court required an explicit analysis of all the evidence. Id., at *16.

Upon reconsideration of all the evidence on remand, the undersigned finds that a logical sequence of cause and effect supports Ms. Tarsell's claim. The absolutely essential reason for the undersigned's change in course concerns challenge-rechallenge. For sake of completeness, the undersigned will also address the other aspects of the record required by the Opinion and Order.

1. Challenge-Rechallenge

The Federal Circuit has noted that challenge-rechallenge can help a petitioner establish the second prong of Althen. Capizzano, 440 F.3d at 1322. The February 12, 2016 Decision recognized this guidance but found that the facts that could be established by preponderant evidence did not fit the paradigm. 2016 WL 880223, at *17.

Now, as explained above, due to the Court's instruction and sequence of questions, the undersigned has found that Christina's arrhythmia developed within a medically appropriate time after the first HPV vaccination. This finding satisfies the "challenge" aspect of challenge-rechallenge.

The undersigned has also found that Christina's death occurred within a medically appropriate time after the third HPV vaccination.¹⁰ This event constitutes the "re-challenge" aspect of challenge-rechallenge.

In addition, upon further reflection, the undersigned recognizes that the initial Decision may not have given appropriate weight to the findings that she felt

¹⁰ The parties have not presented any arguments based upon the second HPV vaccination. Ms. Tarsell has not explained the lack of explicit symptoms from Christina. The Secretary has not argued the lack of explicit symptoms after the second vaccination undermines the challenge-rechallenge paradigm.

dizzy and faint from June 7, 2008 to June 12, 2008. See Findings of Fact, 2012 WL 1608741, at *4. Feeling faint and feeling dizzy can be symptoms of arrhythmia. Tr. 248 (Dr. Shoenfeld), 328 (same), 550 (Dr. Yeager). However, feeling faint and feeling dizzy can be symptoms of other problems. Tr. 549-50. Given the general finding that Christina experienced challenge-rechallenge, her reports of feeling faint and feeling dizzy help fill in the picture that she was reacting adversely to the third dose of the HPV vaccination. In other words, Christina's feeling faint and feeling dizzy provide ancillary support for the challenge-rechallenge phenomena. However, if the challenge-rechallenge paradigm were not valid, then the feeling faint and feeling dizzy could not carry Ms. Tarsell's burden.

While Christina's feeling faint and feeling dizzy provide some circumstantial evidence of an adverse reaction, the presence of 2-12 red dots from June 5, 2008 until June 19, 2008 does not. See Findings of Fact, 2012 WL 1608741, at *4. Dr. Shoenfeld assumed that the presence of red dots meant that Christina broke out in a rash and Dr. Shoenfeld further asserted that a rash is a manifestation of an autoimmune reaction. Tr. 201, 247. However, Dr. Phillips persuasively rebutted these points. Tr. 402-06. Among other comments, Dr. Phillips explained that allergic reactions and autoimmune reactions follow different immunologic pathways. The undersigned credits Dr. Phillips's opinion.¹¹

But, the finding that the presence of 2-12 red dots does not signify an autoimmune reaction does not weigh against Ms. Tarsell. Ms. Tarsell can prevail – and does prevail – based upon the challenge-rechallenge paradigm. Nevertheless, to ensure compliance with the Opinion and Order, the undersigned will address other points potentially relevant to prong 2.

2. Christina's Medical History, including Hypothyroidism

In May 2004, Christina saw Renee Howard, her pediatrician, who completed a form for 16-19 year olds. Dr. Howard noted Christina was a well adolescent but who also had experienced fatigue and gained weight. Dr. Howard ordered lab tests to check on Christina's thyroid level. Exhibit 1 at 14. After a few months of tests (see exhibit 1 at 58-59), the doctor placed Christina on Synthroid on September 20, 2004. Exhibit 1 at 13.

¹¹ Likewise, Christina's history of being allergic to Cefzil and Augmentin (see exhibit 11 at 214) does not make her pre-disposed to having an autoimmune reaction. Although Dr. Shoenfeld made this assertion (Tr. 205, 246-47), Dr. Phillips effectively rebutted it. Tr. 402-06.

