NEONATOLOGY TODAY

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NT

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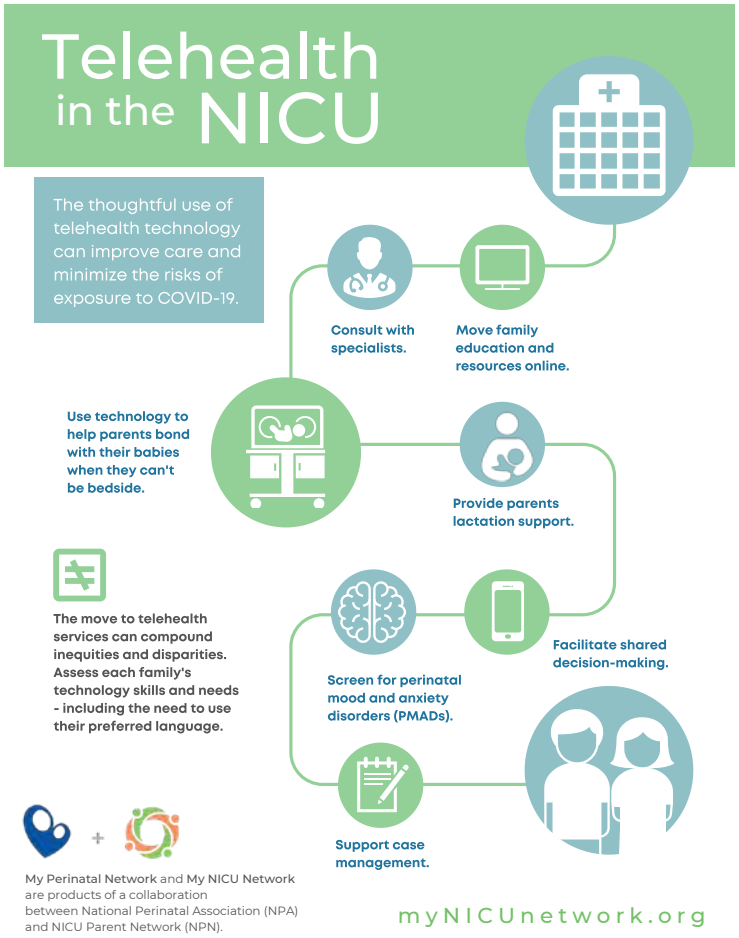
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Pictured: Baby Kole with his Dad

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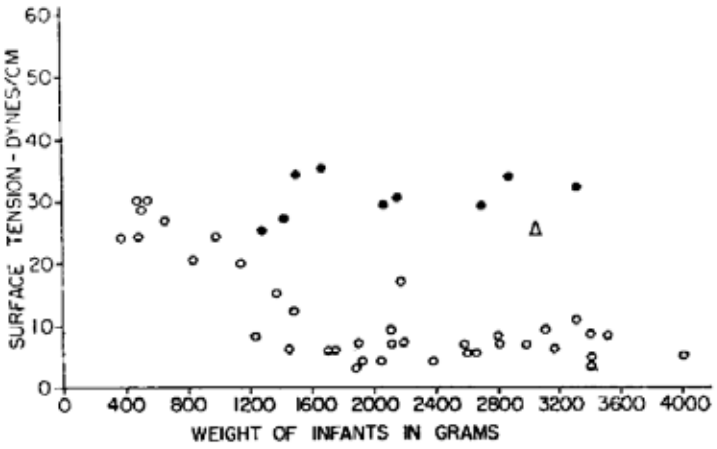
Joseph B. Philips, III, MD, FAAP, Monica V. Collins, RN

(JBP) The development of surfactant replacement therapy for respiratory distress syndrome (RDS) is one of the most significant advances in the history of neonatology. Our goal in this reminiscence is not to review the development of surfactants in detail but instead to present our personal, albeit small, part in the introduction of this lifesaving treatment. We will briefly review surfactant development and refer the reader to excellent reviews of the same up until 1980 by Obladen (1), as well as the final three chapters in Julius Comroe's wonderful collection of essays, *Retrospectroscope.* (2)

"The development of surfactant replacement therapy for respiratory distress syndrome (RDS) is one of the most significant advances in the history of neonatology."

In summary, abnormalities in the lungs of deceased infants were noted by Virchow shortly after the invention of the microscope. Hyaline membranes were first correctly described by Hochheim in 1903 and were again described by Farber and Sweet in 1931. These membranes were hypothesized, among other things, to be composed of fibrin or aspirated vernix and were purported to be the cause of RDS as detailed in Silverman's superb book*, Human Experimentation: A Guided Step into the Unknown* (Table 1). (3) Multiple attempts at dissolving them or preventing their formation were made and failed (Table 2). All of this confusion was clarified by the seminal discovery by Avery and Mead in 1959, which revealed that surfactant deficiency is the cause of RDS (Figure 1). (4) Further interest in RDS was stimulated by the death of the infant son of President and First Lady, John F. and Jacqueline

Figure 1. Lowest surface tension of extracts from infants dying from RDS (filled circles) and infants without RDS (open circles). (4)



Kennedy, Patrick Bouvier Kennedy. He was born in August of 1963 by cesarean section at Otis Air Force Base at 34 weeks, 5 days gestation and weighed 2,110 grams. He immediately developed RDS and was transferred to Boston Children's Hospital, where the intern caring for him was Dr. George Cassady, who recruited me here in 1980 (Figure 2). He related to us that the baby developed a pneumothorax. It was debated whether it was under tension or not, because the lung was not fully collapsed, as it would be in an adult with a tension pneumothorax. We now know that the lungs of babies with tension pneumothorax and RDS do not collapse the lung entirely due to the stiffness of the lung. The decision was made to place a chest tube by a senior surgical team, and in the process, the baby's heart was lacerated, and he exsanguinated.

Following Avery and Mead's landmark discovery, a lengthy period of research ensued to determine the nature and composition of

Table 1. Hypothesized Origin of Hyaline Membranes (3):

- Myelin formation in lungs
- Congenital aspiration pneumonia
- Asphyxial membrane
- Desquamative anaerosis
- Congenital alveolar dysplasia
- Vernix membrane
- Hyaline membrane
- Hyaline atelectasis
- Fibrin exudate
- Pulmonary hypoperfusion syndrome

Table 2. Failed or Abandoned Treatments for (3):

- Bloxom Air Lock (cycled hyperbaric oscillation)
- Hyperbaric Oxygen
- Alevaire Mist (detergent/bicarbonate aerosol)
- Acetylcholine
- Magnesium Sulfate (Epsom Salt) Enemas
- Glucose/Insulin/Bicarbonate (Usher regimen)
- Exchange Transfusion
- Plasminogen Infusions
- Sternal Traction

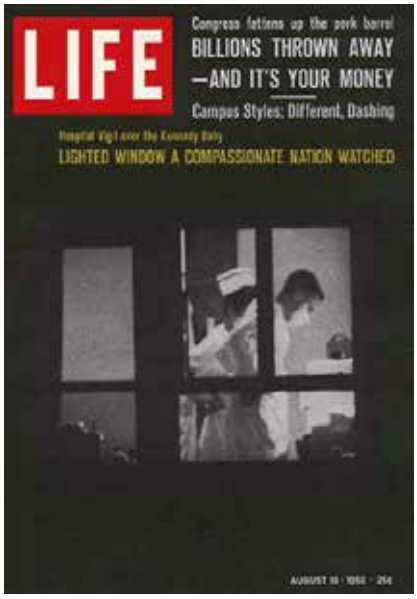
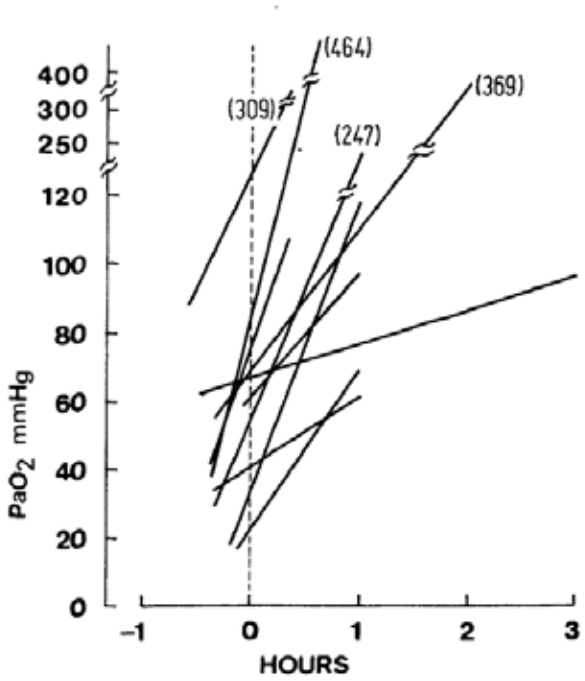


Figure 2. The cover of LIFE magazine features Dr. George Cassady and an unidentified nurse examining the incubator of Patrick Bouvier Kennedy.

pulmonary surfactant, identifying dipalmitoyl phosphatidylcholine (DPPC) as the primary component. What followed was a series of unsuccessful attempts at surfactant therapy, primarily using aerosolized DPPC. (5, 6) After a series of studies in animals demonstrated that surfactant lung extracts could be effective, Fujiwara published his groundbreaking report in 1980, showing efficacy in human infants (Figure 3). (7)

Following this momentous discovery, the race to develop a commercially viable surfactant preparation was in full swing. The

Figure 3. Changes in arterial oxygen tension in response to surfactant treatment. (7)



1980s were the decade of surfactant development. An excellent review by Merritt and Hallman in 1988 summarized the various preparations under development as well as the clinical trials to date. (8)

Our small part in this saga began with a dose-ranging study of Exosurf Neonatal, a synthetic surfactant composed of DPPC with two alcohol additives to promote absorption and spreading developed by Dr. John Clements at the University of California at San Francisco and licensed to the Burroughs Wellcome Company (BW). (9, 10) Dr. Philips travelled to their futuristic headquarters building in the Research Triangle located in central North Carolina for an organizational meeting. Following this, BW sent a team to UAB to train us. The study was then conducted from March through December of 1989.

"Our small part in this saga began with a dose-ranging study of Exosurf Neonatal, a synthetic surfactant composed of DPPC with two alcohol additives to promote absorption and spreading developed by Dr. John Clements at the University of California at San Francisco and licensed to the Burroughs Wellcome Company..."

(MVC) The BW study team spent 2½ days at UAB educating the research nurses, nurse practitioners, respiratory therapists, fellows, and faculty on everything from the physiology of surfactant deficiency, the composition of Exosurf Neonatal (including the fact that the lipid component was made in Alabaster, AL), procedures for the study, completion of data forms and regulatory documents, and obtaining informed consent. In 1989, there was very little money for conducting research activities and purchasing hospital equipment. My husband and I constructed a screen from several 1 x 2 boards and some opaque fabric, which was used to shield the study procedures from onlookers. Two of the research nurses were on call 24/7, including weekends, without pay, in order to complete consent, randomization, and administration of the study drug or sham as quickly as possible within 24 hours after birth. The hospital pages calling us away from the Thanksgiving dinner table, after-school activities, or at 4 AM were difficult, waking husbands up to ensure they could get the children to daycare or school, brushing our hair and teeth, and heading into the hospital with a pep talk and a smile. The drive was often in the dead of night, through Birmingham's Southside, and then parking in an eerie, adjacent, poorly lit parking deck. Getting from the parking deck to the inside of the hospital, walking/running through the dimly lit hospital exterior to the one unlocked external door, three-quarters of a block away, provided the adrenaline needed to hit the ground running once inside.

New parents—almost always stunned due to the premature birth with "deer-in-the headlight" looks on their faces—were being asked to trust us, people they had never met before who were explaining complicated study procedures, risks, benefits and asking for their voluntary participation in a study of a brand new

drug for a disease they just were told about to allow their tiny baby to be in the study. The decision had to be made as quickly as possible, often within hours. Many of these families chose to participate in this pivotal research, and for that, we were grateful.

"New parents—almost always stunned due to the premature birth with "deer-in-the headlight" looks on their faces—were being asked to trust us, people they had never met before who were explaining complicated study procedures, risks, benefits and asking for their voluntary participation in a study of a brand new drug for a disease they just were told about to allow their tiny baby to be in the study. The decision had to be made as quickly as possible, often within hours."

After obtaining consent, we called the research pharmacist on call (often in the middle of the night), who then randomized the infant while we silently hoped the randomization was for surfactant, not air sham. We traveled to the 17th floor of the hospital to obtain the drug/sham treatment from the pharmacy, proceeded to gather the required paperwork, the homemade shield, and took deep breaths as we assumed care of the infant from the staff RN and RT. The baby was taken off the ventilator, the existing connector of the endotracheal (ET) tube was removed from the tube (while it was still in the baby) and replaced with a connector with a side port. This had to be done quickly, and even then, babies would often drop their oxygen levels, monitored with transcutaneous pO_2 monitors, with the resultant bradycardia. After the baby was restabilized, it was shielded from the view of the nursery staff and administered 5 mL/kg of study fluid or sham air in four aliquots via the side port. The baby was rolled onto its left side with its head up, then down. We then rolled the baby to the right side and proceeded with dosing in the head-up and head-down position. We held *our* breaths, hoping that the ET tube would stay put and that the baby would not develop a pneumothorax or even drown during the dosing. Often, ventilator pressures and oxygen levels had to be adjusted rapidly during dosing as the baby's lung compliance changed dramatically. The changes left us breathless—pun intended! We waited 15 minutes behind the screen to allow the surfactant to be absorbed and not come back up the ET tube, and then emerged, certain that the staff would know which treatment the baby had received, either by changes in ventilator settings or our attempted suppressed smiles—but surprisingly, they often guessed incorrectly. The care was then returned to the regular nursery staff.

The data collected pre- and post-dosing were meticulous, including dates, times, heart and respiratory rates, oxygen levels, morbidities, and concomitant medications. When the protocol required an arterial blood gas at 15 minutes post-dosing, one obtained at 16 minutes was outside the window and thus, "not counted." The same with all data points—30 minutes, 2 hours, etc. Every question had to be answered—dated and timed, meticulously. The study was closely monitored with BW sending study personnel to verify every data point we collected, after every enrollee. We learned a great deal about good, clean research from this study.

This was such an exciting time in neonatal research! As neonatal nurses, we had watched over the years as babies died from pneumothoraces and other severe RDS-related complications, devastating young parents and their caregivers. This particular research changed forever the hopes and futures of premature babies, their families, and those of us who cared for them. We were fortunate to be part of it!

(JBP) The results of the Exosurf Neonatal trial showed that it was superior to the placebo and that the intermediate dose was most effective (Figure 4). An earlier publication demonstrated that it significantly reduced mortality up to one year of age (Figure 5). (11) Although not cited as authors, we received two further grants from BW for trials entitled "North American Multicenter Trial of the Effects of Two Dosing Regimens of EXOSURF Neonatal on Alveolar-Arterial Oxygen Tension Gradient Improvement in Larger Infants with Established Respiratory Distress Syndrome" and "North American Multicenter Trial of 3 vs. 6 Doses of Exosurf Neonatal in Infants Either at Risk for or with Early Established Respiratory Distress Syndrome and with Birthweights ≥ 500 grams and < 750 grams."

Next up was a head-to-head trial conducted by the NICHD-sponsored Neonatal Research Network (NRN) of which UAB was a founding member in 1986. (12) The Network enrolled a total of

Figure 4. Effect of three different doses of Exosurf Neonatal compared to placebo on the arterial–alveolar oxygen gradient. (9)

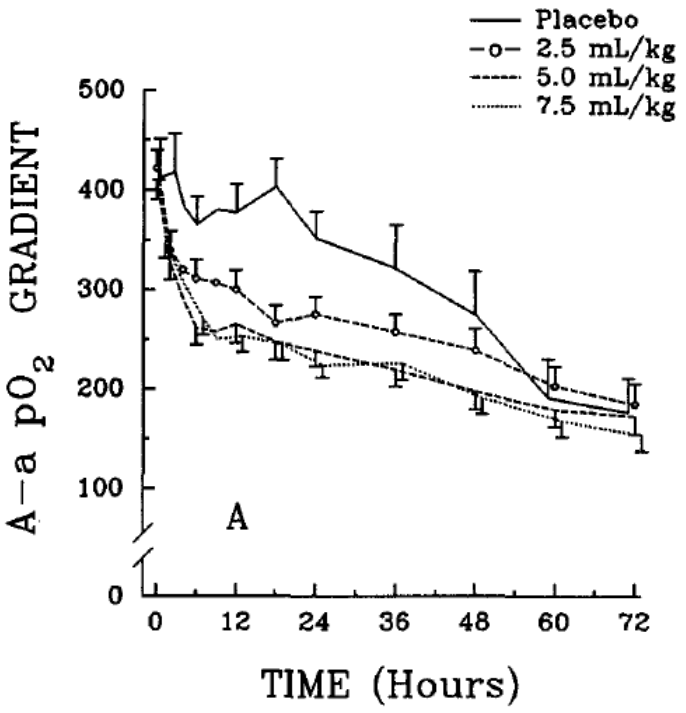
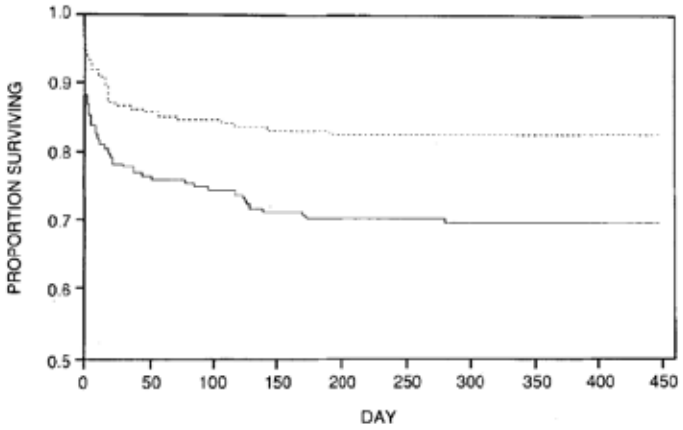
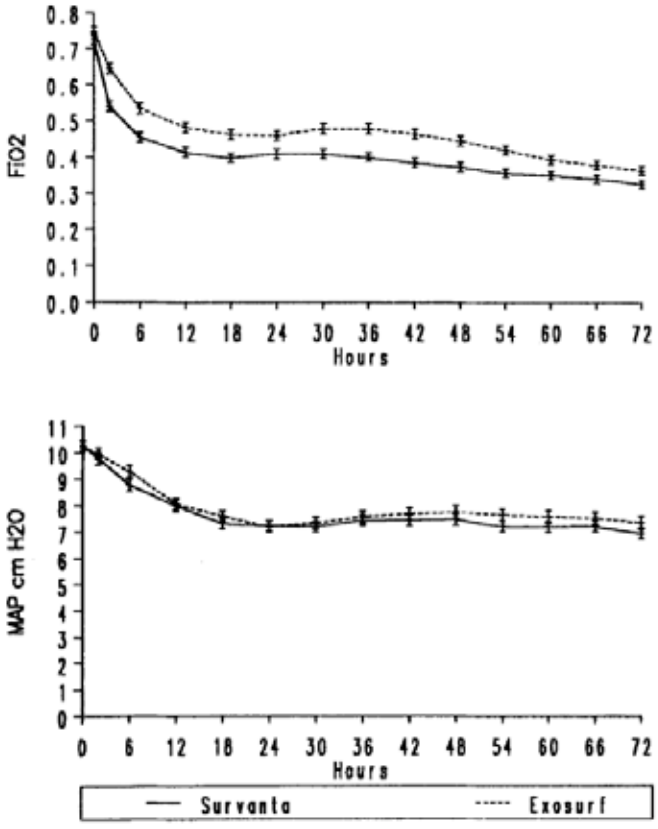


Figure 5. Kaplan-Meier survival curves showing the effect of Exosurf Neonatal (dotted line) versus air placebo (solid line) out to 450 days of age. (11)



617 infants to receive either Exosurf Neonatal or Survanta (Ross Laboratories). Results showed no difference between the two surfactants in rates of death or bronchopulmonary dysplasia but noted a difference in the initial response to the two, with the better one being associated with Survanta (Figure 6).

