

# Navigating toward Neonatology: Cerebral Palsy

*Benjamin Hopkins, OSM IV, Robert White, MD*

***“Welcome back to another installment. My name is Benjamin Hopkins, and I am currently a fourth-year medical student at Western University of Health Sciences in Pomona, California. When ‘I grow up,’ I want to be a Neonatologist. Look at previous months’ journals for my earlier articles and follow along with this column as I navigate my way to becoming a neonatologist.”***

Welcome back to another installment. My name is Benjamin Hopkins, and I am currently a fourth-year medical student at Western University of Health Sciences in Pomona, California. When “I grow up,” I want to be a Neonatologist. Look at previous months’ journals for my earlier articles and follow along with this column as I navigate my way to becoming a neonatologist.

This month was “The Match,” and I am happy to say I will be a pediatric intern at the University of California San Francisco–Fresno. Currently, I am rotating within pediatric neurology and getting a deep sense of how to care for these patients, both in the hospital and out. The attending neurologist I work with is a superb teacher who exemplifies what it means to practice individualized patient care with optimal treatment options. Much of my time this month was spent looking at long-term or life-long disorders and how to manage them during acute flares as well as day-to-day to maintain an optimal state of health.

One of my patients this month was a 14-month-old female who is an ex-34<sup>0</sup>/<sub>7</sub> wk preemie whom we have had continued follow-ups for cerebral palsy. Her official diagnosis is quadriplegic right-over-left cerebral palsy, which was evident by the physical exam. The patient had recently received an MRI of the brain and spine w/ and w/out contrast to observe locations of past damage during a traumatic delivery. The MRI of the spine was normal; however, the MRI of the brain showed diffuse white matter loss and thinning of the corpus callosum. The patient receives multiple therapies, including occupational, physical, and speech, and uses ankle-foot orthotics. She is continuing to develop well and had increases in her flexibility and movement; however, she is still non-verbal and will most likely continue to have developmental and intellectual delays due to the findings on the recent MRI. Physical exam findings show tight and restricted right hand and leg movement, more significant than left, and the patient is found to be in the 5<sup>th</sup> percentile for height and weight and 14<sup>th</sup> percentile for head circumference.

Cerebral palsy (CP) is the most common motor disability in children (1–3). Prevalence is 2–3/1000 in high-income countries (4, 5). There has been a decline in the prevalence of CP in many high-income countries, most likely due to advancements in treatment

options, although there has not been a decrease in incidence (1, 5). Various studies have indicated that the prevalence of CP is stable (4). CP is a group of diseases with an underlying cause of non-progressive nerve tissue damage and is categorized into spastic (80%), dyskinetic (15%), and ataxic (5%) forms (4, 5). CP is associated with various developmental delays, and its prevention is a public health priority (1, 3).

***“Cerebral palsy (CP) is the most common motor disability in children. Prevalence is 2–3/1000 in high-income countries...CP is a group of diseases with an underlying cause of non-progressive nerve tissue damage and is categorized into spastic (80%), dyskinetic (15%), and ataxic (5%) forms. CP is associated with various developmental delays, and its prevention is a public health priority.”***

The cause of CP is multifactorial, with multiple risk factors contributing to its development, and two-hit and multi-hit models have been considered (1, 5). Risk factors include preconception, prenatal, perinatal, or postnatal time periods, with most patients having pre- or perinatally acquired CP (4, 6). Injury to the developing brain before, during, or after birth can lead to CP, with various symptomatology that may be present (4). Preconception risk factors depend on the mother’s health condition, and certain factors, such as obesity and age, have been identified as damaging to the brain (1, 4). The most significant risk factors for developing CP are the baby’s gestational age and birth weight (1, 4, 5). Despite the strong correlation between gestational age and birth weight, more than 50% of infants with CP are born at or near term (5, 6). The risk of developing CP increases with complications that result from premature birth (5). Premature complications such as periventricular leukomalacia, intraventricular bleeding, bronchopulmonary dysplasia, neonatal encephalopathy, and neonatal stroke all increase the chance of developing CP, while others have no identifiable risk factors and might be due to genetics (4–6). In addition to complications of prematurity, other risk factors include intrauterine growth restriction, intrauterine infection, antepartum hemorrhage, multiple pregnancies, placental

***“The most significant risk factors for developing CP are the baby’s gestational age and birth weight. Despite the strong correlation between gestational age and birth weight, more than 50% of infants with CP are born at or near term.”***

pathologies, and congenital and genetic predispositions (5). Even though most causes of CP happen in the prenatal and perinatal periods, 14% of CP diagnoses result from CNS damage during infancy and early childhood (5). Some of the leading causes of development postnatally are sepsis, meningitis, kernicterus, head trauma, hypoxia, and stroke (5).