Christina appears to have taken Synthroid for a few months. See Tr. 240 (Dr. Shoenfeld: Christina was on Synthroid “for a short time”). On February 2, 2005, Christina reported that she had been off Synthroid for 5-6 weeks. Exhibit 1 at 9. The ensuing labs showed that Christina’s T4 was on the low end of normal. Exhibit 1 at 53. Laboratory work from June 2005 showed that Christina’s TSH was normal. Exhibit 1 at 50. Approximately one year later, Christina’s TSH remained normal. Id. at 48.

From this information, Dr. Shoenfeld opined that Christina had an autoimmune thyroid disease such as Hashimoto thyroiditis. Tr. 240-41 (discussing hypothyroidism, characterized by counsel as Hashimoto). He also predicted that if Christina had lived, she would have required more Synthroid. Tr. 241. Dr. Shoenfeld also asserted that because Christina had one autoimmune disease, she was predisposed to suffering another autoimmune disease. See Tr. 192-93, 204-05.

Dr. Phillips disagreed. He stated that “we don’t even know that she has hypothyroidism, and second, there were no tests done, such as measuring . . . antithyroglobulin antibody or antithyroperoxidase antibody, which are necessary to make that diagnosis.” Tr. 405. He added “it’s totally speculative whether she had Hashimoto’s and even if she had Hashimoto’s, that’s usually a limited, not systemic, autoimmune disease.” Id.

From the undersigned’s perspective managing the case, the issue about Christina’s hypothyroidism was not significant. Dr. Shoenfeld’s first report mentions Christina’s thyroid only in two places and his discussion in those two places was limited to one sentence. See exhibit 36 at 4 (before the vaccination, Christina was “diagnosed with possible mild hypothyroidism”), 14 (Christina was “diagnosed with mild hypothyroidism”). Dr. Shoenfeld did not use the term “Hashimoto” at all in the first report. Dr. Shoenfeld’s second and third reports do not mention thyroid problems at all. See exhibits 94 and 101. Dr. Shoenfeld’s fourth report mentions thyroid antibodies as an example of how antibodies can affect organs. Exhibit 108 at 6. Consistent with her expert’s limited development of this point, Ms. Tarsell’s pre-trial brief makes no mention of Christina’s thyroid problem. See Pet’r’s Prehear’g Br., filed Sept. 26, 2014, at 4 (omitting any discussion of a thyroid problem from petitioner’s recitation of facts). Furthermore, from the undersigned’s observation of the witnesses during the testimony, Dr. Shoenfeld discussion of thyroid problems was also relatively unsubstantial.

After the hearing, Ms. Tarsell’s briefs seemed to confirm the undersigned’s assessment that Christina’s thyroid was not a very important issue. Her primary brief did not discuss Christina’s thyroid at all. See Pet’r’s Posthear’g Br., filed

Feb. 17, 2015, especially at 2-3 (omitting facts about thyroid testing). She did not cite Dr. Shoenfeld's argument that Christina's hypothyroidism made her predisposed to suffering another autoimmune disease. See id. Likewise, Ms. Tarsell's reply brief did not discuss Christina's thyroid at all. See Pet'r's Reply, filed May 15, 2015.

Under these circumstances, the undersigned concluded that petitioner had not actively prosecuted the issue of Christina's thyroid condition and determined that the issue did not require discussion. The undersigned, however, had acknowledged Christina's history of thyroid problem in an earlier adjudication. Findings of Fact, 2012 WL 1608741, at *3. However, after Ms. Tarsell's motion for review, the Court directed an evaluation of Christina's thyroid. Opinion and Order, 2017 WL 3837363, at *13.

