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Root Cause Analysis

Megan Paulsen, MD

University of Minnesota Medical School, Department of Pediatrics, Division of Neonatology, Minneapolis.

Ten weeks into his neonatal intensive care unit (NICU) course, our son had a code event. He was on high-flow nasal cannula and had been breastfeeding. He aspirated, became apneic, blue, and limp. His nurse took him from my arms, placed him in his crib, and began to suction him without improvement. His oxygen saturations and heart rate were low. She reached for the code button and started bag-mask ventilation. A flurry of clinicians crowded into our small nursery. He recovered, returning to his clinical baseline within 24 hours.

I am a neonatologist, in the same unit where my twin sons were admitted following their extremely premature delivery. In the context of critical care issues that I treat, apneic events related to prematurity are exceedingly common. Most of the time these types of events are resolved by the bedside nurse and don't require physician assistance, yet even those that do are typically the least dramatic in the realm of codes we lead.

Despite my experience, I was hysterical. I have heard stories of other physicians stepping in when a loved one needs medical attention. For example, colleagues have performed cardiopulmonary resuscitation on a close relative, led a neonatal delivery room resuscitation for their newborn, or performed the Heimlich maneuver on their choking child. Not me. In this instance, I did nothing. Instead, I backed into the corner of the room, ringing my hands, gasping for breath, and crying in panic.

After NICU discharge, I was diagnosed with post-traumatic stress disorder (PTSD). Comically, I both questioned and was annoyed by the diagnosis. I tried reasoning with the counselor: I have always been high-strung, they had survived, we were home as a family, and my sons were thriving. Why would I have this issue now? Yet she was obviously right. After all, this is why it is called *post*traumatic stress. I had flashbacks and dreams of certain aspects of our NICU course: labor triage, the operating room, apnea and desaturation events, reintubations, surgeries, and codes. Additionally, I had flashbacks of previous experiences as a neonatologist: family interactions, patient codes, and deaths. I avoided friends, family, NICU parents, and coworkers. I thought about myself as a failure: both as a parent and as a neonatologist. I felt isolated. I was easily startled, always on guard for danger, and severely irritable. And the most difficult to endure was my all-consuming guilt.

Corresponding Author: Megan Paulsen, MD, University of Minnesota, Department of Pediatrics, Division of Neonatology, 2450 Riverside Ave, Sixth Floor East Building, Delivery Code 8952A, Minneapolis, MN 55454 (mgosslin@unm.edu).
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One tool that has helped me manage and recover from PTSD is similar to a root cause analysis (RCA). An RCA can determine why an adverse event occurred and what action steps may improve outcomes. In short, an RCA can find purpose in traumatic events. To apply this concept to this scenario: the adverse outcome was my intense guilt and its potential impact on my ability to be a mother and neonatologist. My temperament, and previous life experiences, put me at risk of developing PTSD. The root cause, however, is my struggle with infertility.

My guilt is deep-seated and complex. I yearned to have a family far more than I ever desired to be a physician. Opportunities in medicine, however, were consistently more available to me than in my personal life. I struggled to find a partner accepting of my intense desire to be a mother in the setting of a strong career drive, known infertility, and advancing age. Once married, the first years of my marriage were peppered with transitions and loss. Years of infertility evaluation and treatment were extremely taxing emotionally and physically.

My husband and I pursued in vitro fertilization (IVF). After previously advocating against more than a one-embryo transfer, I conceded to our only 2 embryos being transferred together in a last attempt at a reproductively assisted pregnancy. I was mentally exhausted, ready to be done with IVF, and ready to move on with either a biological pregnancy or begin alternative ways to build our family.

Both embryos implanted and I was ecstatic. But 6 months into my pregnancy, in March 2019, our twin sons were urgently born at 25 weeks' gestational age. Neonatologists, either consciously or unconsciously, assign mortality and morbidity risk based on an infant's gestational age, birth weight, exposure to antenatal steroids, multiple gestation status, and their sex. Our twin sons who were extremely premature, low birth weight, and without exposure to ante-natal steroids were among the highest risk for mortality and morbidity. I was acutely aware of the potential challenges my sons would face during and after their NICU course.