---

***“Even though most causes of CP happen in the prenatal and perinatal periods, 14% of CP diagnoses result from CNS damage during infancy and early childhood. Some of the leading causes of development postnatally are sepsis, meningitis, kernicterus, head trauma, hypoxia, and stroke.”***

---

There has not been an agreed-upon age by which CP can be diagnosed; however, evidence does point to increased cognitive and motor benefits with early diagnosis (1). Diagnosis is based on clinical investigation and neurologic exams; gathering information from the mother, looking for early signs of brain damage in the child, magnetic resonance imaging, biomarkers, and cranial ultrasound can all be used to diagnose CP (4). While neonatologists look out for premature babies and patients who stay in the NICU who might develop CP, pediatricians play an essential role in identifying full-term infants with CP who may not have been under the care of a neonatologist (6). In most patients, the predominant motor abnormality is spasticity, and the term “high risk of cerebral palsy” can be given before confirmation so that early cognitive and motor interventions can start (3, 6). A test known as the General Movements Assessment (GMA) has been shown to reliably identify infants at risk for CP; it is a non-invasive and low-cost test with robust predictions on CP development (7).

---

***“While neonatologists look out for premature babies and patients who stay in the NICU who might develop CP, pediatricians play an essential role in identifying full-term infants with CP who may not have been under the care of a neonatologist. In most patients, the predominant motor abnormality is spasticity, and the term “high risk of cerebral palsy” can be given before confirmation so that early cognitive and motor interventions can start. A test known as the General Movements Assessment (GMA) has been shown to reliably identify infants at risk for CP...”***

---

A normal GMA exam in a term high-risk infant at three months is associated with a low risk for moderate or severe CP (7). If the patient has neonatal encephalopathy, the GMA is less reliable when performed before 15 weeks of age; however, if cramped synchronized general movements are found, there is a strong probability that CP will be diagnosed by two years of age (7). Although the GMA is a helpful tool in diagnoses, there is a lack of high-quality research, which limits its applicability, so the GMA test should not be used alone but along with other diagnostic methods (7).

The extent of damage to the developing brain can vary from patient to patient, resulting in a variety of symptom presentations (5). The first symptoms may appear discreetly, such as trouble gaining new development skills, with difficulties revealing themselves over time (5). Common symptoms are abnormal resistance to movements, activity limitations, sensory disturbances, problems with perception, cognition, communication, behavior, epilepsy, and secondary musculoskeletal abnormalities (4, 5). The damage is not progressive; however, due to the plasticity of the maturing CNS, other areas of the brain may take over damaged areas and change the general condition (5). With the possibility of multiple associated problems, a multidisciplinary team of specialists should assess and manage the patient (4).

---

***“The extent of damage to the developing brain can vary from patient to patient, resulting in a variety of symptom presentations. The first symptoms may appear discreetly, such as trouble gaining new development skills, with difficulties revealing themselves over time. Common symptoms are abnormal resistance to movements, activity limitations, sensory disturbances, problems with perception, cognition, communication, behavior, epilepsy, and secondary musculoskeletal abnormalities.”***

---

The best treatment for any disease process is prevention. Several prevention techniques are implemented when CP is anticipated (4, 5). Since the development of the CNS occurs over various time frames, specific prevention strategies are implemented multiple times (5). Since preterm delivery and low birth weight are the leading risk factors for the development of CP, interventions to prolong pregnancy are consistently implemented (1, 4, 5).

Antenatal steroid therapy has been used for over 50 years and has confirmed efficacy in preventing respiratory distress syndrome, perinatal death, intraventricular bleeding, necrotizing enterocolitis, and the development of sepsis (5). Given the proven effects of antenatal steroid therapy, it is unethical to perform placebo-controlled trials; however, a meta-analysis of observational studies indicated the benefit of a single course of antenatal steroid therapy in reducing the risk of CP (3, 5). There was a 32% decrease in CP diagnoses in patients whose mothers received a single course of antenatal steroids (5).