The undersigned finds that this argument has very little persuasive value. First, Christina's experience with a thyroid problem seems temporary. She took Synthroid for a few months, but then her thyroid levels returned to normal. Ms. Tarsell has not persuasively explained why Christina's experience of low thyroid in 2004 has long-lasting consequences. Second, the undersigned has not identified any treating doctor that diagnosed Christina as having an autoimmune disease. The lack of diagnosis from a treating doctor tends to suggest that Christina was not suffering from an autoimmune disease. See Capizzano, 440 F.3d at 1326 (indicating that reports of treating doctors are favored). While Dr. Shoenfeld diagnosed her as having an autoimmune disease in his testimony, Dr. Phillips disagreed. See Tr. 404-05 ("she really didn't have any evidence of clinical autoimmune disease"), 481 ("there's no evidence that [Christina] has any of these autoimmune diseases"). Third, even assuming that Christina suffered from an undiagnosed autoimmune disease, the significance is not clear. Dr. Shoenfeld may be correct (on a more likely than not basis) that a person with one autoimmune disease is prone or predisposed to develop another autoimmune disease. But, if this is true, why does the vaccination contribute to the onset of the second autoimmune disease? It would seem that if Christina developed an autoimmune thyroid problem approximately three years before the HPV vaccination, then an expected course of this autoimmune problem would be to develop another autoimmune problem. Dr. Shoenfeld has not persuasively explained why the HPV vaccine would be a substantial factor in the progression from one autoimmune

disease to another.¹² For these reasons, Ms. Tarsell has not established that Christina's temporary hypothyroidism supported her claim that the HPV vaccine caused Christina's arrhythmia.

3. Statements from Treating Doctors

The Court directed the undersigned to consider statements from treating doctors. The Court specifically listed "internist Christine Lafferman, pediatrician Renee Howard, gynecologist Julie Jacobstein, otolaryngologist Karl Diehn, and various physicians at Bard College student health services." Opinion and Order, 2017 WL 3837363, at *14. The Court distinguished this group of doctors from Kari Reiber, the pathologist who performed Christina's autopsy, because the former treated Christina while she was alive. Id.; but see Nordwall v. Sec'y of Health & Human Servs., 83 Fed. Cl. 477, 488 (2008) (stating that although autopsy reports "may not have been created in the context of diagnosing and treating a patient, they are contemporaneous records made by a health care professional outside the context of litigation, and should be given the same probative weight as other medical records"), app. dismissed voluntarily, 331 Fed. App'x 720 (Fed. Cir. 2009).

The undersigned has reviewed the records. The undersigned has not identified any statement from a treating doctor that suggested that the HPV vaccine caused Christina's arrhythmia and/or her death. While all the physicians who treated Christina commented about different aspects of her health, the undersigned focused on the specific question of the treating doctor's opinions, if any, about the role, if at all, of the vaccination. Because Ms. Tarsell bears the burden of proving her case with preponderant evidence, the silence from these doctors does not help Ms. Tarsell meet her burden.

The Court also corrected a factual matter in that the undersigned incorrectly stated that Dr. Lafferman administered the second dose of the HPV vaccine. Actually, as the Court pointed out, Kim Buerhaus from Dr. Jacobstein's office administered the second dose at an unknown time on November 20, 2007. See exhibit 3 at 107 (VAERS report). Dr. Lafferman appears to have seen Christina later in the day on November 20, 2007, because the EKG strip is labeled: "Nov/20/2007 14:36:15." Exhibit 4 at 142. Thus, it appears that Dr. Jacobstein's

¹² In other cases, petitioners' experts have proposed that the evolution from one autoimmune disease to another autoimmune disease requires a trigger. However, Dr. Shoenfeld appears not to have offered this opinion in this case.

decision to order the second dose of the HPV vaccine occurred before Christina's arrhythmia was detected.

Finally, the undersigned has considered that Dr. Jacobsen filed a VAERS report. However, Ms. Tarsell requested that Dr. Jacobsen inform appropriate people that Christina died after receiving the HPV vaccine. See exhibit 3 at 113. Dr. Jacobsen did submit a report to VAERS. However, as the February 16, 2016 decision stated, a doctor's decision to file a report to VAERS does not necessarily indicate that the doctor believed that the vaccine caused the injury.

4. Response Predicted by Causal Theory

The February 16, 2016 Decision also found that Ms. Tarsell had not established that Christina showed signs or symptoms of an adverse reaction that was in accord with the theory her experts had presented. Decision, 2016 WL 880223, at *18. The Court required a re-examination of this issue. Opinion and Order, 2017 WL 3837363, at *16.

Essentially, Dr. Shoenfeld posited that the HPV vaccination can lead to an autoimmune attack on the heart, specifically on the calcium channels contained within the cell membrane. Dr. Eldar continued the theory by explaining how damage to a calcium channel can cause a fatal arrhythmia.