Figure 6. Effect of Exosurf Neonatal versus Survanta on inspired oxygen concentration and mean airway pressure in the first 3 days after treatment. (12)



At some point around this time, I received a phone call from the founder and CEO of Avanti Polar Lipids, the company mentioned by Ms. Collins, saying that BW was placing orders for huge amounts of DPPC and wanted to know if this product would endure because he would need to expand his plant to fulfill the orders greatly. I told him yes but that I was not sure for how long, as there were many additional surfactant preparations in the pipeline, and I could not be sure which one(s) would ultimately prevail.

Our center participated in a further head-to-head trial comparing Survanta (Beractant), a modified bovine lung extract supplemented with DPPC, palmitic acid, and tripalmitoylglycerol, which contains surfactant proteins B and C, with Infasurf (Calfactant). This calf lung lavage extract also contains surfactant proteins B and C. (13) The study included both a treatment arm, including infants ≤ 2,000 grams birthweight with established RDS, and a prevention arm with infants < 1,250 grams birthweight treated at birth. Infants in the treatment arm who received Infasurf had significantly lower inspired oxygen concentrations in the first 24 hours, while there were no significant differences in the prevention group. Both surfactants had similar rates of adverse events and survival for both treatment and prevention arms.

Indeed, multiple other surfactant preparations have been tried over the years with varying degrees of success. A comprehensive review of the topic was published in 2017. (14) Exosurf Neonatal fell out of favor relatively quickly due to its slower onset of action. This is likely due to it not becoming fully active until the DPPC has been taken up by the pulmonary type II pneumocytes and reprocessed into biologically active surfactant, before being re-released into the alveolar space. (15) Exosurf Neonatal was withdrawn from the market in 2003. By this time, however, it had likely saved millions of lives worldwide. Burroughs Wellcome no longer exists as a separate company. It merged with Glaxo to form Glaxo Wellcome in 1995 and then merged with SmithKline Beecham, becoming GlaxoSmithKline in 2000. However, the Wellcome Trust, founded in the United Kingdom by Sir Henry Wellcome, remains the fourth largest philanthropic organization in the world with assets of $50 billion and over $2 billion in annual expenditures as of 2024 (16), while the much smaller Burroughs Wellcome Fund ($783 million) is headquartered in the United States. (17)

"Indeed, multiple other surfactant preparations have been tried over the years with varying degrees of success. A comprehensive review of the topic was published in 2017. Exosurf Neonatal fell out of favor relatively quickly due to its slower onset of action. This is likely due to it not becoming fully active until the DPPC has been taken up by the pulmonary type II pneumocytes and reprocessed into biologically active surfactant, before being re-released into the alveolar space."

Readers who have not participated in clinical trials should understand how challenging and time-consuming these studies can be. As detailed in Ms. Collins' section, considerable sacrifice is often required of the individuals conducting the trials. Most of the studies UAB has conducted for the NRN over the past few decades required a year or more of planning and review before approval. Manuals of Operating Procedures, which often span scores of pages, and detailed data collection forms need to be developed, and the team conducting the studies must be trained in their use. The Institutional Review Board must approve the project of each participating institution before it is initiated. Recruiting subjects requires dedicated research personnel who may need to be on call 24/7/365. Other individuals collect and maintain the database from which the results will be derived. Data Monitoring and Safety Committees periodically review the progress of the projects and may terminate them early if adverse safety signals or signs of futility are detected. Data analysis and manuscript preparation also require considerable time and effort. Ultimately, submission to a journal, review, and revision result in the publication and dissemination of the findings, which may then influence or change patient care. The publications appear clean and tidy, but behind them lie huge amounts of time, money, and energy invested by many people.

"In conclusion, individuals who entered our arena after the FDA approval of various surfactants in the early 1990s have no inkling of how suddenly and profoundly these agents transformed neonatal ICUs... These lifesaving drugs have now spared millions of lives."

In conclusion, individuals who entered our arena after the FDA approval of various surfactants in the early 1990s have no inkling of how suddenly and profoundly these agents transformed neonatal ICUs. Prior to this, our standard starting settings for ventilators in infants with RDS were at a rate of 40 breaths per minute, a peak pressure of 25 cm H_2O, an end-expired pressure of 5 cm H_2O, and an inspired oxygen concentration of 40%. From there, we would usually increase the settings significantly as the infants worsened over the first few days, often to peak pressures of 35 cm H_2O or more, higher rates, and up to 100% oxygen. After this, surviving babies would slowly improve as their endogenous surfactant production matured and improved their lung function, provided their lungs had not been irreversibly injured by barotrauma, volutrauma, and oxygen toxicity. These lifesaving drugs have now spared millions of lives. It was thrilling to play even a small part in this process.

The authors thank Ms. Lauren McInnis, BA, MA, for her assistance with the references.

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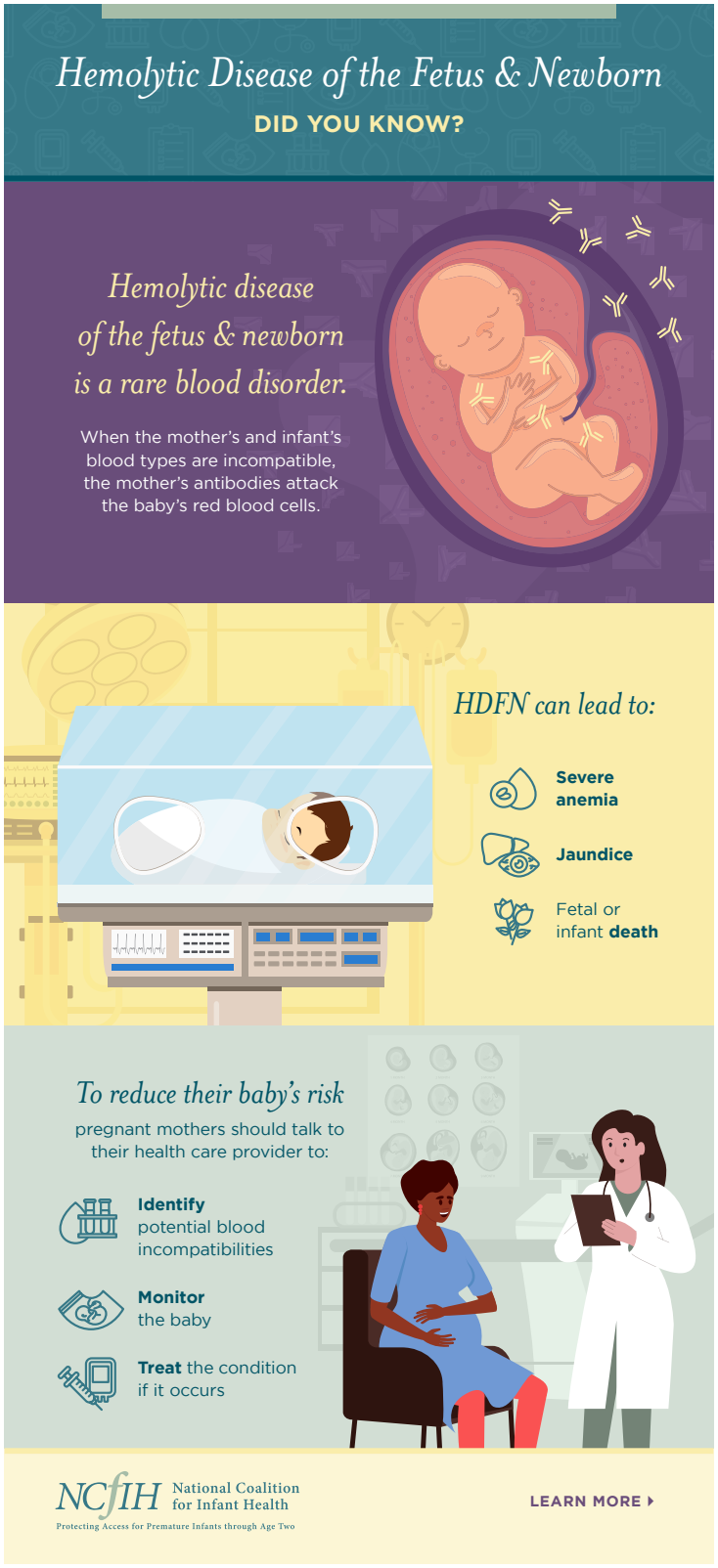


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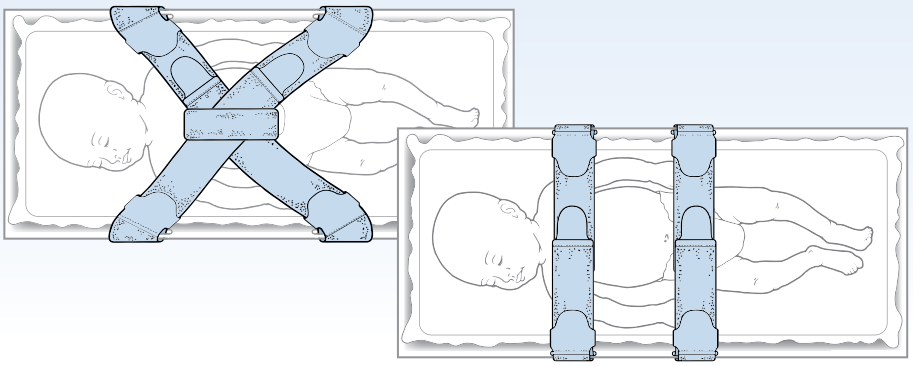


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A Commentary on the Selected Aspects in the History of Surfactant Therapy for Premature Infants: A Bench to NICU Success Story

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The journey of pulmonary surfactant began nearly a century ago in 1929 (1). By the early 1990s, the synthetic surfactant preparation Exosurf® (Burroughs-Wellcome, Research Triangle, North Carolina), formulated by Dr. John Clements, was the first surfactant approved by the Food and Drug Administration (FDA) for clinical use in premature infants following animal studies that demonstrated its efficacy (2, 3).

"The journey of pulmonary surfactant began nearly a century ago in 1929. By the early 1990s, the synthetic surfactant preparation Exosurf®, formulated by Dr. John Clements, was the first surfactant approved by the Food and Drug Administration (FDA) for clinical use in premature infants following animal studies that demonstrated its efficacy."

The passing of John Clements in 2024 at the age of 101 marked a significant loss, as his contributions to Neonatal Medicine were immense, as described by Hawgood (4). Although the clinical "life" of Exosurf was short, Dr. Clements, as a physiologist, established rigorous scientific inquiry as an example for today's Neonatologists and those in training. Furthermore, as vividly described in this issue, the clinical dedication by clinical trialists (Neonatologists, NICU nurses, and Respiratory Care Practitioners) documents the discipline and clinical coordination to gain informed consent and the real-time documentation of critical clinical data that gained Exosurf the status of first in class of novel drug dedicated to the treatment of premature infants to be approved by the US Food and Drug Administration.

Human, cow, calf, or porcine-derived surfactants were the focus of clinical trials (under investigational drug numbers issued by the FDA) among infants with or at high risk of respiratory distress syndrome (RDS), previously termed hyaline membrane disease, in a series of clinical trials initially compared to placebo and then against other formulations in the 1980s and 1990s. Both the FDA and the National Institutes of Health (NIH), as well as the March of Dimes, publicized surfactant replacement therapy as a "laboratory bench to bedside research" success story. Indeed, surfactant replacement therapy has resulted in saving millions of lives of prematurely born infants worldwide as well as in reducing morbidities in these babies.

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In this account of the history of surfactant discovery and its transition to bedside use, several contributions highlight the fact that although surfactant replacement therapy has become commonplace and is now routinely used in Neonatal Intensive Care Units, the initial steps were very challenging. A neonatologist's practice before surfactant therapy was a different reality not witnessed by current trainees or recently graduated Neonatologists.

Among infants born prematurely with surfactant deficiency, and using earlier modes of assisted ventilation, pulmonary air leak syndromes were common, as inspiratory distending pressures were often higher than currently used, and death was common, including the infant son, Patrick Bouvier Kennedy, the prematurely born infant son of President Kennedy (birthweight 1860 grams, gestational age 34–35 weeks) who died of RDS at Boston Children's Hospital. As documented by Philips and Collins, this infant's death drew national attention to RDS, then termed hyaline membrane disease, after multiple therapies were attempted as documented by Dr. Philips' mentor and described by Dr. Philips in this issue.

The key functions of the lung include its ability to carry out

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oxygen (O_2)/carbon dioxide (CO_2) exchange, as well as defend against harmful agents to which the lung is exposed during respiration. Pulmonary surfactant is of paramount importance for life because it prevents the collapse of the distal airspaces or alveoli at low lung volumes, thereby enabling the lung to carry out gas exchange. Pulmonary surfactant is a lipoprotein complex that consists of multiple characteristic lipids, including dipalmitoyl phosphatidylcholine (DPPC), being the major saturated phospholipid, phosphatidyl inositol, and phosphatidylglycerol that herald "mature" surfactant (3). The four surfactant proteins (SP-A, -B, -C, and -D) have important roles in surfactant-related functions and/or innate host defense (5–7).

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The initial clinical surfactant replacement studies were short of success in part due to the choice of the surfactant component for treatment of prematurely born infants (8). DPPC, the major phospholipid component of pulmonary surfactant, was initially used in surfactant replacement studies. These studies were unsuccessful because the phase-transition temperature of DPPC is above 37 ºC; therefore, at body temperature, it remains in its solid state and cannot spread.

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Today, several surfactant preparations are used in the Neonatal Intensive Care Unit. They are derived from a natural source, either minced bovine or porcine lung, or bronchoalveolar lavage (BAL). Synthetic surfactants containing synthetic peptides or proteins have been studied. These clinical trials have been promising. However, the commercially available surfactants at present are derived from natural sources. In the foreseeable future, as our knowledge of the function of surfactant components, alone or in combination with other drugs, increases, it will be possible to have "designer" surfactant preparations. Methods of administration will also become less invasive in the NICU, and their use may be condition- or disease-specific. Equally important is an understanding of the genetic variations in surfactant proteins or their absence, which may initially mimic RDS or prove difficult in treatment, including the necessity of lung transplantation when specific surfactant proteins are absent, such as in SP-B (7).

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The distinctive characteristic of the lung to expand and retract was recognized early on, and the expansion/ contraction property of the lung was initially attributed to its elasticity. In fact, the lung was viewed as a simple bag for gas exchange, and no one credited the lung with having an active metabolic life that would involve the production of substances such as surfactant. Kurt von Neergaard, a Swiss physiologist, introduced the concept in 1929 that several forces contribute to the expansion and contraction of the lungs (1). Given the fact that the terminal airspaces are spherical-like structures, with near-equal radius (R), he proposed that these structures are subject to forces, creating pressure (P), dictated by the surface tension coefficient (γ) of the lining material, as shown by the law of Young and Laplace: $P = 2\,\gamma\,(1/R_1 + 1/R_2)$. However, he also realized that, according to this law, the pressure exerted on a spherical-like structure, such as the alveolus, increases as the radius decreases, which would result in the collapse of the small alveoli. Because this does not happen in the normal mature lung, Neergaard hypothesized that there may be a substance, yet to be identified, that lowers surface tension during expiration, thereby preventing alveolar collapse. Hence, he not only recognized the importance of forces and specifically that of surface tension in lung expansion and contraction, but also conceptually recognized the existence of "a substance" that would be critical in preventing alveolar collapse. The proposed substance was later identified as pulmonary surfactant.

In 1947, Dr. Peter Gruenwald repeated von Neergaard's observation that lower pressure is required to fill the lungs of newborn babies (who had passed away) with a salt solution than with air. He attributed this to the principles of surface tension, and he experimented with "surface active substances" that lowered the surface tension (9). Unable to make the clinical connection, he stopped his inquiry there. In 1956, John Clements of the Edgewood US Army Center published his experiments on quantitative studies of lung surfactant, using saline to extract material from the airways

of degassed lungs. He studied its surface tension properties using the modified Langmuir–Wilhelmy balance. The surface area was cycled mechanically, and the weight of the immersed thin platinum plate was recorded, indicating the magnitude of the surface tension coefficient ($\gamma = \Delta F/2\ L$, where ΔF is the weight increase of the platinum plate and L is the length of one immersed side of the plate). γ decreased to near zero upon surface compression and increased to 30–46 mN/m during surface expansion (γ = 72 mN/m in water-air). Detergents generally have a low and constant γ.

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Mary-Ellen Avery, a student of Gruenwald and a neonatal fellow of Clement Smith at Harvard in Boston, collaborated with Jere Mead, an experimental biologist; they reported a remarkable finding in 1959. She analyzed the surface activity of airway lavage in autopsies at Dr. Mead's research laboratory, using the Clements method. For the nine studied infants who had died of HMD, birth weights ranged from 1,200 to 3,300 g, and the postmortem airway lavage fluid was not surface-active (i.e., the minimum surface tension upon surface compression was 25–40 mN/m). For multiple newborns who had died of other causes, the minimum surface tension was lower (<10 mN/m^2, approaching zero) (13). This finding was the first solid evidence that in HMD, the lining material of the terminal air spaces is not surface-active since low surface tension was not obtained upon surface compression. These observations inspired Avery and Mead to investigate reduced surface tension properties in infants with hyaline membrane disease (9).

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Over a quarter of a century went by before Neergaard's vision of the existence of surfactant was revisited. This delay was due, in part, to the fact that the focus was on the presence of "hyaline membranes," which were thought to be the cause of respiratory problems in prematurely born babies. These membranes were thought to form when babies breathed in amniotic fluid. As we now know, the hyaline membranes are a result, rather than the cause, of respiratory distress. In 1954 a British Army physician Richard Pattle, while studying pulmonary edema foam, observed that a "foamy" substance lines the surface of alveoli and that the bubbles from this substance were stable for one hour or even longer, compared to bubbles from other fluids, such as blood, that lasted only a few minutes, indicating that the surface tension in the lung was low. He surmised that the bubbles must be covered with a unique substance that confers the observed stability. Its tiny bubbles were exceptionally stable, indicating a lack of air-liquid pressure according to Young-Laplace: $P = 2\gamma/r$, where γ is the surface tension coefficient and r is the radius of the bubble. In contrast, bubbles of serum or de-aerated lung edema were unstable, suggesting a higher air-liquid surface tension (10). Pattle speculated about the consequences of this high surface tension in newborns' lungs (12).

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Almost in parallel with Pattle, Dr. John Clements, a volunteer for military service in 1956, was assigned the task of determining the disastrous effects of war gases on lung tissue. (11, 12). Rather than focusing on the entire lung or lung extracts, he focused on the bubbles that appeared in the airways of the exposed lungs (11). Dr. Clements, a physiologist, along with the Canadian pathologist Chris Macklin, developed methods to measure surface tension (12, 13). They observed that the surface tension of this previously unknown foamy material was low and varied according to the surface area and the function of the lung (i.e., inhalation and exhalation). When the surface was compressed, the surfactant was concentrated on the surface, and its surface tension approached zero dynes/cm. It is noteworthy to mention that the Pattle and Clements-Macklin teams came to the same conclusions independently within a few months of each other (11, 12). Dr. Clements initially named this substance "anti-atelectasis factor" and later named it pulmonary surfactant. He also highlighted the essential role of surfactant in maintaining a healthy lung.