---

***“...a meta-analysis of observational studies indicated the benefit of a single course of antenatal steroid therapy in reducing the risk of CP. There was a 32% decrease in CP diagnoses in patients whose mothers received a single course of antenatal steroids.”***

---

The World Health Organization currently recommends the administration of magnesium sulfate to mothers who are at risk for preterm labor and whose gestational age is less than 34 weeks (5). This recommendation is based on a meta-analysis that showed a 30% reduction in the incidence of mild and a 40% reduction in moderate and severe CP (5). However, it is essential to note that composite endpoint of CP or death did not significantly decrease (5).

---

***“The World Health Organization currently recommends the administration of magnesium sulfate to mothers who are at risk for preterm labor and whose gestational age is less than 34 weeks. This recommendation is based on a meta-analysis that showed a 30% reduction in the incidence of mild and a 40% reduction in moderate and severe CP.”***

---

The World Health Organization also recommends delayed cord clamping (after 1 minute) to benefit the health and nutrition of preterm and full-term babies (5). The delay in cord clamping has been shown to reduce the risk of intraventricular hemorrhage, necrotizing enterocolitis, iron deficiency anemia, and to improve neurological development (5).

For newborns who experienced a perinatal episode of hypoxia, one must watch for hypoxic-ischemic encephalopathy (HIE), which increases the risk of CP (3, 5). Therapeutic hypothermia is used to treat hypoxic-ischemic encephalopathy and leads to improved survival rates and neurologic development, as well as a reduction in neurologic disorders and death (3, 5). Therapeutic hypothermia is implemented in the first six hours of life to prevent the primary necrosis phase from progressing to the secondary apoptosis phase of neuronal damage; however, with more severe hypoxic-ischemic injury, the latency period is shorter (5).

Multiple methods exist for treating patients with CP; however, it is crucial to implement the interventions early (2, 7). The earlier the intervention, the more likely nervous system plasticity will help develop the systems appropriately (2). Initial care should be conducted using a multidisciplinary approach covering nine domains: motor function, cognitive skills, communication,

---

***“Therapeutic hypothermia is used to treat hypoxic-ischemic encephalopathy and leads to improved survival rates and neurologic development, as well as a reduction in neurologic disorders and death. Therapeutic hypothermia is implemented in the first six hours of life to prevent the primary necrosis phase from progressing to the secondary apoptosis phase of neuronal damage; however, with more severe hypoxic-ischemic injury, the latency period is shorter.”***

---

eating and drinking, vision, sleep, muscle tone management, musculoskeletal health, and parental support (2, 3). Treatment should focus on care coordination, support, continued evaluations, and monitoring advancements in research that could improve life functions (3, 4). There is a multitude of treatment options that start primarily with physiotherapy, speech therapy, language therapy, constrain-induced movement therapy, and occupational therapy; second-line treatments can include therapeutic hypothermia, nanomedicine, stem cell therapy, and Botulinum toxin A (1, 3, 4). The critical part of caring for patients with CP is managing with an individualized approach tailored to their specific symptoms and etiology.

---

***“Initial care should be conducted using a multidisciplinary approach covering nine domains: motor function, cognitive skills, communication, eating and drinking, vision, sleep, muscle tone management, musculoskeletal health, and parental support. Treatment should focus on care coordination, support, continued evaluations, and monitoring advancements in research that could improve life functions.”***

---

This month, I enjoyed talking with Dr. Robert White, the medical director at Pediatrix Medical Group at Beacon Children’s Hospital in South Bend, Indiana, and a neonatologist with over 20 years of experience who has specialized in NICU design. We discussed what makes an excellent neonatologist, NICU layout and its impacts on patient health, and critical care worker burnout. \*

1. What qualities are most essential to excel at as a neonatologist?

Well, at least for the first part of my career and hopefully for a long time going forward, I have a natural appetite for learning new treatments. When we started, we had babies dying of lots of things at gestational ages and weights that we don't have now because we kept getting new treatments like surfactants and jet ventilators and better antibiotics and better nutrition. It's been an exciting ride because there's always a new way to treat a problem that we've been challenged with for all these years, and now, finally, someone's come up with a better idea. I suspect that will be the case with neonatology for a long time. There are some professions where you do the same thing over and over for 20 years, but neonatology is not one of them.