You could hear a pin drop in the operating room. I was silently, desperately pleading that both boys would survive long enough for me to hold them. Our son whose membranes were not ruptured was delivered first. He had some respiratory effort and tone, received about 30 seconds of delayed cord clamping, and then was taken to the radiant warmer for resuscitation. His heart rate, while initially low, responded to positive pressure ventilation. He was intubated, received surfactant for his respiratory distress and prematurity, and he was shown to me before being taken to the NICU. His eyes were fused shut and his chest was rising with each hand-delivered breath. I was reassured that, by my gross assessment, he looked to be a good size for his gestational age. I reached out to feel his tiny hand with tears leaking from the corners of my eyes. I fiercely loved him.

Our second son had ruptured his membranes and he was engaged in my pelvis. Although it was seconds, it felt like hours to deliver him. The tension in the operating room was palpable. He came out vigorous, vocal, and with a strong heart rate. After his intubation but before he was brought over to me, my husband warned me that he appeared bruised

compared to his brother. Indeed, he was bruised from head to toe. He appeared smaller than his brother, and he was no longer feisty. I fiercely loved him.

I was also overwhelmed with a deep sense of remorse. I did this. I am responsible. I have since imagined my feelings in this moment to be akin to those of a drunk driver at the scene of a serious accident she had caused. I felt profound and crushing guilt; I took advantage of science, past my own biological capability, to serve a selfish desire to be a mother and my decisions had caused suffering for the ones I love.

As a critical care physician, my training has prepared me to anticipate problems, control what I can, and lead a team. My fears were clear from their birth: I was afraid one or both of my sons would die, would have severe intraventricular hemorrhage, require a tracheostomy and chronic ventilation, have profound sepsis, or have intestinal morbidity requiring surgery and chronic parenteral nutrition. I anticipated and controlled what I could. Early in the NICU course I prepared for their death. They were baptized the morning after they were born. Every night before my husband and I left the NICU, we prayed for their medical team, to protect them from infection and feeding intolerance, to grow their lungs, and to provide us as parents the tools to help them develop. I doggedly pumped breastmilk to maximize my milk supply. Both my husband and I held our sons as much as the boys could safely tolerate. We journaled, met regularly with our pastor, humbly accepted help from others, and practiced gratitude. We financially prepared for long-term morbidities after discharge.

Despite my initial fears, none of these things happened to our sons. For this, I will never have the words to adequately express my gratitude or my relief. That is not to say that my boys had an “easy” NICU course either. They required prolonged mechanical and high-frequency ventilation, patent ductus arteriosus ligation, treatment for sepsis and meningitis, and inguinal hernia repair. They were both discharged requiring home oxygen with frequent medications for bronchopulmonary dysplasia. I had moments and days where I was overwhelmingly sad, scared, or angry. At times, I was irritable, irrational, and pessimistic. My husband and I were not always on the same page and we used different coping strategies. Nevertheless, the outcome was merciful. From what I had anticipated, I consider my family, especially my sons, to be extremely resilient—and lucky. With time and effort my guilt continues to subside, PTSD symptoms have waned, and I progressively gain confidence in my abilities as a mother.

As a neonatologist, I have taken away 3 key points from this experience. First, screening for postpartum mood and affective disorders among NICU parents should be as routine as retinopathy of prematurity screening for premature infants. Second, social workers, NICU nurses, developmental therapists, lactation consultants, and chaplains are essential in efforts to increase parental engagement and decrease parental stress. Third, parental mental health and its effect on long-term health outcomes of infants should be included in neonatal-perinatal medicine fellowship core education curricula.

Many people tell me that my experience will make me a better doctor. To be honest, despite knowing their good intentions, the statement makes me feel like I deserved this experience or the perception is that I wasn’t a “good” doctor to my patients prior to this experience. But

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I do understand the sentiment. Although I have always cared deeply about my patients and their families, I now feel a different type of responsibility. So perhaps I won't be a better doctor, but inevitably I am a different doctor. I hope that the experience will augment my medical training and improve my approach to family-centered care.

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