Surfactant replacement therapy is a success story and has helped significantly in reducing the mortality and morbidity of the prematurely born infants suffering from RDS but has not eliminated the disease. A great deal of work has been carried out and continues to be done on the composition and formulation of surfactants used in the clinic, as well as the function of their various components.

King and Clements reported that a multifunctional collectin protein (~35kDa), which they named apolipoprotein A (now termed SP-A), plays an important role not only in the surfactant structure and proper function but also in lung innate host defense, including pathogen phagocytosis and cytokine production through the alveolar macrophages (14,15). SP-A in humans is encoded by two homologous genes, SP-A1 and SP-A2, each of which has several splice and sequence variants. The 5' untranslated region (UTR) splice variants and the 3'UTR sequence variants have been shown to play a role in their regulation (16). The functions of SP-A1 and SP-A2 have also been shown to differ, and both gene products are necessary for the extracellular structural form of surfactant known as tubular myelin (17). Moreover, an imbalanced expression of SP-A1 and SP-A2 has been shown to correlate with an increased risk of lung disease (18), highlighting the need for a better understanding of the regulatory mechanisms. A better understanding of the regulation of SP-A1 and SP-A2 may help identify points of intervention to enhance gene-specific expression in various pulmonary diseases affecting preterm infants (18). Although new information and cutting-edge technology have enabled modern surfactant replacements to approach the properties of naturally occurring surfactants, commercially available surfactants lack the innate host defense properties of surfactant proteins (SP-A and SP-D). These proteins are crucial for maintaining lung homeostasis, regulating surfactant metabolism, and mediating both innate and adaptive lung immunity (19).

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In neonatal RDS, these prematurely born infants have significantly decreased levels of these surfactant defense proteins compared to full-term infants. Given that a significant complication in prematurely born infants is infection, the inclusion of these proteins in future surfactant preparations is essential. Alternatively, these proteins may also be used individually for the therapy of derangements in innate immunity. Phelps and coworkers reported that an SP-A rescue animal study demonstrates the feasibility of the latter scenario, thereby providing support for the therapeutic use of SP-A (20). In that study, SP-A -/- mice were treated with a single dose of human SP-A, and at various times after treatment, alveolar macrophages (AMs) were isolated and their proteomic expression profile was analyzed. The proteomic profile of the treated AMs approximated that of the wild-type mice and was very different from AMs derived from the SP-A -/- mice.

Furthermore, genetic variants of surfactant proteins, including single-nucleotide polymorphisms, insertion/deletion variants, or haplotypes, have been shown to correlate with lung inflammatory processes, surfactant derangement, and several lung diseases (20). Findings from ongoing and future research on the SP-A variants and their role in innate host defense and surfactant-related functions may be helpful in considering personalized medical regimens. For example, we should understand the mechanisms of differential expression of SP-A variants, which will enable us to modulate expression, depending on the particular environmental stressor, SP-A variant, and/or functional activity of surfactant. Importantly, the natural surfactant contained ~10% of SP-A.

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Possmayer, working in Enhörning's laboratory, examined the activity of an organic lipid extract of pulmonary surfactant, which lacked SP-A, using a pulsating bubble surfactometer developed by Enhörning, and found that the preservation of surface activity of these lipid extracts was entirely restored by adding SP-A. However, the lipid extract of rabbit lungs lacking SP-A retained biological activity using the pulsating surfactometer.

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Several attempts were made to find proteins in these lipid extracts. Metcalfe, Enhörning, and Possmayer reported that it was possible to achieve modified surfactant preparations that were surface-active despite lacking protein (21). This article emphasized that SP-A was unnecessary for surface activity, but it failed to consider

the possible presence of other lipid-soluble proteins. Whitsett et al. clearly established the presence of two small, highly hydrophobic proteins, which proved essential for both biophysical and biological activity (22). Whitsett et al further reported that a lack of SP-B results in rapidly progressive lung disease (23).

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According to the neonatologist Marshall Klaus, collaborating with Clements and Richard Havel, the surface tension-lowering capacity of alveolar surfactant was due to its component DPPC, while other phospholipids provided the rapid surface adsorption (24). In 1964, Robillard from Montreal, Canada, showed promising data on the micro-aerosol DPPC treatment of IRDS (5). In 1967, a randomized trial in Indonesia was reported by J. Chu, in collaboration with, among others, Clements, Klaus, and William Tooley from the USA. They found that aerosolized DPPC neither increased the survival of IRDS patients nor improved their lung function. Based on these results, the investigators proposed lung hypoperfusion as the principal cause of IRDS (6, 7)

"Together with the L/S-ratio and DPC, PI and PG refined the accuracy of antenatal prediction of lung maturity (28). This evidence, together with the beneficial effect of continuous positive airway-pressure (CPAP) on alveolar stability and the gas exchange in IRDS patients and the increase in lung compliance after experimental surfactant therapy before the first breath, suggested that immaturity of the surfactant complex is the primary cause of Infantile RDS (IRDS) "

Louis Gluck, neonatologist from Yale, New Haven, found that in the rabbit fetus, the fraction of *di*-saturated phosphatidylcholine (DPC) in lung airway lavage fluid was low on day 27 of gestation (lung immaturity), but increased towards term (day 30–31), with a further increase shortly after birth. The lamellar bodies also increased in the type II cells. Gluck moved to San Diego and, together with Marie Kulovich, introduced semiquantitative measurement of the DPC to sphingomyelin ratio (L/S ratio) in amniotic fluid, to assess fetal lung maturity (25,26). Thereafter, Clements et al. introduced the shake test as a rapid screening test, based on the ability of surfactant to generate a stable foam in the presence of ethanol (27). Hallman et. al defined phosphatidylglycerol (PG) and phosphatidylinositol (PI) as the minor phospholipids of the surfactant complex. PI and PG successively appeared during antenatal development in the fetal lung and in amniotic fluid, and after birth during recovery from IRDS. Together with the L/S-ratio and DPC, PI and PG refined the accuracy of antenatal prediction of lung maturity (28). This evidence, together with the beneficial effect of continuous positive airway-pressure (CPAP) on alveolar stability and the gas exchange in IRDS patients and the increase in lung compliance after experimental surfactant therapy before the first breath, suggested that immaturity of the surfactant complex is the primary cause of *Infantile* RDS (IRDS) (29)

"It included the characterization of surfactant components' formation in the endoplasmic reticulum, as well as the assembly in the lamellar bodies and exocytosis of the lamellar body content to the epithelial lining fluid. After degradation, surfactant particles are taken up to some extent by alveolar macrophages, but most are taken up by type II alveolar epithelial cells and reprocessed for secretion (i.e., recycling)."

From the late 1960s, surfactant research became a multidisciplinary science (1984 review book by Robertson et al.)(30). It included the characterization of surfactant components' formation in the endoplasmic reticulum, as well as the assembly in the lamellar bodies and exocytosis of the lamellar body content to the epithelial lining fluid. After degradation, surfactant particles are taken up to some extent by alveolar macrophages, but most are taken up by type II alveolar epithelial cells and reprocessed for secretion (i.e., recycling). Indeed, the surfactant of a healthy newborn has a relatively long half-life. The increase in biosynthesis and secretion of surfactant in the fetal lung expanded the surfactant pools in the amniotic fluid, stomach, peripheral airways, and intracellular lamellar bodies. During labor and shortly after birth, lung liquid present in mature lungs is transported to the interstitial space across the alveolar epithelium, while the increase in surfactant secretion concentrates the complex within the alveolar lining. The ingenious visualization technique of Samuel Schürch et al. confirmed that surfactant virtually eliminates surface forces within tiny air spaces *in situ*, and surface tension increases during inspiration (31). Finally, discoveries from the late 1980s revealed the immunological properties of surfactant (32).

As described by multiple researchers, phosphatidylcholines (PCs),

containing uniquely high DPPC (~50%) and mostly mono-unsaturated PCs, are the predominant (60–75%) surfactant components. Besides the acidic phospholipids, PG and PI, the phosphatidylethanolamines, free cholesterol, and free fatty acids are minor lipid components. Unsaturated PG was found to increase the surface adsorption of DPPC without compromising the surface stability (33).

Surfactant contains at least four so-called surfactant proteins (SP). SP-B enables both rapid surface adsorption and stability of DPPC during repeated surface expansion and compression, respectively. As described by Jeffrey Whitsett, a neonatologist and molecular pulmonologist, and Lawrence Nogee, a neonatologist and geneticist, SP-B is the critical surfactant protein missing in IRDS, and the genetic absence of functional SP-B results in rapidly progressive lung disease (34). Whitsett and others described SP-C as a proteolipid that promotes the low surface tension of DPPC (35). P.J. Phizackerley first isolated surfactant SP-B and SP-C (36), which are cleavage products of hydrophilic proteins. Quantitatively, the main surfactant protein is SP-A, a polar, collagen-containing lectin (Collectin). As reviewed by Jo Rae Wright, a leader in SP-A research from San Francisco, SP-A has multiple immune functions and a smaller role in surface activity (32). SP-D is the second surfactant-associated Collectin. Both SP-A and SP-D form polymers, and these molecules have complex functions in host defense. The surfactant proteins were renamed (A to D) in the order of discovery (37).

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In 1971, Roderich Rüfer, a German experimental pulmonologist from Mannheim, showed that the removal of surfactant via lavage decreased lung compliance. The return of lung lavage to the airways decreased the pressure required for lung expansion. Rüfer also conducted analogous *ex vivo* experiments in the human fetus (38). Following this preliminary study, other investigators utilized surfactant aggregates from lung lavage in experimental surfactant treatments. Göran Enhörning, an obstetrician in Stockholm, Sweden, and Toronto, Canada, since 1971, collaborated with Dr. Bengt Robertson and Gertie Grossman, both pediatric pathologists in Stockholm. They performed animal experiments on natural surfactant therapy. Both *ex vivo* and *in vivo* experiments demonstrated that administering a surfactant bolus before the first breath to the airways of the immature rabbit strikingly improved lung compliance (39, 40). The pharyngeal deposition of surfactant in preterm rabbits prolonged the survival (40). Forrest Adams, a pediatric cardiologist in Los Angeles, used surfactant-depleted adult rats on mechanical ventilation as a model. The team showed that administration of a bolus of natural surfactant to the airways was more effective in restoring the lung mechanics than the nebulization of natural surfactant or a bolus of DPPC (35).

"Alan Jobe and Machiko Ikegami studied multiple aspects of endogenous surfactant metabolism and the pharmacodynamics of natural homologous surfactant... Measurements of specific activities of labeled surfactant within the airways and the lung parenchyma enabled the determination of endogenous and exogenous surfactant phospholipid pool sizes and surfactant turnover. This contributed to our understanding of the pharmacokinetics of surfactant."

Alan Jobe and Machiko Ikegami studied multiple aspects of endogenous surfactant metabolism and the pharmacodynamics of natural homologous surfactant. Surfactant was administered as a bolus to premature lambs, either directly to the lung fluid of tracheostomized lamb fetuses (prophylactic treatment) or to ventilated immature lambs with severe respiratory distress (rescue treatment). The effects of prophylactic surfactant on lung function were more distinct and lasted longer compared to rescue surfactant treatment (36). These experimental animals were paralyzed and treated with 100 % O_2 and mechanical ventilation. Measurements of specific activities of labeled surfactant within the airways and the lung parenchyma enabled the determination of endogenous and exogenous surfactant phospholipid pool sizes and surfactant turnover. This contributed to our understanding of the pharmacokinetics of surfactant (37). The surface activity of surfactant was studied both *in vitro* and *in vivo*. The pulsating bubble surfactometer, designed by Enhörning, gained popularity in studies on surfactants and their inhibitors (38). The captive-bubble surfactometer, introduced by Schürch from Alberta, Canada, is more accurate than the pulsating bubble surfactometer (39). However, *in vivo* models using immature animals provided the most critical preclinical tests on the efficacy of experimental surfactant therapy in IRDS. Burkhard Lachmann, an experimental pulmonologist from the former East Berlin and a member of Dr. Robertson's team, was instrumental in designing a multi-body plethysmograph that could perform controlled studies. This system was used in 27-day-old fetal rabbits with

lung immaturity (i.e., IRDS) to determine the efficacy of surfactant preparations before proceeding to therapeutic trials (40). Jobe et al. described that the endogenous surfactant pool size was associated with the severity of respiratory distress in ventilated preterm animals (41), and various, mainly blood-derived surfactant inhibitors (for example, albumin), decreased the beneficial effects of exogenous surfactant *in vitro* and in IRDS animal models (42).

Alec Bangham, liposome inventor, and Colin Morley, a neonatologist from Cambridge, UK, and Michael Phillips from Philadelphia, USA, reported experiments using a mixture of unsaturated PG and DPPC added to the air-liquid interface. Cyclic compression of the surface in the presence of PG and "condensed" DPPC eliminates surface tension. In 1981, Morley et al. reported a controlled trial using dry Artificial Lung Expanding Compound (ALEC). ALEC contained DPPC and PG, and was administered to the airways of very preterm infants before air breathing (43). The dry exogenous surfactant improved respiratory adaptation.

A randomized clinical trial (RCT) using surfactant, containing DPPC and serum high-density lipoprotein (TurfSurf) by Henry Halliday from Belfast, UK, revealed no significant benefit in preterm infants with IRDS (44).

"The synthetic lipid surfactant colfosceril palmitate (Exosurf®) contains DPPC, hexadecanol, and tyloxapol... Exosurf® became available in August 1990 as the first commercial surfactant in the USA. It was extensively used in many parts of the world during the 1990s but was gradually replaced by a modified natural surfactant preparation."

The synthetic lipid surfactant colfosceril palmitate (Exosurf®) contains DPPC, hexadecanol, and tyloxapol. Clements was the consultant in the design of Exosurf. In a multicenter RCT, two boluses of Exosurf® were administered 12 h apart to infants with IRDS. The treatment increased survival and decreased morbidity associated with IRDS (2). In a large Osiris trial, the earlier administration of Exosurf® in IRDS was found to be beneficial compared to later treatment (45). Exosurf® became available in August 1990 as the first commercial surfactant in the USA. It was extensively used in many parts of the world during the 1990s but was gradually replaced by a modified natural surfactant preparation.

Native human surfactant isolated from amniotic fluid (HA-surfactant) was effective *in vitro* and *in vivo* experiments, as well as in a clinical pilot (46). The randomized, bi-center trials on the efficacy and safety of prophylactic and "rescue" treatments with HA-surfactant, comparing the prophylactic and "rescue" treatments, were conducted by Hallman et al. in Helsinki, Finland, and Merritt et al. in San Diego, USA, and Helsinki, Finland. The first RCT, using natural surfactant as a rescue treatment of RDS, was reported in June 1985 (47), and as a treatment for established RDS (48). This interventional trial was followed by an RCT using prophylactic HA-surfactant in 1986 (49). Besides decreasing air leaks and deaths, HA-surfactant also decreased the risk of bronchopulmonary dysplasia (BPD) (47, 48). Unlike surfactants containing lipid extracts of animal surfactant, HA-surfactant contained surfactant collectins. No clinical comparison with other natural surfactants was made, as the availability of HA-surfactant was limited, the isolation of high-quality HA-surfactant was not replicated in several centers, and the HIV pandemic complicated its use.

"After randomized trials in Japan using Surfactant TA (Surfacten®) and slightly modified Beractant (Survanta®) in the USA and Europe, these drugs were the first animal-based surfactants approved for the treatment of RDS in the early 1990s."

In the 1970s, successful experimental treatment of lung immaturity using homologous natural surfactants was reported. The use of heterologous protein-containing surfactant was questioned at that time. However, Tetzuro Fujiwara, a neonatologist in Iwate, Japan, collaborating with Dr. Yugi Tanaka, a surface biochemist in Tokyo, reported that *the in vitro* surface properties of surfactant were improved when specific synthetic lipids were added to an apparently protein-free surfactant lipid extracted from minced bovine lung (49). In 1980, Fujiwara and collaborators reported a sequential study of 10 infants with RDS, treated with a bolus of the modified animal surfactant. The symptoms of RDS dramatically improved (50). The magnitude of the effect and the lack of any apparent adverse effects despite the use of animal products were reassuring and stimulated the design of new trials. After randomized trials in Japan using Surfactant TA (Surfacten®) and slightly modified Beractant (Survanta®) in the USA and Europe, these drugs were the first animal-based surfactants approved for the treatment of RDS in the early 1990s.

"Poractant (Curosurf®) was tested in several RCTs by experienced neonatologists. This surfactant was licensed in the USA based on positive results from European clinical trials, despite not having been conducted in the USA."

Lipid extracts of minced animal lungs or animal lung lavages became dominant in treating RDS by the late 1990s. In August 1985, Enhörning et al. reported the first successful RCT on prophylactic use of a modified natural surfactant extracted from calf lung (51). Unlike TA-surfactant and Beractant, bovine lipid extract surfactant (BLES®), Calfactant (Infasurf®), and SF-RI1 (Alveofact®) were lipid extracts obtained from bovine or calf

lung lavages and did not contain added lipids. These surfactants were tested in trials and found to be effective and safe. Robertson collaborated with Tore Curstedt, a clinical chemist in Stockholm, to design a column chromatography technique for isolating surfactant from the lipid fraction of pig lung homogenate (52). It was named CuRoSurf after its creators. Supported by available evidence, the recommended dose of Curosurf was higher than other surfactant preparations (100–200 mg/kg vs. 50–100 mg/kg), and it was not excessively viscous despite its higher concentration (80 mg/mL vs. 15–30 mg/mL). Poractant (Curosurf®) was tested in several RCTs by experienced neonatologists (53). This surfactant was licensed in the USA based on positive results from European clinical trials, despite not having been conducted in the USA. Possmayer produced a bovine surfactant from minced cow lung, demonstrating similar beneficial effects in Canada, and Egan and coworkers initially at the University of Buffalo, formed a company (ONY, Inc), adapting Possmayer's techniques using calf lung lavage (Infasurf®) that was comparable or superior to the results of beractant (Survanta).

"From the early 1990s onward, numerous trials helped identify better therapeutic strategies for surfactant replacement. A meta-analysis of RCTs showed that modified natural surfactants are superior to protein-free synthetic surfactants."

The human surfactant team collaborated with Dr. Charles Cochrane and Sue Revak, both immunologists at the Scripps Research Institute, who had isolated surfactant low-molecular-weight proteolipids and demonstrated similar biologic activity in surface tension measures and physiologic responses in fetal rabbits (54). Cochrane and Revak reported on an effective synthetic DPPC-PG surfactant containing "SPB-mimic," a 21-amino-acid peptide KL4 (55). After multiple studies, including comparison trials with other surfactant preparations, showing efficacy and safety, the KL4-surfactant was approved by the FDA for IRDS treatment as Lucinactant (Surfaxin®) in 2012. Another synthetic surfactant containing recombinant SPC, DPPC, PG, and palmitic acid (Venticute®) was also developed, but evidence of its efficacy was limited to experimental studies on acquired respiratory failure (56).

"However, after advances in neonatal–perinatal management, the results of randomized comparison trials indicated that prophylactic surfactant replacement was no longer beneficial in preventing deaths and air leaks compared with selective treatment."