---

*“When we started, we had babies dying of lots of things at gestational ages and weights that we don't have now because we kept getting new treatments like surfactants and jet ventilators and better antibiotics and better nutrition. It's been an exciting ride because there's always a new way to treat a problem that we've been challenged with for all these years, and now, finally, someone's come up with a better idea. I suspect that will be the case with neonatology for a long time. There are some professions where you do the same thing over and over for 20 years, but neonatology is not one of them.”*

---

HIE is a great example. When I started, we had nothing to do for those babies. Cooling came along and refined over the years. It wasn't just now that we could cool; it was all the variations on how soon we should start, how long we should go, and what criteria we should use. They are testing erythropoietin and other medications for neuroprotection. That's an excellent example of an area where we've come a long way, yet we still have much to figure out.

2. What do you now know that you wish you had known before going into neonatology?

I didn't know what to expect and was just really lucky. Part of what I got lucky with was a wife who was willing to have me gone for long hours and even when I was home to be still working on other projects or still have my mind occupied, probably for longer than the average doctor would, certainly longer than the average nine-to-five person would.

I got lucky that the location where I ended up, a level three non-academic center, still gave me all the opportunities to do exciting stuff nationally and internationally. I am interested in NICU design and have pursued that over the years. I am also interested in the environment of care that we talk about at the Gravens Conference

every year.

I could do those things just as much at South Bend as at some big academic medical center. The difference is that this is at a level we take direct care of babies. While we have some nurse practitioners and occasionally a family practice resident, for the most part, we're the ones taking direct care of the baby and the family, and we're doing it day in and day out. This is our full-time job; if you love it, there's no better place to do it than in a setting like this.

---

*“I could do those things just as much at South Bend as at some big academic medical center. The difference is that this is at a level we take direct care of babies. While we have some nurse practitioners and occasionally a family practice resident, for the most part, we're the ones taking direct care of the baby and the family, and we're doing it day in and day out. This is our full-time job; if you love it, there's no better place to do it than in a setting like this.”*

---

I came here because this is where I grew up and, more importantly, where she wanted to raise our kids. I didn't know at the time that there would be all these benefits compared to, for example, training at Johns Hopkins. For a while, I thought that would be my career path; I'd be on the faculty there doing significant research and taking great care of babies. I came back to South Bend feeling like I was making some compromises, but as it turned out, I had all the opportunities to do research and have an impact that everyone had, and plenty of people could tell the same story. I have friends in Kalamazoo up the road, and they would say the same. This is not to denigrate an academic career because we need people doing full-time research and people to whom we can send babies. We need someone with expertise and uncommon problems that we don't have, but it was another way that I was just fortunate to have chosen to be at level three in a medium-sized community.

Still, there's a real danger if all of your training is at a place like that of having an ivory tower syndrome and believing that you can't possibly deliver good medicine any place but in such a center. You've got all these people around that you can call in if you need them, and how could you possibly practice good medicine at a location where you didn't have all those sorts of experts? It was true back then, but it's even more true now; they're at the other end of a telephone or an email. You are not giving up much access to expertise by practicing at a level three in a medium-sized community, and there are all these other benefits.

One of the things for me is being part of the community outside of medicine. I couldn't have done this in Baltimore, but I can do it here. I have friends that I play softball and basketball with; I have friends from church; and I have a community all around me that, not that you wouldn't have those things in Baltimore or Los Angeles, but it's a lot more intimate and personal, and the number of times that someone will come up to me in a grocery

store and say, “You took care of my baby 20 years ago, and here are pictures of her now”—that kind of experiences I don’t think I would have had in Baltimore.

3. You are known for NICU layout and design. Can you discuss some important aspects to consider when designing a NICU?

Let me give you my background, which is why this is important to me. When I started in neonatology, everyone had a big open NICU with 8, 10, or 12 beds in each room. They were very noisy and bright, significantly overstimulating not only for the babies but also for the staff and the families. The amount of time families were allowed there was not much, and we’ve gotten much better at that. We still have ways to go because a lot of people now have gone to the other extreme and believe that NICU should be quiet and dark, and you have to restrict touching the baby or bothering them much until they’re almost close to discharge.

There is still overstimulation in a few NICUs; however, there’s a lot of sensory deprivation now, and it’s all well-intentioned, but it’s not consistent with the evidence. The babies benefit from a circadian rhythm, lighting, hearing music, and their mother’s voices even while asleep. Touch is an essential means of communication with them. You wonder what that has to do with design, but you must understand a baby’s and the family’s needs to get the design right.