Dr. Phillips questioned whether this process occurred in Christina. He stated:

If, in fact, it was a significant autoimmune reaction going on, one would expect to see cellular infiltrates in various organs, and if the autoimmune reaction was going on of significance in the heart, you would expect that the myocardium would be infiltrated with lymphocytes.

If there was a cytotoxic antibody there which had been attacking these channels, that cytotoxic antibody would also cause pathologic changes, with secondary infiltration of other cell populations which were inflammatory in nature, including polymorphonuclear cells or mononuclear cells.

Tr. 407-08. Dr. Phillips later expressed a similar idea:

[I]f it's thought that this is an arrhythmia caused by an antibody doing something to the conduction system of the heart, then it -- if it's a tissue-specific autoimmune reaction, it will be in the heart, and then you should see some abnormalities in the heart vis-à-vis histologic changes, and there weren't any.

Tr. 482. Dr. Phillips's testimony carries a fair amount of weight. Under Dr. Shoenfeld's theory, the antibodies must break through the cell membrane to reach the calcium channel before damaging the calcium channel. Therefore, it seems to make some sense that such a destructive process would leave some tell-tale signs as Dr. Phillips indicated.

Instead of looking at this part of Dr. Phillips's testimony, the Court cited another portion.

[Q.] Have you ever -- in your career or in your research, have you ever -- have you ever encountered a cross-reactivity that doesn't produce cell damage?

A. We see cross-reactivities all the time, and many of them don't.

Tr. 433. As the transcript indicates, the undersigned believed that the attorney asking the question and the witness answering the question were understanding the term "cross-reactive" differently.¹³ In any event, the questions and answers following this exchange show that Dr. Phillips expected to see detectable changes. See Tr. 434-37. Moreover, to the extent that Dr. Phillips suggested on page 433, that some autoimmune reactions would not produce cell damage, his testimony about the specific autoimmune reaction in this case – an antibody attack on the L-1 calcium channels of the heart – is that it would be detectable.

Dr. Phillips expected that the damage would be visible on the organ that was being attacked – the heart. Although, as the Court pointed out, Dr. Shoenfeld

¹³ Specifically, the undersigned interjected that it appeared that petitioner's counsel was using "cross-reactivity" differently than respondent's counsel had upon previous questioning of the witness. Tr. 433. After that, counsel rephrased his question and Dr. Phillips provided a longer explanation. Tr. 433-434.

explained that doctors did not look for antibodies, Dr. Phillips was looking at the heart.¹⁴

After additional reflection, the undersigned believes that Dr. Phillips presented several strong points weakening Ms. Tarsell's case. See Bazan, 539 F.3d at 1353-54 (recognizing that the Secretary may introduce evidence to controvert petitioner's case). If Ms. Tarsell could not establish that Christina's case fit within the challenge-rechallenge paradigm, then the undersigned would likely find Dr. Phillips's opinion strong enough to outweigh Ms. Tarsell's evidence on prong 2. However, the undersigned finds that the challenge-rechallenge evidence is sufficiently probative that this presentation carries Ms. Tarsell's burden of proof. See Doe 11 v. Sec'y of Health & Human Servs., 601 F.3d 1349, 1355 (Fed. Cir. 2010) (recognizing that the presence of some contrary evidence does not make a special master's fact-finding arbitrary or capricious).

Ultimately, because of the finding that Christina began to experience arrhythmia after her HPV vaccination, Ms. Tarsell has presented preponderant evidence of a logical sequence of cause and effect, connecting the HPV vaccination to the ensuing arrhythmia.

IV. Conclusion

The Court's Opinion and Order required additional consideration consistent with the legal principles articulated by the Court for analyzing the evidence in this tragic case about a woman, Christina Tarsell, who died much too young. Under the approach dictated by the Court, Ms. Tarsell is entitled to compensation. The parties should anticipate that a separate order regarding damages will issue shortly.

Pursuant to Vaccine Rule 28.1(a), the Clerk's Office is instructed to notify the Court of this ruling.

¹⁴ Similarly, the finding in one article that trace amounts of the DNA of the human papillomavirus have been found in people who have received the HPV vaccine seems irrelevant to the question of whether Christina cross-reacted.

IT IS SO ORDERED.

s/ Christian J. Moran
Christian J. Moran
Special Master