From the early 1990s onward, numerous trials helped identify better therapeutic strategies for surfactant replacement. A meta-analysis of RCTs showed that modified natural surfactants are superior to protein-free synthetic surfactants (57). With the use of a natural surfactant and low levels of positive end-expiratory pressure (PEEP), prophylactic surfactant administration proved to be the most effective method, particularly for extremely immature newborns. However, after advances in neonatal–perinatal management, the results of randomized comparison trials indicated that prophylactic surfactant replacement was no longer beneficial in preventing deaths and air leaks compared with selective treatment (58, 59).

"Angela Kribs and her colleagues in Germany used Less Invasive Surfactant Administration (LISA), which involved inserting a small, flexible catheter into the trachea for surfactant administration. A trial was conducted using laryngoscopy and a less flexible vascular catheter, termed minimally invasive surfactant treatment (MIST)..."

Lars Victorin and his colleagues in Scandinavia promoted non-invasive ventilation and surfactant in the 1990s (60). The method to deliver surfactant with very short intubation (*In*tubate *Sur*factant *E*xtubate [INSURE]) was introduced, as reviewed by Kajsa Bohlin from Stockholm (61). By 1992, Henrik Verder described the usage of a thin catheter or a laryngeal mask to deliver surfactant while a baby breathed spontaneously (62).

"Nevertheless, no significant trials comparing LISA versus MIST have been conducted, and the use of a sham control group did not demonstrate superiority over the use of the Kribs technique."

A decade later, Angela Kribs and her colleagues in Germany used Less Invasive Surfactant Administration (LISA), which involved inserting a small, flexible catheter into the trachea for surfactant administration (63). A trial was conducted using laryngoscopy and a less flexible vascular catheter, termed minimally invasive surfactant treatment (MIST), as a sham control. Infants were randomized to the MIST group (n = 241) and received exogenous surfactant (200 mg/kg of poractant alfa) via a thin catheter or to the control group (n = 244) and received a sham (control) treatment; CPAP was continued thereafter in both groups unless specified intubation criteria were met. The primary outcome was the composite of death or physiological BPD assessed at 36 weeks'

postmenstrual age. The components of the primary outcome (death prior to 36 weeks' postmenstrual age and BPD at 36 weeks' postmenstrual age were considered separately. Among the 485 infants randomized (median gestational age, 27.3 weeks; 241 [49.7%] female), all completed follow-up. Death or BPD occurred in 105 infants (43.6%) in the MIST group and 121 (49.6%) in the control group (risk difference [RD], −6.3% [95% CI, −14.2% to 1.6%]; relative risk [RR], 0.87 [95% CI, 0.74 to 1.03]; *P* = .10).

"Roberts has reviewed trials comparing the LISA, MISA, and SALSA techniques, demonstrating reduced sedation and adverse events with the SALSA technique."

Incidence of death before 36 weeks' postmenstrual age did not differ significantly between groups (24 [10.0%] in MIST vs. 19 [7.8%] in control; RD, 2.1% [95% CI, −3.6% to 7.8%]; RR, 1.27 [95% CI, 0.63 to 2.57]; *P* = .51), but incidence of BPD in survivors to 36 weeks' postmenstrual age was lower in the MIST group (81/217 [37.3%] vs. 102/225 [45.3%] in the control group; RD, −7.8% [95% CI, −14.9% to −0.7%]; RR, 0.83 [95% CI, 0.70 to 0.98]; *P* = .03). Serious adverse events occurred in 10.3% of infants in the MIST group and 11.1% in the control group. Dargaville and coworkers (64) concluded that among preterm infants with respiratory distress syndrome supported with CPAP, minimally invasive surfactant therapy compared with sham (control) treatment did not significantly reduce the incidence of the composite outcome of death or bronchopulmonary dysplasia at 36 weeks' postmenstrual age. However, given the statistical uncertainty reflected in the 95% CI, a clinically important effect cannot be excluded (63). Nevertheless, no significant trials comparing LISA versus MIST have been conducted, and the use of a sham control group did not demonstrate superiority over the use of the Kribs technique.

"However, over the last few years, other forms of non-invasive respiratory support, such as NIPPV, BiPAP, SiPAP, and NIV-NAVA, have been increasingly used in preterm infants. These newer modes of less-invasive ventilation and methods of surfactant administration, which do not require laryngoscopy and sedation, may decrease the risk of BPD."

In the USA, Roberts et al. conducted a randomized trial using a laryngeal mask placed above the glottis to non-invasively deliver surfactant or SALSA (Supra Airway Laryngeal Surfactant Administration), which demonstrated reduced adverse events compared to INSURE (64). This method of surfactant administration has gained acceptance in low, middle, and high-income countries, and laryngeal masks are now manufactured for infants <1000 grams for surfactant administration (65). Roberts has reviewed trials comparing the LISA, MISA, and SALSA techniques, demonstrating reduced sedation and adverse events with the SALSA technique (66). Kribs et. al. have reviewed various alternative routes of surfactant administration in the setting of nasal CPAP. However, over the last few years, other forms of non-invasive respiratory support, such as NIPPV, BiPAP, SiPAP, and NIV-NAVA, have been increasingly used in preterm infants. These newer modes of less-invasive ventilation and methods of surfactant administration, which do not require laryngoscopy and sedation, may decrease the risk of BPD (67).

Aerosol was used to administer DPPC in very early surfactant studies. In the 1990s, improved nebulization methods for natural surfactants still demonstrated only limited effects due to low deposition rates (68). The increase in CPAP levels and minimally invasive strategies prompted new studies with either new aerosol devices or new surfactant preparations. However, to date, their results remain disappointing (69). Further progress in the development of synthetic surfactants combining lipids with both SP-B and SP-C is promising. These synthetic surfactant preparations (e.g., CHF 5633), which have been tested in clinical trials containing both SP-B and SP-C analogs, have demonstrated similar improvements in gas exchange for IRDS as porcine modified surfactant (70). This synthetic surfactant was effective in extreme lung immaturity (69). As Egbert Herting showed, similar protein-containing synthetic surfactants are more resistant to inhibitors than modified natural products (70), which suggests that specific surfactants may also prove effective in treating adult conditions of severe respiratory distress (71, 72)

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The search for an optimal, completely synthetic, safe, standardized surfactant preparation that is free from batch-to-batch variations, readily producible in large quantities, and with similar efficacy to current modified natural surfactants remains ongoing (72). To conclude, the various modes of surfactant delivery during spontaneous breathing with CPAP are all attractive from a theoretical perspective. Nebulization of surfactant and SALSA avoids sedation and laryngoscopy; however, they require ongoing nasal CPAP or another form of non-invasive mechanical ventilation. Nevertheless, there is still no proven benefit in the prevention of BPD, perhaps due to limitations in the applicability to the most immature infants, who are at the highest risk of BPD. The various

modes of surfactant delivery during spontaneous breathing with CPAP are all attractive from a theoretical perspective.

"Nebulization of surfactant and SALSA avoids sedation and laryngoscopy; however, they require ongoing nasal CPAP or another form of non-invasive mechanical ventilation. Nevertheless, there is still no proven benefit in the prevention of BPD, perhaps due to limitations in the applicability to the most immature infants, who are at the highest risk of BPD."

Nebulization of surfactant and SALSA influences the avoidance of mechanical ventilation, but there is still no proven benefit in preventing BPD (73–74). Deposition in the terminal bronchioles and developing alveoli of aerosolized surfactants has been problematic and device-dependent. Gregory et al. (75) determined that inhalation of lyophilized lucinactant using the Aerosurf Delivery System, in conjunction with nasal CPAP in cynomolgus macaques, resulted in only 11.4% of the aerosolized surfactant into the lungs, with 80% remaining in the nose and mouth. Kaouane et al. (76) used an ex vivo respiratory model and "atomization" of Curosurf using an innovative device (Endosurf) to demonstrate that the surface tension of the atomized surfactant was retained, but the reduced vesicle size, which may promote deposition into the lungs, was encouraging.

"Three studies showed statistically significant results in favor of nebulized surfactant, indicating that it decreased the need for invasive endotracheal surfactant. These studies found no safety issues, but all recommended additional studies to explore dosing, timing, and gestational age groups that would yield the greatest benefit, using a device that delivers a significant dose to the distal airways in premature infants. Currently, only surfactant preparations in liquid form are approved by regulatory agencies."

Nancarrow (77) recently reported on neonatal respiratory outcomes following the administration of nebulized surfactant. Three studies showed statistically significant results in favor of nebulized surfactant, indicating that it decreased the need for invasive endotracheal surfactant. These studies found no safety issues, but all recommended additional studies to explore dosing, timing, and gestational age groups that would yield the greatest benefit, using a device that delivers a significant dose to the distal airways in premature infants. Currently, only surfactant preparations in liquid form are approved by regulatory agencies.

"The use of surfactant as a carrier for other drugs has been proposed since it serves as a spreading agent, particularly for drugs that have a local benefit but possible systemic toxicity. One example is the supplementation of budesonide to surfactant. A recent RCT showed that budesonide mixed with surfactant decreased the risk of BPD."

The use of surfactant as a carrier for other drugs has been proposed since it serves as a spreading agent, particularly for drugs that have a local benefit but possible systemic toxicity. One example is the supplementation of budesonide to surfactant. A recent RCT showed that budesonide mixed with surfactant decreased the risk of BPD (78, 79). The surfactant Collectins, SP-A and SP-D, have important immune defense functions that may influence the risk of BPD. Trials on supplementation of SP-D-analog for extremely preterm infants are ongoing (80).

"Surprisingly, surfactant replacement therapy remains based on modified natural surfactants extracted from human amniotic fluid or animals, which were developed by pioneers in the field nearly 50 years ago. It is anticipated that the development of more advanced surfactants, refined administration techniques, and the introduction of surfactant-drug combinations will continue to improve survival without chronic lung disease, along with the use of supplementary therapies."

In summary, the development of lung surfactant treatments for RDS proved to be a significant breakthrough in neonatal care, saving the lives of millions of premature infants with RDS.

Surprisingly, surfactant replacement therapy remains based on modified natural surfactants extracted from human amniotic fluid or animals, which were developed by pioneers in the field nearly 50 years ago. It is anticipated that the development of more advanced surfactants, refined administration techniques, and the introduction of surfactant-drug combinations will continue to improve survival without chronic lung disease, along with the use of supplementary therapies.

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A Systematic Approach to Diagnosing Neonatal Hypoglycemia

Noel D Tan, MD

"Neonatal hypoglycemia is a prevalent and potentially severe metabolic disorder that requires timely identification and management to prevent long-term complications, including neurodevelopmental impairments."

Abstract:

Neonatal hypoglycemia is a prevalent and potentially severe metabolic disorder that requires timely identification and management to prevent long-term complications, including neurodevelopmental impairments. This review presents a comprehensive diagnostic and therapeutic approach to neonatal hypoglycemia, incorporating a tiered strategy that integrates metabolic markers and clinical interventions. The diagnostic algorithm begins with broad laboratory tests, including glucose levels, acid-base status, and key hormonal and metabolic parameters, which guide the differentiation of common causes such as hyperinsulinism, hormonal deficiencies, and fatty acid oxidation defects.

Subsequent focused and advanced evaluations, including genetic and enzymatic studies, enable the diagnosis of complex or rare conditions. Management strategies range from first-line nutritional interventions to advanced pharmacologic therapies and surgical options for refractory cases. By systematically addressing the diagnosis and treatment of neonatal hypoglycemia, this review ensures a thorough, efficient, and practical approach to care.

Introduction:

Neonatal hypoglycemia, a blood glucose level <50 mg/dL within the first days of life, is a common metabolic concern with potentially severe implications. It frequently affects high-risk populations, including preterm infants, small-for-gestational-age neonates, and infants of diabetic mothers. While transient hypoglycemia may resolve with minimal intervention, persistent or recurrent episodes necessitate thorough evaluation to determine the underlying etiology and guide targeted management.

The clinical spectrum of neonatal hypoglycemia ranges from asymptomatic cases to severe manifestations, such as seizures, lethargy, and apnea. The interplay of hormonal and metabolic regulators that maintain glucose homeostasis is central to understanding and managing this condition. Insulin, the primary anabolic hormone, promotes glucose storage, fat synthesis, and protein preservation. Its overproduction, such as in hyperinsulinism, leads to hypoglycemia by suppressing glucose production and lipolysis. Conversely, counter-regulatory hormones such as glucagon, epinephrine, cortisol, and growth hormone mobilize glucose and alternative energy substrates during fasting or periods of stress. Deficiencies or dysfunctions in these hormones significantly impact glucose availability and utilization, contributing to hypoglycemia.

The following table summarizes the key hormonal interactions in glucose homeostasis and their diagnostic and therapeutic relevance:

Hormone	Glucogenolysis	Gluco-neogenesis	Lipolysis	Protein Catabolism	Peripheral Glucose Intake
Insulin	Decreases	Decreases	Decreases	Decreases	Increases
Glucagon	Increases	Increases	Minimal effect	No significant effect	Minimal effect
Epinephrine	Increases	Increases	Increases	Minimal effect	Decreases in some tissues
Cortisol	Minimal effect	Increases	Increases	Increase	Decreases
Growth Hormone	Minimal effect	Increases	Increases	Decreases	Decreases

Understanding these interactions is crucial for identifying the pathophysiology of hypoglycemia and tailoring effective treatment strategies.

When to Initiate a Diagnostic Evaluation:

Transient hypoglycemia is common in high-risk neonates, such as preterm infants, small-for-gestational-age newborns, or infants of diabetic mothers. In most cases, transient hypoglycemia resolves spontaneously or with minimal interventions, such as feeding or glucose supplementation. Routine diagnostic evaluation is generally unnecessary for transient cases unless specific concerning features are

"Transient hypoglycemia is common in high-risk neonates, such as preterm infants, small-for-gestational-age newborns, or infants of diabetic mothers. In most cases, transient hypoglycemia resolves spontaneously or with minimal interventions, such as feeding or glucose supplementation."

observed.

A detailed workup is essential when hypoglycemia is:

- **Persistent Hypoglycemia**: Blood glucose levels <50 mg/dL persisting beyond 48 hours despite glucose infusion rates ≥6–8 mg/kg/min.
- **Recurrent Hypoglycemia**: Multiple episodes of hypoglycemia after initial stabilization, especially following reductions in glucose supplementation.
- **Severe Hypoglycemia**: Blood glucose <30 mg/dL associated with clinical symptoms, such as seizures, lethargy, or apnea.
- **Associated Systemic Findings**: Features such as hepatomegaly, dysmorphic characteristics, hypotonia, or metabolic acidosis suggest a systemic or metabolic disorder.
- **Unresponsive Hypoglycemia**: Failure to correct blood glucose with standard glucose supplementation strategies.

"The tiered approach ensures a systematic, stepwise evaluation, minimizing unnecessary testing while efficiently identifying the underlying causes of hypoglycemia. Once the Tier 1 critical laboratory tests are completed, their results provide a framework for identifying the underlying cause of hypoglycemia and determining the next steps in diagnosis."

Prompt recognition and a systematic diagnostic approach are critical to identifying the underlying causes, preventing complications, and guiding appropriate management.

Tiered Algorithm for Diagnosing Neonatal Hypoglycemia:

The tiered approach ensures a systematic, stepwise evaluation, minimizing unnecessary testing while efficiently identifying the underlying causes of hypoglycemia. Once the Tier 1 critical laboratory tests are completed, their results provide a framework for identifying the underlying cause of hypoglycemia and determining the next steps in diagnosis. These findings inform the interpretation of metabolic states and aid in differentiating between various etiologies.

Tier 1: Initial Critical Laboratory Tests:

The first tier involves broad testing to confirm hypoglycemia and assess essential biochemical markers. These tests confirm the presence of hypoglycemia and provide insights into possible underlying conditions.

Test	Purpose	Cutoff Value
Plasma Glucose	Confirms hypoglycemia.	<50 mg/dL
Blood Gas (pH, HCO_3^-)	Detects acidemia or metabolic acidosis.	pH <7.35, HCO_3^- <18 mmol/L
Beta-Hydroxybutyrate	Assesses ketogenesis.	<0.3 mmol/L (suppressed), >1 mmol/L (elevated)
Free Fatty Acids (FFAs)	Indicates lipolysis and fatty acid metabolism.	<0.5 mmol/L (suppressed), >1.5 mmol/L (elevated)
Lactate	Suggests mitochondrial or gluconeogenic defects.	>2 mmol/L
Insulin	Identifies hyperinsulinism.	>2 µU/mL during hypoglycemia
Cortisol	Detects adrenal insufficiency.	<10 µg/dL
Growth Hormone (GH)	Identifies growth hormone deficiency.	<10 ng/mL

Interpreting and Acting on Initial Critical Laboratory Tests:

The presence or absence of acidemia (pH < 7.35) is crucial in refining the differential diagnosis of neonatal hypoglycemia.

Acidemia Present (pH <7.35):

Elevated Lactate (>2 mmol/L):

Suggests mitochondrial dysfunction or defects in gluconeogenesis or glycogen breakdown, such as:

- Pyruvate carboxylase deficiency
- Fructose-1,6-bisphosphatase deficiency

Elevated Ketones (>1 mmol/L):

Indicates glycogen storage disorders or hormonal deficiencies, including:

- Glycogen Storage Disease Type I
- Cortisol deficiency
- Growth hormone deficiency

Normal pH (pH ≥7.35)

Low Ketones (<0.3 mmol/L) and Elevated FFAs (>1.5 mmol/L):

Suggest fatty acid oxidation defects such as:

- MCAD deficiency

Confirmatory testing includes a plasma acylcarnitine profile.

Suppressed Ketones and FFAs:

- Suggests hyperinsulinism.

Confirmatory testing includes a positive glucagon stimulation test, which shows a glucose rise of >30 mg/dL, indicating intact glucagon-mobilized glycogen stores.

Tier 2: Focused Metabolic Evaluation:

If Tier 1 testing suggests specific metabolic or hormonal disorders, Tier 2 evaluations focus on confirming these

findings. These evaluations involve targeted laboratory tests that refine the differential diagnosis by identifying abnormalities in metabolic pathways or hormonal functions.

Test	Purpose	Key Findings
Plasma Amino Acids	Detects aminoacidopathies or gluconeogenic defects.	Elevated alanine (indicative of gluconeogenesis defect), abnormal branched-chain amino acids (suggestive of maple syrup urine disease).
Acylcarnitine Profile	Identifies fatty acid oxidation defects.	Elevated medium-chain acylcarnitines (consistent with MCAD deficiency).
Urine Organic Acids	Screens for organic acidemias or mitochondrial dysfunction.	Elevated methylmalonic acid (seen in methylmalonic acidemia).
Ammonia Levels	Detects urea cycle defects or organic acidemias.	Elevated ammonia >100 µmol/L (indicative of ornithine transcarbamylase deficiency).
Glucagon Stimulation Test	Confirms hyperinsulinism.	A glucose rise of greater than 30 mg/dL indicates the mobilization of glycogen stores.

Tier 3: Advanced Genetic and Enzymatic Testing:

If Tier 2 evaluations remain inconclusive or point to rare metabolic or hormonal conditions, Tier 3 involves advanced diagnostic modalities. These tests are particularly valuable for identifying inherited metabolic disorders or structural causes.

Test	Purpose	Key Findings
Genetic Testing	Identifies mutations associated with metabolic or hormonal disorders.	*GLUD1* mutations (hyperinsulinism-hyperammonemia syndrome), *ACADM* mutations (MCAD deficiency).
Enzyme Assays	Confirms specific enzymatic deficiencies.	Reduced enzyme activity in pyruvate carboxylase deficiency or VLCAD deficiency.
Imaging Studies	Detects structural causes of hyperinsulinism.	Localizes focal pancreatic lesions (e.g., insulinomas) using 18F-DOPA PET-CT.