---

***“There is still overstimulation in a few NICUs; however, there’s a lot of sensory deprivation now, and it’s all well-intentioned, but it’s not consistent with the evidence. The babies benefit from a circadian rhythm, lighting, hearing music, and their mother’s voices even while asleep. Touch is an essential means of communication with them. You wonder what that has to do with design, but you must understand a baby’s and the family’s needs to get the design right.”***

---

The first part is knowing what babies need for neurodevelopment, and that led us to build a NICU that has a lot of single-family rooms. Some people call them private rooms, but I like to emphasize the family component. The next crucial component is couplet care rooms if your NICU is in a hospital where they do deliveries. Until now, almost all babies and mothers are separated when the baby goes to the NICU, and the mother is sent to a postpartum floor where she’s surrounded by mothers with healthy babies, which has to be extremely painful for her, not only the separation but seeing that other moms are not having to go through what she goes through.

We figured out that we shouldn’t be separating mothers from healthy babies back in the 80s. It used to be done before when there was the nursery, mom had a room, and everybody came and looked at babies through the windows. We figured all that out in the 80s, and now nobody would think about separating mothers

and babies when the baby is healthy. Likewise, they shouldn’t be doing it when the baby’s sick. The baby needs the family as much, or more; the mother and father want to be with the baby more than if the baby is healthy.

For daylight and the visual environment, we have a giant atrium. All the rooms have windows to either the atrium or the outside, so families can stay with their babies and have access to regular day and night; they know the weather outside, and there’s a balcony they can go out on to relax and decompress before they go back to see their baby. We try to make it a place where families can have a home away from home. Many of them will be there for weeks at a time, and when that happens, parents bond better, and babies do better, not only when they’re in the NICU but also after discharge.

We have occasional kids that we have to send to a level four NICU because they need specialist care that we can’t provide. Pediatric surgery is the most common, and the parents can’t wait to get back to our NICU because the environment is so much more supportive and nurturing for them and their baby. We’re hoping that other people can learn from our experience. We’re just one of a couple dozen in the country with couplet care rooms. There are many more with single-family rooms, which is the trend for the future because that’s the right thing to do.

I was trying to make the point that it’s not that you can’t do this kind of radical new different stuff at level fours; you definitely can, and Loma Linda and Yale are good examples of that, but I think it was a lot easier to do at our hospital. I have to give credit to the CEO of the hospital. I’m sure there are other hospitals where the CEO wouldn’t think of it, and there wouldn’t be any chance. But you certainly are not reducing your chance of doing something new and innovative just because you might practice at a medium-sized community hospital instead of a big level four.

4. How do you think the critical care scenario of the NICU affects the chance of burnout? And how should we counter it?

I teach a class of pre-med students at Notre Dame, and we discuss dealing with critical situations because some people aren’t sure they want to go into a specialty that’ll frequently put them in the position of losing a patient or having challenging, emotional moments. One of the points I always make to them is how gratifying it is if you can make it through that with a family, even if you lose the baby, to know that somebody cared, did the absolute best that could be done, and cared not only about their baby but about them. If you get them through that situation with that kind of feeling at the end of it, even when you’ve lost the baby, you feel like, okay, that’s what God put me here for. He gave me the talents and opportunities to help people through this situation, and I’d be selfish if I were not willing to use them for people suffering in this situation.

The other part of the story is you get the baby through, and then you have this wonderful feeling that this was hard, and I gave it everything I could and did the best I could, and the baby made it through. The parents sometimes will look at you as a miracle worker and say you saved my baby. However, even when you know that’s not entirely true, you still know that you were part of a challenging situation, and it turned out well, and I don’t know any better feeling you could have in any profession. It took me a while to reach that point, but now I embrace those moments.

You won’t find it in any other area of critical care medicine. I have a son who works in adult critical care and another who works in pediatric critical care, and when they get their patients through the most crucial stage, they get moved out to the floor and don’t see

them again. For the most part, after we get a 23-weeker through a tough first week and they're moving along, we get to stay with them and their family till they go home for the next three months and watch them grow and thrive.

