



# A Primer for Nurses on Perinatal/Neonatal Stroke

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On her fourth day of life, my granddaughter, Charlotte, had a stroke. It was unexpected. As a perinatal nurse, I knew of nothing out of the ordinary that would have contributed to this condition. My daughter-in-law, Katie, a pediatric nurse, was a primigravida who had been induced for post dates and low amniotic fluid. In the last weeks of pregnancy, she had mild hypertension, but her condition was not considered pre-eclamptic. A decision to proceed with a primary cesarean surgical birth was made after a prolonged second stage with a non-reassuring fetal heart tracing. Charlotte's APGAR scores

were good, 9 and 9, and she and Katie did well in the early postpartum period. From my standpoint, everything that had happened during labor was pretty routine with expected outcomes. It was too bad that Katie had a cesarean, but then, more than 30 percent of births are via cesarean (Martin, Hamilton, Osterman, Curtin, & Matthews, 2013), so it wasn't too surprising.

Because mom and baby were doing so well, I encouraged them to leave the hospital for the comforts of home with the offer of private duty baby nurse for the first night (me) even though

**Abstract** Perinatal or neonatal stroke is not uncommon, but diagnosis is often missed. Perinatal nurses are often the first health professionals in the position to observe the most typical symptom of stroke in a newborn, which is focal seizure. Etiology, symptoms and outcomes are reviewed and discussed through the context of the author's personal story. DOI: 10.1111/1751-486X.12221

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they were entitled to one last night in the hospital. Everyone agreed, so I arrived at their home ready to manage feedings through the night. Charlotte was latching onto the breast well, but seemed hungry after feeding; Katie's milk wasn't yet in. Of note, Katie had previously had a surgical breast reduction; a lactation consultant had suggested a breast pump, which was producing just drops of colostrum. I suggested a bit of formula supplementation, which Katie agreed to.

At 10 p.m., Charlotte took 1oz of formula and then slept for about 2 hours. When she woke up, I prepared another bottle. At this feeding, Charlotte seemed to demonstrate a disorganized suck but did take about 20 mL of formula. After the feeding, I held her and observed a rhythmic twitching of her right arm, which persisted for 3 to 5 minutes and then stopped. She fell asleep.

I considered what I had observed. It wasn't the jitteriness we associate with hypoglycemia; she seemed fine now; was I being an overly anxious nurse/grandmother?

When Charlotte awoke later that night, the twitching of her right arm started anew. I woke up Katie and we both watched the baby for several minutes. Uncertain about what we had observed, we convinced ourselves that we were being hyperobservant because of our nursing backgrounds. Katie went back to bed and I rocked Charlotte. I felt her entire body start to jerk. I got Katie, we called the pediatrician's emergency number and after discussing our observations with the on-call pediatrician, my son and daughter-in-law took Charlotte to the emergency department at the large teaching hospital where Katie worked. Charlotte had seizure activity on admission and was quickly diagnosed as having experienced a cerebral venous sinus thrombosis, a type of neonatal stroke, with seven separate clots by magnetic resonance imaging (MRI). She was admitted to the pediatric intensive care unit, where she spent the next 10 days.

### What Is Stroke in the Newborn?

A neonatal or perinatal stroke is defined by Rutherford, Ramenghi, and Cowan (2011) as "an area of damaged cerebral tissue resulting either disruption to blood flow in a major cerebral artery from thrombosis or embolism or from thrombosis in a major cerebral vein which occurs between 20 weeks of fetal life to the 28th

postnatal day ..." (p. F377). The terms neonatal stroke and perinatal stroke are used interchangeably. Stroke occurs most frequently in term or late-term infants. Estimates of the prevalence of perinatal stroke vary and are derived from retrospective studies. van der Aa, Benders, Groenendaal, and de Vries (2014) have provided the most recent statistics, stating that a perinatal arterial ischemic stroke (PAIS) is more common. It occurs in between 1 in 1,600 and 1 in 5,000 births. Cerebral sinus venous thrombosis (CVST) is rarer, with an incidence of approximately 12 in 100,000 live births. Both types of stroke can result in long-term neurologic sequelae. Motor, cognitive and learning deficiencies can occur. Stroke in infants is more common than brain tumors, and by some estimates, as frequent as strokes in the elderly (Nelson & Lynch, 2004).

### Stroke occurs most frequently in term or late-term infants

Stroke in the newborn is different from birth asphyxia. Zanelli, Stanley, and Kaufman (2014) state that perinatal asphyxia as the cause of hypoxic-ischemic encephalopathy (HIE). HIE is a result of hypoxemia during pregnancy, labor or birth, leading to diffuse neurologic injury in many infants. Rather than specific insult in one area of the brain, damage occurs due to acidemia and cerebral edema. Seizures are also the most frequent symptom observed, but unlike the recurrent focal seizures seen in neonatal stroke, these seizures are usually myoclonic or multifocal. Timing of the seizures is also different—often starting soon after birth or within 6 to 12 hours after birth and are followed by stupor, coma, absent neonatal reflexes (sucking, Moro) and irregularities of breathing, heart rate and blood pressure. In terms of outcome, infants experiencing HIE have a higher rate of mortality (25 percent to 50 percent) and morbidity (up to 80 percent of infants with HIE develop serious complications). These children experience long-term functional impairments, such as cerebral palsy and intellectual disability.

Identifying the timing and type of seizure occurring in a neonate is among the greatest challenges of diagnosing infants with neurologic damage. Events of apnea and bradycardia

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