Tier 4: Emerging and Investigational Approaches:

Tier 4 employs novel diagnostic techniques and experimental therapies when traditional diagnostic approaches fail to yield a diagnosis. These are often used in collaboration with research centers to address complex or refractory cases.

Test/Approach	Purpose	Key Applications
Whole Exome Sequencing (WES)	Identifies novel or rare genetic mutations	Detects mutations not covered by standard genetic testing
Gene Panels	Focuses on a group of genes linked to specific metabolic disorders	Identifies known mutations related to fatty acid oxidation or hormonal pathways
Experimental Therapies	Investigate novel treatment modalities.	Includes enzyme replacement therapies and gene therapies under clinical trials.

This tiered approach systematically addresses neonatal hypoglycemia, providing increasingly detailed and targeted evaluations to guide both diagnosis and management.

Pharmacologic and Supportive Interventions in Neonatal Hypoglycemia:

Management of neonatal hypoglycemia requires a strategic approach to stabilize blood glucose levels while concurrently investigating and addressing the underlying cause. Prompt intervention is essential to prevent potential complications, including seizures, brain injury, and long-term neurodevelopmental impairments. This section provides a detailed framework of escalating interventions, from basic nutritional support to advanced therapies, tailored to the severity and etiology of hypoglycemia.

"Management of neonatal hypoglycemia requires a strategic approach to stabilize blood glucose levels while concurrently investigating and addressing the underlying cause. Prompt intervention is essential to prevent potential complications, including seizures, brain injury, and long-term neurodevelopmental impairments."

First-Line Interventions:

First-line therapies aim to stabilize glucose levels in neonates with mild or transient hypoglycemia, particularly in high-risk populations such as preterm infants, small-for-gestational-age neonates, or infants of diabetic mothers.

High-Calorie Feeding:

- **Mechanism**: Provides an immediate energy source through enteral feeds, increasing glucose availability to meet metabolic demands.
- **Indications**: Used in asymptomatic neonates or those with mild hypoglycemia who can tolerate oral or enteral feeding.
- **Effectiveness**: Often sufficient to correct hypoglycemia in transient cases, particularly in neonates without significant metabolic or hormonal abnormalities.
- **Limitations**: Not suitable for neonates with severe hypoglycemia, poor feeding ability, or underlying disorders requiring rapid glucose correction.

Oral Glucose Gel:

- **Mechanism**: Buccal administration ensures rapid glucose absorption through the mucosa.
- **Indications**: Effective for mild, transient hypoglycemia in neonates who can feed.
- **Effectiveness**: Offers a convenient, non-invasive option for rapidly increasing blood glucose levels.
- **Limitations**: Ineffective for recurrent or severe hypoglycemia, where sustained glucose delivery is required.

Continuous Intravenous Glucose Infusion

- **Mechanism**: Administers glucose directly into the bloodstream, maintaining a steady glucose supply.
- **Indications**: Used for neonates with moderate to severe hypoglycemia unresponsive to enteral feeds or oral glucose

gel.

- **Effectiveness**: Rapidly corrects symptomatic hypoglycemia and prevents further episodes during diagnostic evaluation.
- **Limitations**: Requires intravenous access and careful monitoring to avoid complications such as hyperglycemia or fluid overload.

"When hypoglycemia persists despite first-line measures or when the etiology remains unclear, second-line interventions are introduced to address potential hormonal imbalances or metabolic defects."

Second-Line Interventions:

When hypoglycemia persists despite first-line measures or when the etiology remains unclear, second-line interventions are introduced to address potential hormonal imbalances or metabolic defects.

Diazoxide:

- **Mechanism**: Opens ATP-sensitive potassium (KATP) channels in pancreatic beta cells, suppressing insulin secretion.
- **Indications**: Suspected or confirmed hyperinsulinism, particularly when unresponsive to glucose infusion.
- **Effectiveness**: Effective in approximately 50–60% of cases of hyperinsulinism, especially those without severe genetic defects in the KATP pathway.
- **Limitations**: Not effective in certain forms of congenital hyperinsulinism. Side effects include fluid retention, pulmonary hypertension, and rare hematologic abnormalities.

Hydrocortisone:

- **Mechanism**: Enhances gluconeogenesis and glycogenolysis while counteracting insulin's effects.
- **Indications**: Suspected adrenal insufficiency or cortisol deficiency.
- **Effectiveness**: Resolves hypoglycemia in most cases of cortisol deficiency, thereby supporting glucose production during periods of stress or fasting.
- **Limitations**: Ineffective for hyperinsulinism or fatty acid oxidation defects. Prolonged use may lead to adrenal suppression and other systemic side effects.

Glucagon:

- **Mechanism**: Stimulates hepatic glycogenolysis and gluconeogenesis, rapidly increasing blood glucose levels.
- **Indications**: Used for the acute treatment of severe hypoglycemia unresponsive to intravenous glucose.
- **Effectiveness**: Provides immediate glucose correction when glycogen stores are intact.
- **Limitations**: Ineffective in conditions characterized by glycogen depletion or prolonged fasting, such as glycogen storage disorders.

Third-Line Interventions:

These therapies are reserved for neonates with confirmed diagnoses that require more targeted treatments.

Octreotide:

- **Mechanism**: A somatostatin analog that inhibits insulin secretion by reducing calcium influx in beta cells.
- **Indications**: Confirmed cases of diazoxide-nonresponsive hyperinsulinism.
- **Effectiveness**: Controls insulin secretion and stabilizes blood glucose levels in severe hyperinsulinism.
- **Limitations**: Requires subcutaneous or intravenous administration. Side effects include gastrointestinal symptoms, bradycardia, and growth suppression with long-term use.

Recombinant Growth Hormone (GH):

- **Mechanism**: Promotes gluconeogenesis and lipolysis while suppressing insulin-like effects.
- **Indications**: Confirmed growth hormone deficiency contributing to hypoglycemia.
- **Effectiveness**: Restores euglycemia in neonates with GH deficiency by improving glucose and lipid metabolism.
- **Limitations**: It requires daily injections, and its benefits depend on an accurate diagnosis and appropriate dosing.

Fourth-Line Interventions:

When pharmacologic therapies fail to control hypoglycemia, advanced options are considered, including surgical interventions and emerging therapies.

Surgical Interventions

- **Mechanism**: Partial or complete pancreatectomy reduces insulin production in cases of severe congenital hyperinsulinism.
- **Indications**: Severe, refractory hyperinsulinism unresponsive to medical therapies or focal lesions identified via imaging (e.g., 18F-DOPA PET-CT).
- **Effectiveness**: Can provide a definitive cure in cases of focal hyperinsulinism.
- **Limitations**: Associated with significant long-term risks, including diabetes mellitus and exocrine pancreatic insufficiency.

Emerging and Investigational Therapies:

- **Examples** Include Long-Acting somatostatin analogs (e.g., lanreotide) for hyperinsulinism and gene-targeted therapies for inherited metabolic disorders.
- **Limitations**: These therapies remain experimental and are primarily available in research settings.

By incorporating these pharmacologic and supportive interventions into the diagnostic and management framework, clinicians can stabilize blood glucose levels while investigating the underlying cause of hypoglycemia. This integrated approach minimizes the risk of complications and ensures timely, effective treatment tailored to the neonate's specific needs.

Summary:

Neonatal hypoglycemia is a common yet serious condition that requires prompt and systematic diagnosis and management to prevent long-term complications such as neurodevelopmental impairments. This review provides a comprehensive, tiered diagnostic approach, starting with essential laboratory tests (Tier 1), followed by more focused metabolic evaluations (Tier 2), advanced genetic and enzymatic testing (Tier 3), and emerging diagnostic tools and treatments (Tier 4).

The first tier of testing confirms the presence of hypoglycemia and provides initial insights into possible underlying conditions. Tier 2 focuses on refining the diagnosis by evaluating metabolic pathways and hormonal dysfunctions. If necessary, Tier 3 employs genetic and enzymatic testing to confirm rare or complex conditions, while Tier 4 explores emerging diagnostic and therapeutic strategies.

Pharmacologic interventions, including glucose supplementation, diazoxide for hyperinsulinism, hydrocortisone for cortisol deficiency, and glucagon for acute treatment, play critical roles in stabilizing glucose levels. Surgical interventions may be required in cases of focal hyperinsulinism, and emerging therapies offer new avenues for treatment.

"By incorporating these pharmacologic and supportive interventions into the diagnostic and management framework, clinicians can stabilize blood glucose levels while investigating the underlying cause of hypoglycemia. This integrated approach minimizes the risk of complications and ensures timely, effective treatment tailored to the neonate's specific needs."

The systematic use of these tiered diagnostic and treatment approaches ensures early identification and targeted management, minimizing complications and improving outcomes for neonates with hypoglycemia.

Appendix: Case Study:

Refractory Neonatal Hypoglycemia Managed with Glucagon Infusion:

Patient Information:

- Name: Baby M
- Sex: Male
- Gestational Age: 39 weeks
- Birth Weight: 3.8 kg (LGA)
- Delivery: Cesarean section for maternal diabetes (GDM, poorly controlled)
- APGAR Scores: 8 and 9 at 1 and 5 minutes

Clinical Presentation:

At 12 hours of life, Baby M developed lethargy, poor feeding, and jitteriness. A point-of-care glucose revealed 29 mg/dL. Despite receiving two doses of oral glucose gel and making increased feeding attempts, blood glucose levels remained low.

Initial Management:

Baby M was started on IV dextrose bolus (2 mL/kg of D10W) followed by a continuous glucose infusion at 6 mg/kg/min, but glucose levels remained <45 mg/dL. The GIR was progressively increased to 12 mg/kg/min, yet persistent hypoglycemia was noted.

Diagnostic Evaluation: Tier 1 Critical Sample:

- Plasma glucose: 29 mg/dL
- Blood gas: pH 7.39
- Beta-hydroxybutyrate: 0.1 mmol/L (suppressed)
- Free fatty acids: 0.4 mmol/L (suppressed)
- Lactate: 1.2 mmol/L (normal)
- Insulin: 12 µU/mL (inappropriately elevated)
- Cortisol: 18 µg/dL (normal)
- Growth hormone: 12 ng/mL (normal)

Interpretation: Suppressed ketones + suppressed FFAs + elevated insulin → Hyperinsulinism suspected

Second-Line Intervention: Glucagon Infusion:

Given persistent hypoglycemia despite high GIR, glucagon infusion was initiated at 10 mcg/kg/hour.

- Response: Within 30 minutes, glucose rose to 65 mg/dL.
- Glucagon Stimulation Test: Bolus 0.03 mg/kg given → Glucose increased by >30 mg/dL
- Supports hyperinsulinism diagnosis.

Ongoing Management Plan: **Glucagon infusion continued at 5–10 mcg/kg/hour for stabilization and monitoring for tachyphylaxis.**

- Diazoxide therapy is considered the next step, pending the results of genetic testing (for ABCC8/KCNJ11 mutations).
- Imaging (18F-DOPA PET-CT) is planned if genetic testing suggests focal disease.

Discussion Points:

- Glucagon infusion is a temporizing therapy for hyperinsulinemic hypoglycemia when high GIR alone is insufficient.
- The algorithmic approach in the paper, which begins with critical labs, interprets metabolic profiles, and incorporates targeted therapies, facilitates diagnosis and management.
- This case illustrates the importance of timely critical sampling,

understanding metabolic patterns, and the appropriate use of glucagon infusion.

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Case Report: Goltz Syndrome

Nicholas P Callahan, IV, MS3, Joseph B. Philips, III, MD

This 37-week gestation female was transferred from an outside hospital for evaluation of possible Pentalogy of Cantrell. The pregnancy was complicated by chronic hypertension, diet-controlled gestational diabetes, and intrauterine growth restriction. Mother was noted to be Group B Streptococcus positive and received three doses of ampicillin during labor. Rupture of membranes occurred three hours prior to delivery, which was vaginal. Apgar scores were 8 and 9 at one and five minutes, respectively. However, she had immediate respiratory distress and required endotracheal intubation in the delivery room.

"This 37-week gestation female was transferred from an outside hospital for evaluation of possible Pentalogy of Cantrell."

Anomalies on the admission examination included a small anterior fontanel, preauricular skin tags, a 9 cm x 6 cm open vertical defect to chest/abdomen covered with a thin membrane and visible heart pulsations (Figure 1), limb and digit anomalies, a diffuse rash with excoriation and vesicles (Figure 2), sacral dimple and



Figure 1. Thoraco-abdominal defect.



Figure 2. Diffuse rash and low set ears.

Figure 3. Lesion on back.



a 3 cm x 0.5 cm open defect in lower spine versus deep sacral dimple. Dermatology consult noted additional anomalies (Figures 3–5) and suggested Goltz syndrome, which was confirmed by Invitae Ectodermal Dysplasia panel as pathogenic in PORCN: c.1186C>T (p.Arg396*) consistent with X-linked Focal Dermal Hypoplasia (Goltz-Gorlin syndrome). Ophthalmology diagnosed

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Figure 4. Linear streaks with telangiectasias that follow Blaschko lines on the trunk and extremities.





bilateral chorioretinal colobomas and left ocular microphthalmia with lens subluxation and iris coloboma. At three months of age, she had complex closure of the thoracoabdominal defect by plastic and general pediatric surgery, along with gastrostomy tube placement. At almost 4 months of age, she was transferred to a hospital closer to home on nasal CPAP and full G tube feeds.

Since then, she has had multiple readmissions for developmental delay and further treatments, including multiple replacements of a dislodged gastro-jejunal feeding tube. She is deaf in her right ear and blind in her left eye, with limited vision in the right eye. She has had bilateral foot surgeries to improve ambulation and has resolving obstructive sleep apnea.

Goltz syndrome, also known as focal dermal hypoplasia, is an X-linked dominant disorder caused by mutations in the PORCN gene, resulting in defects in ectodermal and mesodermal-derived structures. Affected structures may include focal dermal hypoplasia, telangiectasia, fat eruption lesions, ridged nails, focal alopecia, enamel hypoplasia, hypodontia, syndactyly,

"Goltz syndrome, also known as focal dermal hypoplasia, is an X-linked dominant disorder caused by mutations in the PORCN gene, resulting in defects in ectodermal and mesodermal-derived structures."

Figure 5. Hypoplastic nails and lobster claw deformity.





ectrodactyly, colobomas, chorioretinal defects, with reports also of diaphragmatic hernia, genitourinary anomalies, papillomatosis, especially in the upper airway, and developmental delays. Disease severity is variable depending on the affected organ systems, and life expectancy ranges from significant infantile mortality to normal life expectancy. A large number of different PORCN mutations have been described, and the phenotype of the syndrome is therefore quite variable, with multiple organ systems involved, as seen in our case. Some affected individuals have developed malignant tumors as well.

"Disease severity is variable depending on the affected organ systems, and life expectancy ranges from significant infantile mortality to normal life expectancy. "

Approximately 95% of affected female cases are de novo, with a 5% chance of inheritance from the mother. The disease is lethal in males and, if found in a male, results from post-zygotic somatic mosaicism.

"Approximately 95% of affected female cases are de novo, with a 5% chance of inheritance from the mother. The disease is lethal in males and, if found in a male, results from post-zygotic somatic mosaicism."

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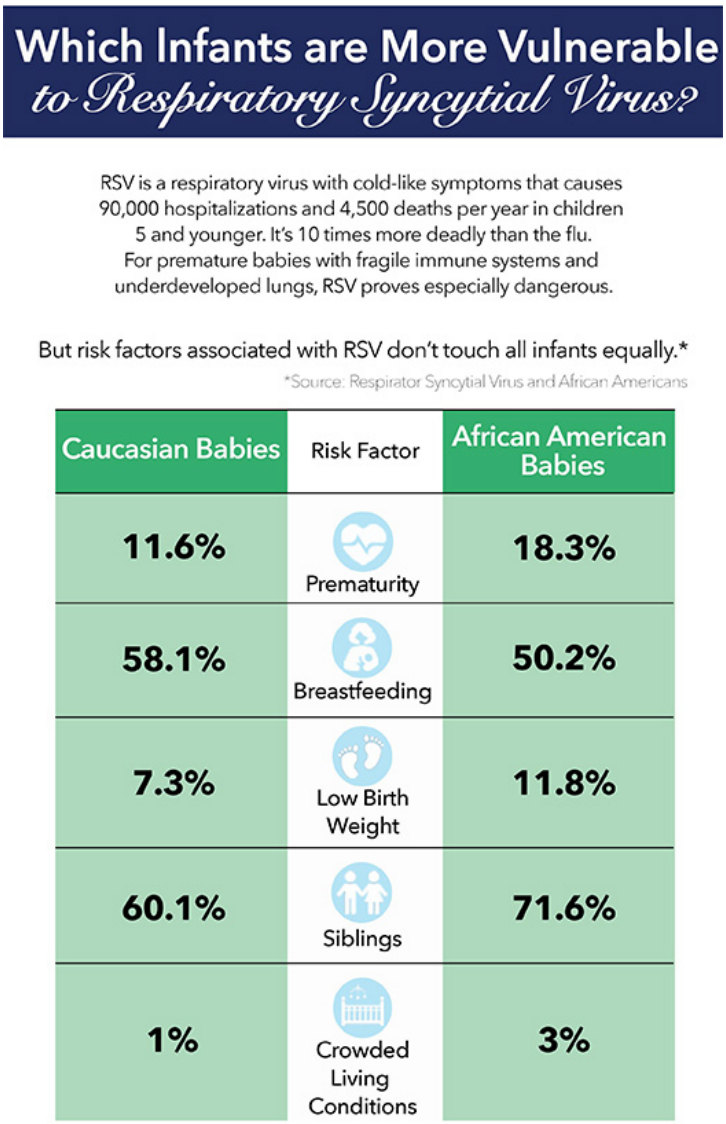
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The Pandemic is Dead: Long Live COVID

Rob Graham, R.R.T./N.R.C.P.

I dedicate this column to the late Dr. Andrew (Andy) Shennan, the founder of the perinatal program at Women's College Hospital (now at Sunnybrook Health Sciences Centre). To my teacher, my mentor and the man I owe my career as it is to, thank you. You have earned your place where there are no hospitals and no NICUs, where all the babies do is laugh and giggle and sleep.

"Imagine that, by some strange quirk of quantum physics, Marilyn vos Savant (1) and Albert Einstein had a child. Further, by that same quirk, imagine the child was a virus. The child's name would be "COVID," and a very smart child it would be indeed."

Imagine that, by some strange quirk of quantum physics, Marilyn vos Savant (1) and Albert Einstein had a child. Further, by that same quirk, imagine the child was a virus. The child's name would be "COVID," and a very smart child it would be indeed.

Syphilis is referred to as "the great imitator" because it displays symptoms during different stages of the infection that resemble a large number of other illnesses (2). COVID-19 (C19) may have taken lessons from syphilis. Omicron and its variants have become the dominant strains circulating by far. These variants have evolved to become highly adept at infecting, and equally adept at masking the symptoms of infection (if any symptoms are present at all).

Initially, C19 presented as a primarily respiratory pathogen, and, like most pathogens, it targeted the most vulnerable segments of the population – the elderly, the immunocompromised, and those with chronic conditions. Perhaps because of their increased risk of death from severe infection, C19 was darkly nicknamed the "boomer doomer". (Over five years into the pandemic, it appears the joke is on them.)