---

***“I teach a class of pre-med students at Notre Dame, and we discuss dealing with critical situations because some people aren’t sure they want to go into a specialty that’ll frequently put them in the position of losing a patient or having challenging, emotional moments. One of the points I always make to them is how gratifying it is if you can make it through that with a family, even if you lose the baby, to know that somebody cared, did the absolute best that could be done, and cared not only about their baby but about them.”***

---

5. What are you currently working on?

I have lots of hobbies, primarily sports. I play softball and basketball, do weightlifting and track and field, but the most fun time I spend is with my grandchildren. I’m fortunate that three out of our four kids stayed in this area, so there are grandkids around a lot of the time, and there’s nothing more fun than that. So when I have that opportunity, that’s what I’m doing when I get home from the hospital.

\*Answers paraphrased from video/voice call.

**References:**

1. Korzeniewski SJ, Slaughter J, Lenski M, Haak P, Paneth N. The complex aetiology of cerebral palsy. *Nat Rev Neurol*. 2018 Sep;14(9):528–543. doi: 10.1038/s41582-018-0043-6. PMID: 30104744.
2. Morgan C, Fetters L, Adde L, Badawi N, Bancalè A, Boyd RN, Chorna O, Cioni G, Damiano DL, Darrah J, de Vries LS, Dusing S, Einspieler C, Eliasson AC, Ferriero D, Fehlings D, Forsberg H, Gordon AM, Greaves S, Guzzetta A, Hadders-Algra M, Harbourne R, Karlsson P, Krumlinde-Sundholm L, Latal B, Loughran-Fowlds A, Mak C, Maitre N, McIntyre S, Mei C, Morgan A, Kakooza-Mwesige A, Romeo DM, Sanchez K, Spittle A, Shepherd R, Thornton M, Valentine J, Ward R, Whittingham K, Zamany A, Novak I. Early Intervention for Children Aged 0 to 2 Years With or at High Risk of Cerebral Palsy: International Clinical Practice Guideline Based on Systematic Reviews. *JAMA Pediatr*. 2021 Aug 1;175(8):846–858. doi: 10.1001/jamapediatrics.2021.0878. PMID: 33999106; PMCID: PMC9677545.
3. O’Shea TM. Diagnosis, treatment, and prevention of cerebral palsy. *Clin Obstet Gynecol*. 2008 Dec;51(4):816–28. doi:

10.1097/GRF.0b013e3181870ba7. PMID: 18981805; PMCID: PMC3051278.

4. Paul S, Nahar A, Bhagawati M, Kunwar AJ. A Review on Recent Advances of Cerebral Palsy. *Oxid Med Cell Longev*. 2022 Jul 30;2022:2622310. doi: 10.1155/2022/2622310. PMID: 35941906; PMCID: PMC9356840.
5. Mlodawski J, Mlodawska M, Pazera G, Michalski W, Domanski T, Dolecka-Slusarczyk M, Gluszek S, Rokita W. Cerebral palsy and obstetric-neonatal interventions. *Ginekol Pol*. 2019;90(12):722–727. doi: 10.5603/GP.2019.0124. PMID: 31909467.
6. Morgan C, Fahey M, Roy B, Novak I. Diagnosing cerebral palsy in full-term infants. *J Paediatr Child Health*. 2018 Oct;54(10):1159–1164. doi: 10.1111/jpc.14177. PMID: 30294991.
7. Seesahai J, Luther M, Church PT, Maddalena P, Asztalos E, Rotter T, Banihani R. The assessment of general movements in term and late-preterm infants diagnosed with neonatal encephalopathy, as a predictive tool of cerebral palsy by 2 years of age—a scoping review. *Syst Rev*. 2021 Aug 12;10(1):226. doi: 10.1186/s13643-021-01765-8. PMID: 34384482; PMCID: PMC8359053.

**Disclosure:** The authors have no conflicts of interests to disclose.

**NT**

**Corresponding Author**



Benjamin Hopkins, OMS IV  
Western University of Health Sciences  
College of Osteopathic Medicine of the Pacific  
Email: [Benjamin.Hopkins@westernu.edu](mailto:Benjamin.Hopkins@westernu.edu)



*Robert D. White, MD*  
*Director, Regional Newborn Program*  
*Beacon Children's Hospital*  
*615 N. Michigan St.*  
*South Bend, IN 46601*  
*Phone: 574-647-7141*  
*Fax: 574-647-3672*  
*Email: [Robert\\_White@pediatrix.com](mailto:Robert_White@pediatrix.com)*