C19 no longer has the "sex-appeal" it once had as a novel pathogen. Testing and surveillance have decreased significantly, and in some cases, have stopped altogether. Testing and test kits are now often no longer available for free, if at all. This makes finding current information about C19 increasingly difficult. Still, there are some who continue to monitor its prevalence. Dr. Tara Moriarty of the University of Toronto has been reporting on Canadian infection rates by province since the beginning of the Pandemic (3) via *Canadian COVID-19 Resources Canada* (4).

Evolution of Symptomology:

In order to propagate and flourish, a pathogen must evolve in such a manner as to increase transmission. The airborne route is the most effective mode. As for symptoms, infectivity is most efficient when it either precedes symptoms, or more so, when there are no clinical symptoms in the acute phase at all. Many C19, RSV, influenza, and common cold symptoms overlap, albeit with greater or lesser prevalence (5). This makes self-diagnosis more difficult, and reduced availability of RAT and PCR testing makes any diagnosis less likely. Symptoms may range from allergy-like reactions to "something I ate" symptoms, such as diarrhea, and may be easily dismissed. One clue is that cold-like symptoms (aside from those attributed to allergies) are unlikely to be due to a cold during the summer months.

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Some people have been asymptomatic (not to be confused with non-contagious!) since C19 first arrived. Just as with the common cold and influenza, we do not become immune to C19 since these viruses mutate too quickly for immunity to develop. Still, with repeated infections and/or vaccinations, the immune system has

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more information available to help it identify new variants. As a result, the likelihood of severe symptoms decreases, while the chances of asymptomatic infection also decrease. Hospitalisation and mortality statistics reflect this (5).

Milder symptoms and asymptomatic infection do not mean there are no resulting sequelae. "Long-COVID", referred to here as "Post-COVID Condition" (PCC), is a recognised set of various symptoms following recovery from an acute C19 infection. The prevalence of PCC has varied, but appears to have decreased since it was first identified early in the pandemic. Vaccination has been shown to reduce the chances of suffering from PCC, but short of avoiding infection altogether, nothing guarantees its avoidance.

"Research by the Canadian government has found over 50% of those infected with C19 will have one or more symptoms 2 years after the acute infection (6)."

Research by the Canadian government has found over 50% of those infected with C19 will have one or more symptoms 2 years after the acute infection (6). PCC affects 14.3% of the American population and 11.7% of the Canadian population. This is high compared to Australia, at 4.7%. This may reflect the management of C19 in the respective countries. ((Previously I reported on C19 mortality rates ("When Science and Dogma Enter the Ring, Humanity is the Loser, *Neonatology Today,* December 2024).)

Pouring Gasoline on the Fire:

If one were to plant the seeds of doubt and distrust in science, medicine, and government institutions, the (mis)management of the C19 pandemic would be an excellent choice. From the start, the public has been given information that has run the gamut from inaccurate to outright false. To make matters worse, this information has come from all three of the above sources. To review:

*Wash your hands

While handwashing is an undeniably good practice, selling it as the primary way to prevent COVID-19 is quite simply absurd.

*C19 is not airborne

C19 has *always* been airborne. The insistence on sticking to the "droplet" mode of transmission may have been responsible for C19's spiraling out of control. A shortage of proper PPE and the expense of dealing with airborne transmission is no excuse for refusing to recognise how seriously flawed the research behind the droplet model of respiratory pathogenic transmission was. Anyone with half a brain could have looked at the rapid spread of C19 in China and come to the conclusion of its airborne nature. No study or degree required!

*Vax and Relax

The speed of development and overall effectiveness of C19 vaccines cannot be denied. That being said, no vaccine is 100% effective, and those for C19 are no exception. Clearly they have been shown to drastically reduce the chance of serious illness, hospitalisation, and death, but to sell them as a panacea to prevent infection was hugely irresponsible.

*Only "high-risk" individuals are at risk

Telling a half-truth is to obfuscate the truth. Healthy people got very sick, and many died. Furthermore, the discovery of how many bodily systems are affected by C19, including the immune system, and the emergence of PCC, demonstrate the false sense of security this advice gave.

"The speed of development and overall effectiveness of C19 vaccines cannot be denied. That being said, no vaccine is 100% effective, and those for C19 are no exception. Clearly they have been shown to drastically reduce the chance of serious illness, hospitalisation, and death, but to sell them as a panacea to prevent infection was hugely irresponsible."

*C19 does not cross the placenta

This has proven to be false. Furthermore, C19 has been shown to have adverse effects on the placenta and significantly increases the risk of complications in pregnancy (7).

*Children are not at risk

This may be the most tragic of all. PCC is now the most common ailment in children (8). Early research on links between childhood C19 infection and diabetes was largely inconclusive, and, although suspicious, often contradictory. More recent data suggests a link in the development of diabetes and an acceleration of the development of type I diabetes. It is also known that diabetes represents an increased risk factor for severe COVID-19 disease (9). Furthermore, infants are at risk from any respiratory illness, and C19 is no different.

*Immunity debt

This never made any sense to me, perhaps because it doesn't. Perhaps the strongest case against this theory is that its alleged effect has been observed in children born long after anti-C19 mitigation programs ended. Furthermore, clinicians have observed a surge in relatively rare infections since C19 that were infrequently seen prior to the pandemic. This suggests C19 has altered immune function (10). Those who remain firm believers in immunity debt should perhaps take a swim in sewage-contaminated water with Robert F. Kennedy Jr. and observe (or not) how much stronger their immune systems are afterwards.

*Children do not spread C19

It is true that children, by and large, are at low risk of severe disease from C19. It is also true that the closure of schools has had an adverse effect on children's education and mental health. However, these may be amplified by poor socioeconomic status (internet access, working parents, increasing social isolation, etc.). It is also true that, despite Dr. Bonnie Henry's assertion that schools were not sources of C19 infection, evidence suggests this is not the case (11). Furthermore, this ignores the risk to children who are at risk, as well as the many adults who must work in them.

The risk of C19 transmission in schools and virtually every other venue can be greatly reduced with mitigation measures (which, of course, come at a cost). The placement of inexpensive Corsi-Rosenthal boxes are easy to make and would involve minimal and effort. Several running at low fan speeds would not significantly alter the noise level in a classroom but could greatly reduce circulating virus(es).

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*Masks

The ubiquitous presence of inexpensive surgical/procedure masks aptly demonstrates a total lack of understanding of how and why masks work. Certainly, something is better than nothing (if barely) in the face of proper N95 mask shortages, but this continues despite the now ample supply of them. Many N95 masks are very easy to fit and work well for almost everyone, provided some simple instructions are followed. Visiting a hospital during mandated masking policy, I was asked to *remove* my well-fitted 3M-Aura and replace it with the aforementioned, vastly inferior surgical one. A compromise was reached by wearing it over my N95. (You know which emoji to insert here!)

Hospitals are full of at-risk and immunocompromised patients, and there may be staff who are at risk as well. Ending mask mandates may have been popular, but it was irresponsible. Infection control should not be a popularity contest.

To make matters worse, "experts" climbed on the anti-mask bandwagon, sowing further doubt on the very real effectiveness of masks in almost eliminating C19 transmission. (Side note: I continue to wear my N95 at work and whenever in public indoor spaces. Not only have I not had COVID-19, but I have also not had a respiratory infection since **2018**. I also refrain from indoor dining, a mitigation measure that has saved me a great deal of money!)

"Hospitals are full of at-risk and immunocompromised patients, and there may be staff who are at risk as well. Ending mask mandates may have been popular, but it was irresponsible. Infection control should not be a popularity contest."

*The pandemic is over

Although I could go on, I have a headache. See title.

The virus has evolved, but the fact that it silently attacks virtually every part of the body remains unchanged. Recent research has shown that it ages vasculature (12), and while coagulopathy is a prominent feature of the infection, effects on red blood cells include increased aggregability. Clots formed by red blood cells do not respond to conventional anti-coagulant measures. Potential costs to society through PCC, even if its prevalence is decreased, are enormous. Add to these costs employee absenteeism due to acute C19 infection, resulting supply chain disruptions (which we all know are still a thing) and the burden placed on an already precarious healthcare system. And then there is the very real threat of future sequelae, known and unknown.

Beware, dear readers; C19 is once again on the rise, and the colder months predicted (wrongly) to be the major contributor to its spread has not yet arrived. It has not morphed into a simple, relatively harmless cold. It has not magically disappeared. Although the population's susceptibility to severe infection has decreased, we do not have herd immunity, and it continues to wreak havoc on the lives of millions of people. Just ask someone who has recently suffered through the "sore throat from hell", a reported feature of the most recent variant!

It seems we know a great deal, yet have learned very little. Recently I walked past the room of a baby whose mother was C19 positive. The door, open, featured a sign: droplet precautions. Before the end of mask mandates, signs throughout the hospital advised visitors that masks (of course the cheap surgical variety) must be worn in patient rooms and treatment areas. I rest my case.

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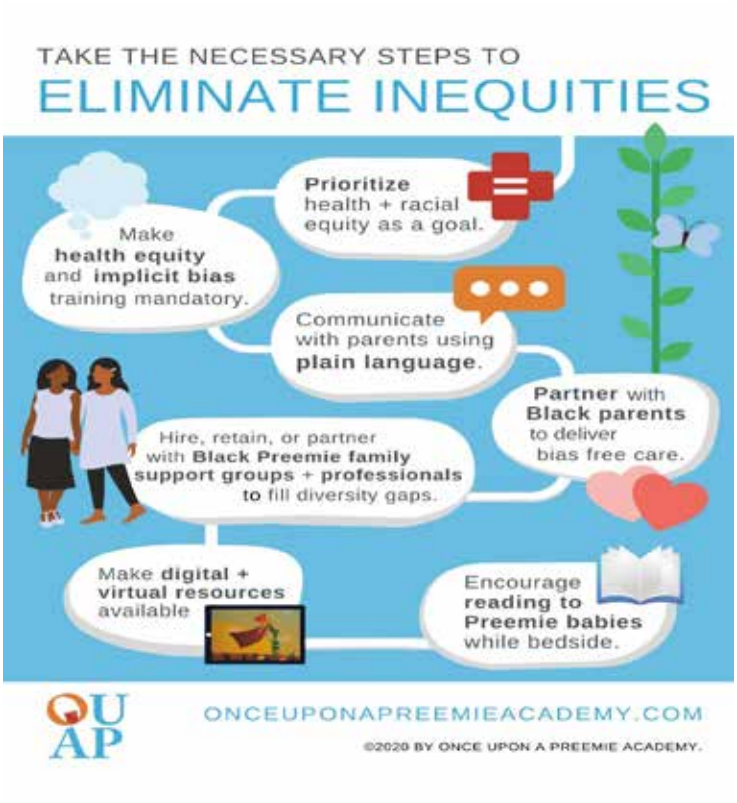
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LiDAScan: A Novel Diagnostic Approach that Integrates LiDAR Technology with Capsule Endoscopy to Generate High-Resolution 3D Intestinal Maps and Enhance the Detection of Gastrointestinal Abnormalities

Anvita Ambardekar

"A less invasive alternative, capsule endoscopy, enables visualization of the entire small and large intestines without the need for sedation or anesthesia. (2)"

Background:

Gastrointestinal (GI) diseases affect millions of people worldwide and require timely and accurate diagnosis to guide treatment and improve outcomes. Conventional esophagogastroduodenoscopy (EGD) and colonoscopy are recognized as the gold standard for evaluating many GI symptoms (1) but are invasive and limited to the upper and lower GI tract. This means they cannot fully visualize the small intestine. These procedures also carry potential risks of discomfort, bleeding, infection, and bowel perforation. A less invasive alternative, capsule endoscopy, enables visualization of the entire small and large intestines without the need for sedation or anesthesia. (2) The majority of capsule endoscopies currently in use feature a forward-facing camera with a limited field of view. This reliance on two-dimensional imaging, combined with variable image quality, can result in missed or mischaracterized pathology (2) and require physicians to estimate the location of abnormalities within the small intestine based on the time elapsed since ingestion. Additionally, capsule endoscopy interpretation is highly specialized and often delayed due to the limited number of trained reviewers. With over 17 million endoscopies performed annually in the U.S. alone (3), there is a critical need for a more advanced, non-invasive diagnostic solution. To achieve more accurate results, improving visualization, localization, extent characterization, and real-time analysis of gastrointestinal pathology is crucial.

Methods:

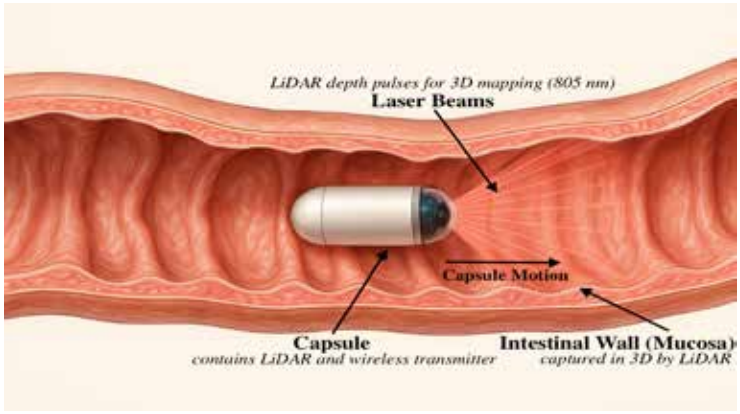


Figure 1: LiDAR capsule traveling through the small intestine

LiDAScan is a novel capsule endoscopy system that utilizes Light Detection and Ranging (LiDAR) technology to construct a detailed, three-dimensional model of the patient's intestines. LiDAR emits rapid pulses of laser light and precisely measures the time it takes for those pulses to reflect off its surroundings. (4) These time-of-flight measurements are then used to create a point cloud of three-dimensional spatial coordinates, enabling an accurate reconstruction of the internal surface. While this technology has been widely applied in fields such as autonomous navigation, robotics, and surgery, its application in endoscopic imaging offers the potential for significantly enhanced anatomical mapping, localization, and assessing severity.

"To ensure unobstructed laser measurement, the patient undergoes standard bowel preparation to clear the small intestine and colon prior to ingestion. This leads to the optimal 3D reconstruction. Since the ingested capsule is comparable in size to existing capsule endoscopes, it can move through the GI tract via natural peristalsis."

To ensure unobstructed laser measurement, the patient undergoes standard bowel preparation to clear the small intestine and colon prior to ingestion. This leads to the optimal 3D reconstruction. Since the ingested capsule is comparable in size to existing capsule endoscopes, it can move through the GI tract via natural peristalsis. As it travels, the LiDAR system continuously acquires depth measurements of the surrounding intestinal walls. These data points are wirelessly transmitted to an external receiver worn on a belt by the patient, similar to many current capsule endoscopy systems. (5) The data is stored in a structured binary point cloud format with timestamps. The receiver stores raw depth data, positional estimates, and timing information. Upon completion of the procedure, the data is transferred to a computer via a secure wired connection and used to reconstruct a complete 3D model of the patient's intestine. To ensure safe and effective operation within human tissue, the LiDAR system uses a near-infrared diode laser at approximately 805 nm. This wavelength is commonly used in endoscopic laser therapy due to its safe interaction with the gastrointestinal mucosa and reliable reflectivity. (6) While therapeutic lasers in endoscopic applications operate at powers between 5 and 25 watts for tissue ablation, (6) LiDAScan operates at less than 0.5 milliwatts. This power level is shown in technical specifications to be within safe regulatory limits for diagnostic use. (7) The laser emits brief pulses lasting only

a few milliseconds, minimizing the risk of tissue damage while still generating sufficient signal strength for high-resolution 3D reconstruction.

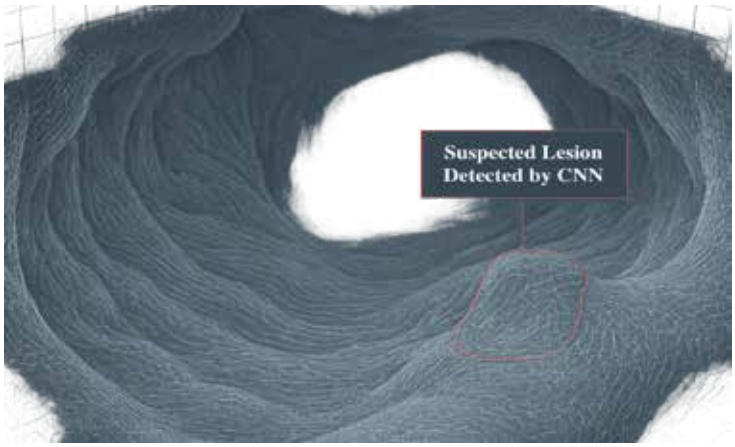


Figure 2: Sample 3D model of intestinal surface from LiDAScan data

The 3D model is generated using AI processing software that aligns and merges the raw point cloud data into a continuous, high-resolution spatial representation of the patient's small and large intestines. A convolutional neural network (CNN) optimized

for 3D data, like 3D CNNs or PointNet, is employed to identify potential abnormalities. (8) This model is trained on a large dataset of annotated intestinal scans, including healthy and pediatric-specific data.This enables it to detect structural irregularities such as protrusions, indentations, or irregularities that may indicate polyps, ulcers, or lesions. Using synchronized timestamps combined with LiDAR-generated spatial measurements from the point of entry into the small intestine (9), the model also estimates the specific intestinal segment (duodenum, jejunum, or ileum) for precise localization of findings. Suspected abnormal areas are highlighted for physician review, while full *access to the reconstructed* 3D model is retained for comprehensive evaluation.

"This LiDAR-based capsule endoscopy system provides a comprehensive, non-invasive method for visualizing and analyzing the entire small intestine and colon, including regions inaccessible by traditional EGD or colonoscopy."

Conclusion:

This LiDAR-based capsule endoscopy system provides a comprehensive, non-invasive method for visualizing and analyzing the entire small intestine and colon, including regions inaccessible by traditional EGD or colonoscopy. Unlike most current capsule endoscopies, which rely on limited two-dimensional, forward-facing imaging, LiDAScan constructs a detailed 3D model of the GI tract, offering a complete, panoramic view of the intestinal surface. This allows providers to assess the intestine from all angles, improving diagnostic accuracy and minimizing the risk of missing patchy diseases or skip lesions that may otherwise go undetected. The integration of AI to flag potential abnormalities and estimate their location reduces interpretation time and streamlines clinical workflow, addressing the current shortage of trained capsule endoscopy reviewers. Though LiDAScan does not provide histologic samples, it offers a simple way to perform evaluations as well as surveillance, particularly for cases where conventional scopes may not reach affected regions, such as IBD and Celiac Disease. LiDAScan may also assist in screening for conditions like colon cancer, with follow-up EGD performed only when a tissue biopsy is needed. By combining high-resolution anatomical mapping, AI-powered analysis, and improved localization, LiDAScan has the potential to significantly improve diagnostic speed, accuracy, and patient outcomes in neonatal, pediatric, and adult populations.

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Pioneer Profile – Sir Joseph Barcroft: The Father of Fetal Physiology

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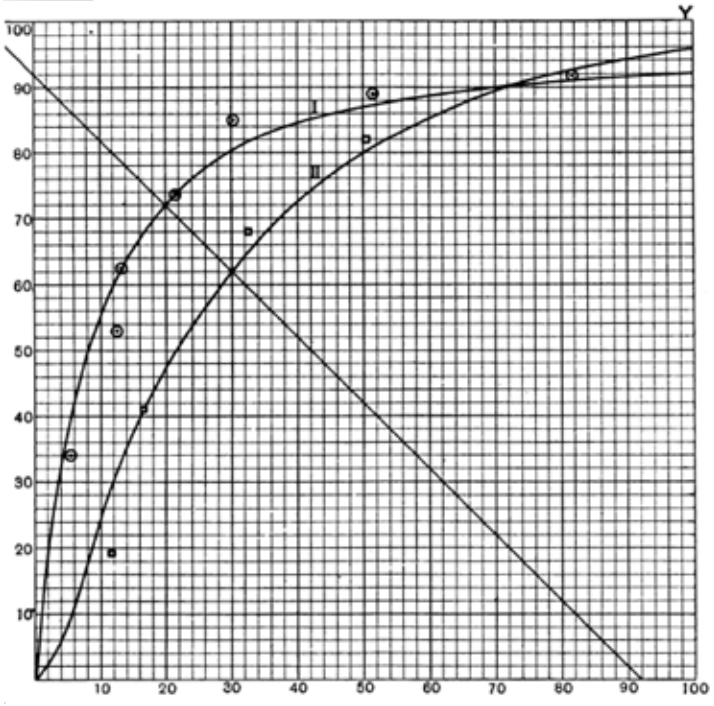
Sir Joseph Barcroft measuring blood gases (1)

"Barcroft undertook extensive work to improve the methods of measuring blood gases. He developed and published in 1908 a 'Differential Method of Blood-Gas Analysis' that allowed for the direct comparison of arterial and venous samples from various organs, thereby facilitating measurements of their oxygen consumption under different states."

Professor Barcroft made numerous fundamental contributions in various areas that, if I were to write about all of them in depth, this profile would amount to a book. Interested readers are referred to an excellent review of his life's accomplishments by Dr. Lawrence Longo, upon which I rely to summarize much of his work unrelated to his studies of pregnancy and fetal physiology (1). The man who became Sir Joseph Barcroft was born in Ulster, Northern Ireland, to Quaker parents in 1872. He showed a precocious interest in science and began his studies in Cambridge at the age of 16. He graduated from King's College in 1896 and joined its Physiological Laboratory, where he conducted the majority of his work.

His early studies focused on the oxygen consumption of various organs, including the salivary gland, pancreas, kidney, and heart. In doing so, Barcroft undertook extensive work to improve the methods of measuring blood gases. He developed and published in 1908 a "Differential Method of Blood-Gas Analysis" that allowed for the direct comparison of arterial and venous samples from various organs, thereby facilitating measurements of their oxygen consumption under different states (2). He then improved upon the current manometric method of blood gas measurement, allowing for accurate values to be obtained with as little as 0.1 mL of blood (3). He also developed a method to measure the partial pressure of oxygen in blood directly (4). Using these techniques, Barcroft measured the oxygen dissociation curves of blood and hemoglobin under various conditions and compared them to earlier work by Haldane and Bohr (Figure 1) (5, 6). Subsequent studies investigated the effect of temperature on the dissociation curve of blood, showing that higher temperatures shifted the curve to the right, requiring higher oxygen tensions to achieve the same degree of saturation.

Figure 1. Oxyhemoglobin dissociation curves for hemoglobin in dialyzed (Curve I) and undialyzed (Curve 2) solutions (5).



Additionally, it estimated the molecular weight of hemoglobin and demonstrated that oxygen binds chemically to it (7, 8). Additional reports showed that acidification also shifted the dissociation curve to the right (9), as did the addition of carbon monoxide,

which displaces oxygen from hemoglobin (10). Another study investigated the hydrogen ion concentration in human blood (11). In total, these and other studies laid the foundation for the rest of Barcroft's life's work. It is hard for us to imagine today, when we are handed a pair of handheld blood gas machines in the delivery room showing the umbilical artery and vein values, or receive a printout within minutes from a self-calibrating blood gas machine in the NICU, how complex and ground-breaking these early studies were.

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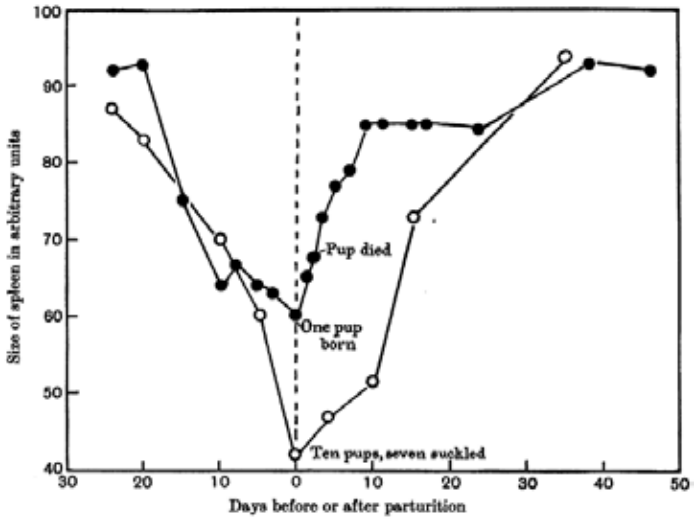
Another area of great interest to Barcroft, which I only touch upon here, was the effect of altitude on human physiology, with a particular focus on a vigorous debate at the time about whether the pulmonary alveolar epithelium could actively secrete oxygen into the blood. He participated in several trips to the Alps, Tenerife, a volcano in the Canary Islands, and the Peruvian Andes mountains for these studies (1). Ultimately, he spent six days in a glass-enclosed room in Cambridge, where the oxygen tension was gradually lowered to the equivalent of one-half atmosphere, or an elevation of 18,000 feet. Periodically sampling blood from a surgically exposed radial artery, Barcroft was able to conclusively show that the alveolar epithelium did not secrete oxygen in response to altitude (12).

"...he worked at the British War College Experimental station, studying the effects of hydrocyanic acid, which had been introduced to the battlefield by the Germans...in yet another self-experiment, exposed himself and a dog to dilute concentrations of it in the previously mentioned glass chamber."

Being a pacifist, Barcroft did not enlist in the military during World War I. Instead, he worked at the British War College Experimental station, studying the effects of hydrocyanic acid, which had been introduced to the battlefield by the Germans. He published an extensive manuscript on the effects of this gas on various birds and mammals and ultimately, in yet another self-experiment, exposed himself and a dog to dilute concentrations of it in the previously mentioned glass chamber (13). The dog lost consciousness rapidly and was thought to have died, but Barcroft had only mild symptoms. The dog was found to be alive the following day.

Barcroft's interest in pregnancy and subsequently in the fetus began serendipitously. He was studying the effect of exercise on the size of exteriorized dog spleens when one of his dog's spleens shrank over several weeks, becoming small and pale (14). At autopsy, the dog was found to be pregnant, and the uterine vessels were noted to be dilated and engorged. He then studied the effect of pregnancy on splenic size, showing that normally innervated spleens contracted remarkably during gestation while denervated spleens did not (Figure 2) (15). This finding led him to study the volume of blood in the uterus during gestation in rabbits, cats, and dogs (16). Additional studies investigated blood flow, gaseous metabolism, and oxygen utilization in and by the uterus during pregnancy (17, 18). A further study reported changes in blood and plasma volume, hematocrit, and corpuscular volume during pregnancy in sheep (19).

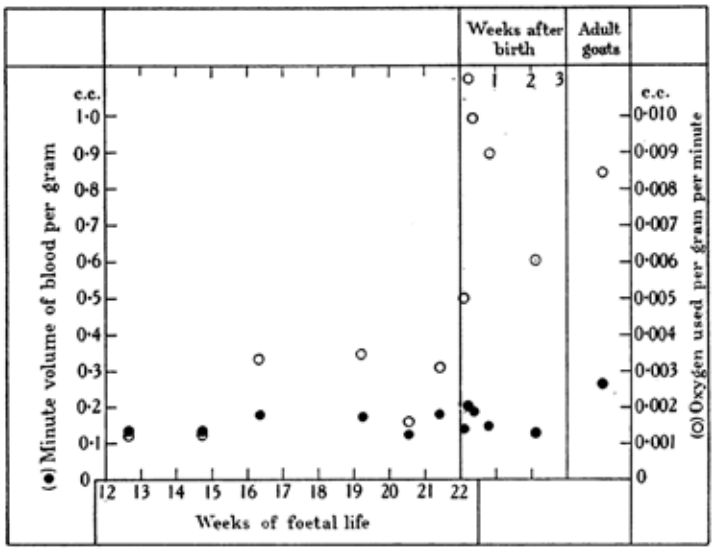
Figure 2. Size of the innervated spleen in two dogs during and after pregnancy (15).



"Prior to Barcroft, there had been little interest in the physiology of the fetus... He changed all that and founded the field."

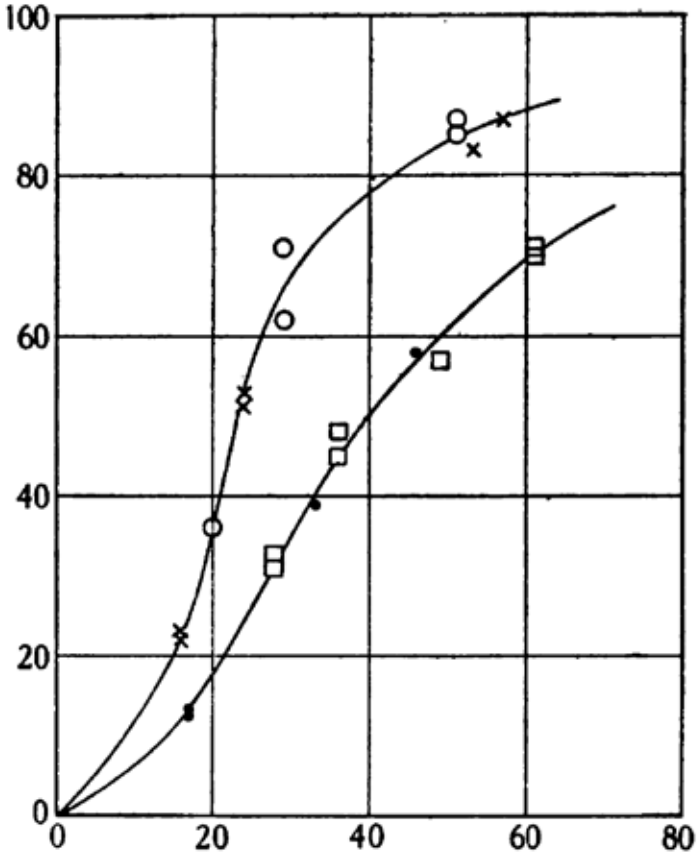
Prior to Barcroft, there had been little interest in the physiology of the fetus, or foetus to use the British spelling. He changed all that and founded the field. His earliest studies pioneered a technique where the pregnant mother was placed in a saline bath maintained at body temperature, and the fetus was then delivered by cesarean section for study. An early such study measured the cardiac output of the fetal goat, rabbit, and guinea pig (20). This study also measured oxygen consumption of the fetal goat compared to the newborn kid and showed an approximately four-fold increase following birth (Figure 3). In what must be one of the shortest scientific reports in history, Barfield documented "The atmosphere in which the foetus lives," showing the average umbilical venous oxygen saturation in fetal sheep to be 87% while the arterial saturation was 58% (21). A longer report verified these numbers, which ultimately led to the expression of the "fetus on Mount Everest" (22). These values are quite similar to those in the human fetus.

Figure 3. Minute volume of oxygen before and after birth versus oxygen consumption showing a significant increase in consumption after birth (20).



A seminal publication documented the leftward shift of the oxyhemoglobin dissociation curve in the fetus compared to the pregnant dam, which we now know is due to increased fetal hemoglobin levels (Figure 4) (23). In a lecture delivered in 1945, Sir Joseph showed similar curves for frogs and chickens, suggesting that this phenomenon was likely universal in vertebrates (24). In the introduction to this talk, Barcroft stated, "The problem which Nature has to face is the following: to establish an organism which can at once carry on an existence of rather limited activity within its mother's womb, and yet can at once-in a few seconds or minutes-become detached from all its former sources of nourishment and face the shocks of an existence in the outside world." He then conducted studies to determine the oxygen consumption and rate of blood flow in the umbilical arteries of fetal sheep (25). The increase in oxygenation of carotid artery blood at birth was studied using a colorimetric method that predated the development of pulse oximetry by about 4 decades (26). Additional studies measured heart rate and umbilical vessel blood pressures in fetal sheep (27, 28).

Figure 4. Oxyhemoglobin dissociation curves for fetal blood (left curve) versus maternal blood. The X-axis is oxygen tension, and the Y-axis is percent saturation (23).

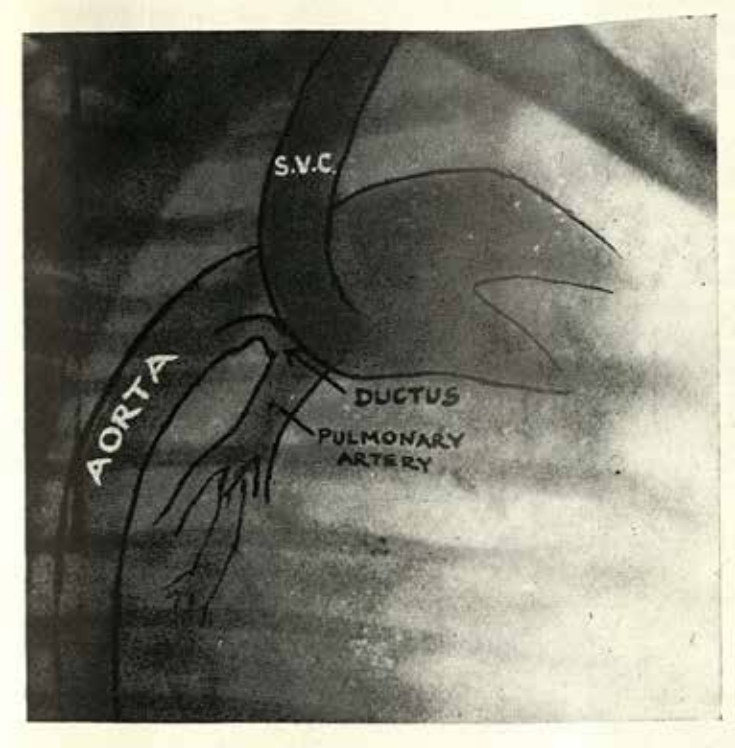


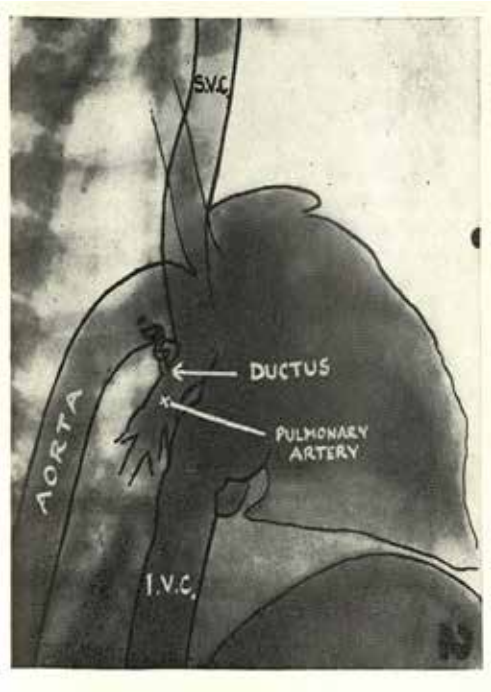
Another area of interest for Barcroft was the genesis of somatic movements in the fetus. He used taps from a glass rod and mild electric shock to show that individual skeletal muscle contractions could be elicited before reflex arcs were established (29, 30). In the mid-1930s, Donald H. Barron, PhD, began working with Barcroft, initially studying the development of respiratory movements in fetal sheep, showing that rhythmic movement of the diaphragm begins about one-third of the way through gestation and that these movements are accentuated by asphyxia produced by transient umbilical cord occlusion (31). These studies were then extended into mid-gestation with an extensive investigation into the role of the central nervous system on respiratory movements (32). Results of these studies were summarized in *The British Medical* Journal in 1939 (33). A subsequent study investigated the oxygen supply to the fetal brain and the effect of asphyxia on fetal respiratory movements, showing that carotid artery blood saturation is intermediate between that in the umbilical vein and artery and again showing the stimulatory effect of asphyxia on breathing movements (34).

"In the mid-1930s, Donald H. Barron, PhD, began working with Barcroft, initially studying the development of respiratory movements in fetal sheep, showing that rhythmic movement of the diaphragm begins about one-third of the way through gestation and that these movements are accentuated by asphyxia produced by transient umbilical cord occlusion."

Finally, Barcroft, Barron, and colleagues turned their attention to the ductus arteriosus using the newly developed technique of cineangiography. They delivered lambs by cesarean section, rapidly instrumented them, and showed that the ductus begins to functionally close rapidly after birth (Figure 5) (35). He wrote, "The manner of closure is curious. There appear to be continual and fairly rapid changes taking place in the walls, resulting in kinking and twisting of the lumen, as well as the loculation of the

Figure 5. Outlined radiographs showing patency of the ductus arteriosus 44 seconds after birth in a lamb (left) and constriction with a "beaded" appearance 2 minutes, 34 seconds post birth (right) (35).





contents within it. This loculation, which gives the radiographic appearance of beads, we regard as definite evidence of complete cessation of flow at the time when it occurs." It seems that ductal closure occurs somewhat more slowly in the human newborn. Further studies evaluated circulation through the fetal and adult heart, with specific reference to the role of the ductus in the fetus (36), and demonstrated a halving of pulmonary circulation time following functional closure of the ductus (37).

"Sir Joseph gave several named lectures in which he summarized much of his work on fetal physiology, including "Phases of Foetal Life,' 'Problems in Foetal Life,' and 'Birth in Relation to Foetal Development.' He published a two-volume book,* The Respiratory Function of the Blood*, summarizing his earlier work with hemoglobin and altitude."

Sir Joseph gave several named lectures in which he summarized much of his work on fetal physiology, including "Phases of Foetal Life" (38), "Problems in Foetal Life" (39), and "Birth in Relation to Foetal Development" (40). He published a two-volume book, *The Respiratory Function of the Blood*, summarizing his earlier work with hemoglobin and altitude (41, 42). In Part I, he elaborated on his altitude studies, while Part II reviews his extensive research on hemoglobin. In 1946, he published *Researches on Pre-Natal Life* (Vol. 1), a work which spans nearly 300 pages and is dedicated to Professor Barron, "to whom the work, of which this book treats, owes so much." (43). This volume summarizes essentially everything known at the time about fetal physiology, specifically the fetal circulation and respiration. It was reissued by Ross Laboratories in 1977 with a foreword by Professor Barron, and I am the proud owner of two copies. Unfortunately, Sir Joseph died in 1947 before he could author Volume 2, which would have focused on fetal metabolism and the development of the fetal nervous system (44).

"Sir Joseph Barcroft received numerous accolades during his lifetime, the most significant of which was being knighted in 1935, even before he had completed most of his brilliant work on fetal physiology...In closing, it is impossible to overstate the importance of Sir Joseph Barcroft's life and work to our understanding of the complexities of fetal life."

Sir Joseph Barcroft received numerous accolades during his lifetime, the most significant of which was being knighted in

1935, even before he had completed most of his brilliant work on fetal physiology. Professor Barron, who went on to a long and distinguished career of his own, wrote an obituary which was published in *Science* (45). In closing, it is impossible to overstate the importance of Sir Joseph Barcroft's life and work to our understanding of the complexities of fetal life.

I thank Ms. Lauren McInnis for her invaluable assistance in acquiring some of the old manuscripts cited herein and her help in editing the references.

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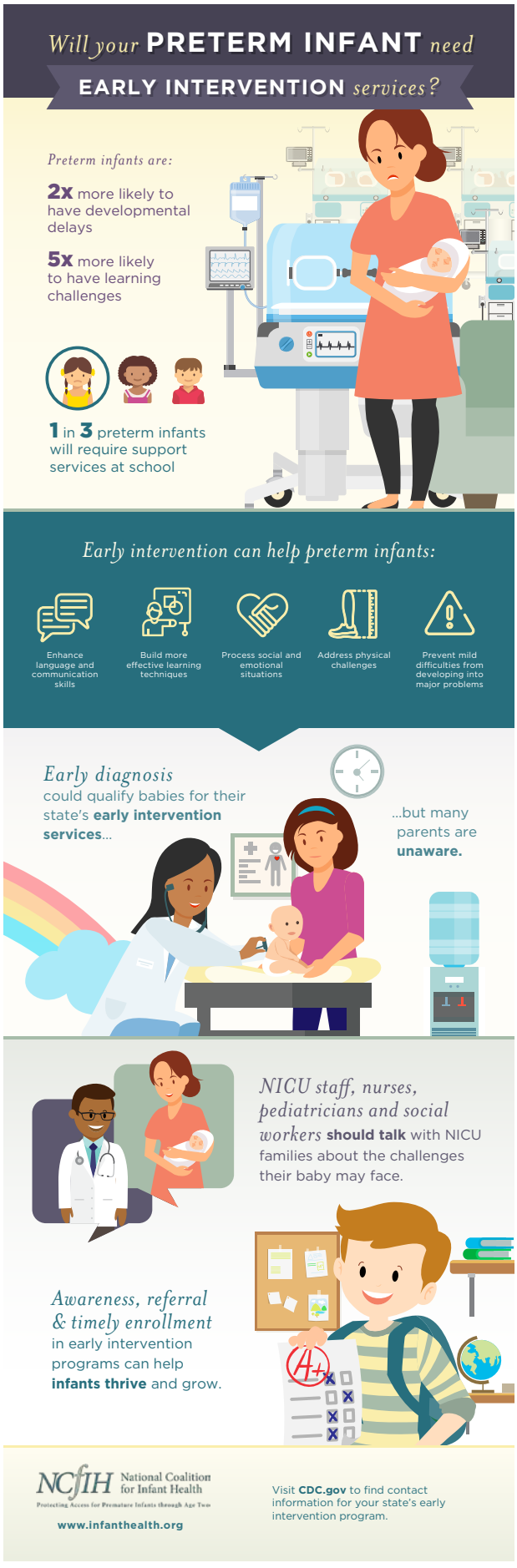
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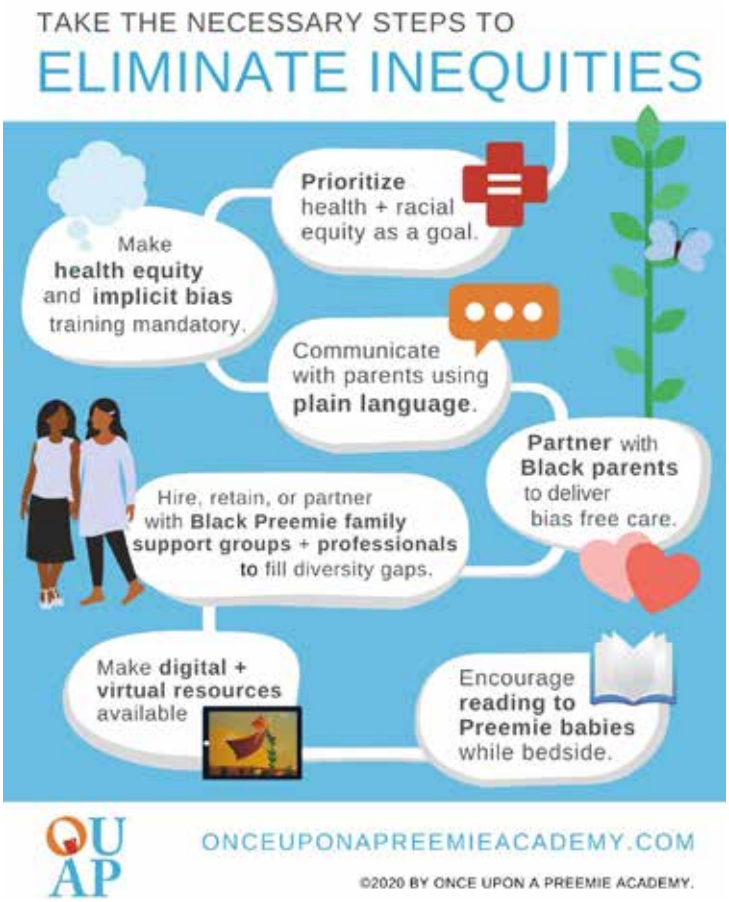


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Memoriam in Honor of Dr. Marti Baum

Gabrielle A. Pina, DO

"It is with profound sorrow and deep respect that we announce the passing of Dr. Marti Baum, a towering figure in pediatric advocacy and community health. For more than four decades, Dr. Baum was a fierce and compassionate champion for children across San Bernardino and Riverside Counties."



It is with profound sorrow and deep respect that we announce the passing of **Dr. Marti Baum**, a towering figure in pediatric advocacy and community health. For more than four decades, Dr. Baum was a fierce and compassionate champion for children across San Bernardino and Riverside Counties. Her legacy as a clinician, leader, and advocate will continue to shape our communities for generations.

Transformative Contributions to Child Health:

Dr. Baum played a pivotal role in advancing developmental screening and addressing social determinants of health (SDOH) within our institution. She spearheaded the integration of essential tools such as the ASQ and M-CHAT into EPIC. She championed the development of smartsets that enabled providers to identify better and manage SDOH—systems that remain foundational to our care today. These innovations, the product of her persistence and vision, reflect her unwavering commitment to improving the way we serve children.

She was also instrumental in establishing the Help Me Grow initiative in partnership with First 5 Riverside and San Bernardino, creating a coordinated regional system to enhance screening for developmental delays, SDOH, and ACEs. Through her tireless advocacy and relationship-building, families gained access to essential resources that extend well beyond the clinic walls.

"She also founded the Policy, Advocacy, and Leadership (PAL) certificate track, inspiring residents to become leaders in advocacy and organized medicine. For nearly 40 years, she served as an Assistant Professor in the Department of Pediatrics at Loma Linda University, modeling what it means to blend medical excellence with a deep sense of social responsibility."

A Visionary Educator and Mentor

Recognizing that the health of children is shaped by their communities, Dr. Baum created the pediatric community rotation, which remains one of the most meaningful and impactful experiences in our residency program. She also founded the Policy, Advocacy, and Leadership (PAL) certificate track, inspiring residents to become leaders in advocacy and organized medicine.

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"Dr. Baum's influence extended to the legislative arena, where she was a tireless advocate for vulnerable populations. She served with distinction on the Board of Trustees of the California Medical Association and as President of the San Bernardino County Medical Society, encouraging physicians at every stage of their careers to engage in shaping policy for the betterment of children."

Leadership in Organized Medicine:

Dr. Baum's influence extended to the legislative arena, where she was a tireless advocate for vulnerable populations. She served with distinction on the Board of Trustees of the California Medical Association and as President of the San Bernardino County Medical Society, encouraging physicians at every stage of their careers to engage in shaping policy for the betterment of children. Her many roles included:

- Director, OK Kids Rotation
- Executive Director, Healthy Neighborhoods Project
- Consultant, San Bernardino School District
- Director, Operation Fit
- Director, Community Benefits, Loma Linda University Medical Center
- Physician Champion, *Help Me Grow* Initiative
- Physician Champion and Advisory Committee Chair, Reach Out and Read Inland Empire

Recognition and Awards

Dr. Baum's contributions were widely recognized. Among her many honors were:

- Local Champions Award, First 5 San Bernardino
- Loma Linda University School of Medicine Distinguished Academic Award, presented at the Class of 2025 Commencement Ceremony
- Nicholas P. Krikes Award for Outstanding Contribution to the California Medical Society and the Community
- **Physician of the Year**, along with numerous publications, abstracts, and book reviews

A Lasting Legacy:

Dr. Baum never allowed life's challenges to deter her mission: to make life better for all children. She embodied a rare blend of compassion, resilience, and vision, and her energy and clarity of purpose inspired all who knew her.

"We mourn her passing deeply, but we honor her legacy by continuing the work she so passionately championed. May her memory be a blessing—and a call to action for all who strive to improve the lives of children."

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Disclosures: *The author has no disclosures*

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Human Donor Milk: A Critical Need for Oversight

Mitchell Goldstein, MD, MBA, CML, Jan M. Bult

"The July 2025 Ohio donor-milk recall, triggered by a faulty thermometer on a pasteurization machine, is a stark reminder of the persistent vulnerabilities in the current oversight framework for human donor milk. Although no contamination was detected, 5,735 bottles of donor milk had to be destroyed, and supply lines to nine states were disrupted."

The July 2025 Ohio donor-milk recall, triggered by a faulty thermometer on a pasteurization machine, is a stark reminder of the persistent vulnerabilities in the current oversight framework for human donor milk. Although no contamination was detected, 5,735 bottles of donor milk had to be destroyed, and supply lines to nine states were disrupted. The incident highlights the fragmented and inconsistent regulatory landscape that governs donor milk, especially as clinical reliance on this critical nutrition for preterm and medically fragile infants continues to rise. (1,2)

Safety is of utmost concern when recipients use products made from a biological human substance for clinical or nutritional purposes. We remember the enormous tragedy in the 80s when many people with hemophilia were infected with HIV through contaminated plasma-derived clotting factors. In later years, we saw transmission of hepatitis C through blood transfusions and the use of plasma products. And if this was not enough, there was the bacterial contamination caused by cracked vials of albumin in 1996, resulting in multiple fatalities. (3,4)

In 1997, the Food and Drug Administration (FDA) created the Team Biologics. (5) The primary focus was on ensuring the quality and safety of biological products through consistent and comprehensive inspection of the manufacturing facilities of manufacturers of biologics. This robust and thorough regulatory oversight does not currently exist for human milk.

Human donor milk is a biological tissue, not merely a nutritional supplement. It carries risks of transmitting infectious agents, pharmaceuticals, and environmental contaminants, similar to those associated with blood and plasma banking. (6-7) Some states regulate donor milk as tissue, but this is not universal, and the lack of harmonized standards leaves gaps in safety protocols. (6,8)

A Fragile Safety Framework:

The safety framework for donor milk is fragile. Regulatory inconsistencies exist between for-profit and nonprofit milk banks, with many facilities operating outside the FDA's purview. Furthermore, there is no standardized national protocol governing donor screening, milk processing, or batch-level testing. The result is a patchwork of practices that vary so widely from bank to bank that the quality of a bottle received in a California NICU may differ substantially from that of an identically labeled bottle in Ohio. (2,8,9)

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Risks extend considerably beyond the milk itself. Contamination can occur through improper breast pump sanitization, sub-optimal home storage temperatures, and uncontrolled transit environments. Failures inside processing facilities, including equipment malfunctions, bottle contamination, and batch mixing errors, can compromise product safety at any stage, from expression to distribution. (7,10)

What the 1980s Blood Bank Crisis Taught Us:

Those of us who witnessed the painful evolution of blood safety remember that the American Red Cross was issued a Consent Decree in 1993 and continued to violate this Decree for more than two decades. Only after 23 years and $47 million in fines was this Decree lifted. (11) This situation is a clear example that non-profit status did not insulate organizations from systematic failures. Regulatory oversight has proven to be instrumental in ensuring

product safety.

Blood banking emerged from that crisis with three durable pillars: 1) uniform donor-exclusion criteria, (12) 2) validated processing and pathogen-reduction steps, (13) and 3) real-time hemovigilance with barcode traceability that links every unit from donor to recipient. (14-15) Confidence followed regulation, not the other way around.

The Unique Stakes in Neonatology:

Preterm and medically fragile infants have no margin for error; even trace amounts of pathogens, toxins, or drug residues in donor milk can tip the balance between recovery and serious harm. This reality demands the highest level of regulatory rigor.

Yet demand has raced ahead of policy. The donor milk supply grew from about 400,000 ounces in 2000 to more than 11 million ounces in 2024, according to the Human Milk Banking Association of North America. While mounting data confirm the clinical value of donor milk, public confidence could erode overnight if preventable contamination prompts recalls, lawsuits, or shattered parental trust.

Regulatory oversight is not limited to the United States. The European Commission initiated a complete review of European regulations covering all Substances of Human Origin (SoHO). These substances now include human milk, bone marrow, sperm, fecal transplant, and more. The new regulation was adopted in July 2024 and must be entered into national legislation within a specified number of years after its adoption. The regulation aims to elevate safety and quality standards across member states by harmonizing regulations, requiring facility approval and inspection for milk banks, and introducing digital traceability systems to track donor milk from collection through clinical use. (17)

"Moving forward, federal recognition of donor milk as a biologic or Medical Product of Human Origin is essential. Baseline standards should include annual inspections, validated donor screening, mandatory batch testing, and national systems for adverse event reporting and traceability."

A Path to Safety Improvements in the US:

Moving forward, federal recognition of donor milk as a biologic or Medical Product of Human Origin is essential. Baseline standards should include annual inspections, validated donor screening, mandatory batch testing, and national systems for adverse event reporting and traceability.

Uniform standards and harmonized guidelines provide a foundation for ensuring safe and equitable access to donor milk for vulnerable infants. Still, they do not address all potential systemic failures that may affect these processes. (1-2,9,18)

A Warning Bell for Clinical and Regulatory Vigilance:

Donor human milk is a lifeline for vulnerable infants, and ensuring its safety must be a collective priority. The recent Ohio recall serves as a clear warning that rigorous regulation, transparent oversight, and consistent quality controls are not optional; they are essential. By embracing the proven strategies developed in blood banking and learning from global role models, the U.S. can forge a safer, more reliable donor milk system that protects families and sustains trust in this vital resource. The time to act is now to ensure that every drop of donor milk delivers only hope and healing.

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The Indirect Impact of **RSV**

NCfIH National Coalition for Infant Health
Protecting Access for Premature Infants through Age Two

OVERVIEW



RSV impacts not only infants and young children, but also entire families.

The National Coalition for Infant Health and the Alliance for Patient Access sought to examine the multifaceted burden that RSV places on families and to identify potential policy solutions.

Two surveys were conducted, one of parents who had at least one child contract RSV and one of health care providers who treat infants and children with RSV.

Both surveys were conducted with YouGov, a global public opinion and data company. Parents and providers were recruited from a pool of pre-selected respondents to ensure they met the survey's requirements. Participants received an honorarium.

RSV PARENT SURVEY

340 parents who had at least 1 child sick with RSV



67% of parents said their child was hospitalized for RSV

RSV HEALTH CARE PROVIDER SURVEY

175 health care providers across various pediatric and neonatal subspecialties



67% worked in an outpatient facility

33% worked in a hospital

RESULTS

FINANCIAL BURDEN

More than ⅔ of parents said the costs of RSV posed a financial burden or financial crisis.

7% of parents said they were fired as a result of caring for their child with RSV.

32% of parents reported losing potential income while their child had RSV.

EMOTIONAL BURDEN

68% of parents said watching their child suffer affected their mental health.

69% of parents felt guilty that they could not do more to prevent their child's RSV.

When parents found out there was no treatment for RSV, only supportive care:

- **48%** felt angry
- **46%** felt helpless

SOCIAL BURDEN

43% of parents had never heard of RSV before finding out their child was sick.

54% of parents had to rely on family and friends for sibling care, transportation and other responsibilities.

42% of parents said they struggled to care for their other children when one faced RSV.

RESULTS

PARENT EDUCATION & AWARENESS

86% of providers said they include RSV education as part of routine care.

99% of providers agreed that parents need more information about RSV.

TREATMENT CHALLENGES

Nearly ⅓ of providers have been reluctant to test for RSV because no treatment exists.

48% of providers said it was difficult to decide whether to send an infant or child with RSV to the emergency room.

92% agreed that if an immunization were available, it should be added to the Vaccines for Children program's list of pediatric vaccines.

MISCONCEPTIONS

A majority of providers (60%) explained that around 50% or more of the babies they see hospitalized for RSV were born healthy, despite many people thinking severe RSV only impacts premature infants or those with preexisting conditions.

CONCLUSION

Both surveys highlighted that the burden of RSV extends well beyond its physical symptoms.

The virus may lead to:

- **Long-lasting health challenges** for babies and young children
- **Financial, social and emotional burdens** for families
- **Frustration for providers,** who lack a cure or viable preventive interventions

This burden is not experienced by the few. Most infants and children contract RSV by the time they are two, and challenges that accompany RSV may impact anyone who has been affected.

Moving forward, the many burdens of RSV demonstrate the need for:

- **More RSV education**
- **Research and innovation** for preventive interventions
- **Access to prevention and treatment** for all babies and children

The challenges caused by RSV can reach far and wide, and its indirect impacts often leave families struggling.

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From Transactions to Transformation: Leading the Journey to Commercial Excellence

Rody Azar, MHA, RRT-NPS

"This article explores the concept of Commercial Excellence through the lens of leadership, focusing on how leaders can guide their teams beyond transactional selling toward consultative, insight-driven engagement."

Abstract:

In today's hypercompetitive business environment, organizations cannot rely solely on innovative products or competitive pricing to sustain growth. True differentiation lies in building a culture of Commercial Excellence, a systematic approach that aligns strategy, people, processes, and customers toward sustained value creation. This article explores the concept of Commercial Excellence through the lens of leadership, focusing on how leaders can guide their teams beyond transactional selling toward consultative, insight-driven engagement. Drawing from established business frameworks, leadership research, and real-world case examples, it identifies five critical steps leaders can take to start the process of Commercial Excellence:

1. *Defining a sharp vision and customer-centric strategy*
2. *Building data-driven capabilities*
3. *Developing talent and coaching for Excellence*
4. *Aligning incentives and metrics with desired outcomes*
5. *Embedding a culture of continuous improvement.*

By embracing these practices, leaders not only increase commercial performance but also inspire trust, resilience, and long-term organizational growth.

Introduction: Why Commercial Excellence Matters:

Commercial Excellence is more than a business buzzword; it is a strategic imperative. As industries face rapid disruption, commoditization, and shifting customer expectations, traditional selling models no longer suffice. Customers today are more informed, digitally enabled, and value-driven, expecting solutions tailored to their unique challenges rather than generic product pitches.

Research from Bain & Company suggests that companies with mature Commercial Excellence programs outperform their peers with up to 15% higher revenue growth and 20% better customer retention. In healthcare, technology, and industrial markets alike, success is not only about closing deals but about building sustainable, mutually beneficial relationships with customers.

The leader's role is critical. Leadership determines whether Commercial Excellence is viewed as a "project" or embraced as a cultural transformation. Without authentic leadership, organizations risk falling into the trap of fragmented initiatives, misaligned teams, and short-term thinking.

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What is Commercial Excellence?

Commercial Excellence can be defined as the systematic pursuit of sustainable growth and customer value through the alignment of strategy, processes, capabilities, and culture across the commercial organization. It requires:

- A sharp vision of the value the company delivers.
- Alignment between sales, marketing, product, and service teams.
- Data-driven insights that shape decision-making.
- Talent development to ensure every commercial interaction creates impact.
- Metrics and incentives that reinforce the right behaviors.

In essence, it shifts the conversation from "What are we selling?" to "How are we helping customers succeed?"

The Leadership Imperative:

Leadership is the catalyst that determines whether Commercial Excellence thrives or fails. Leaders must:

1. Articulate a clear, customer-centric vision that inspires alignment.
2. Model the right behaviors by engaging in authentic,

consultative interactions with both customers and employees.

3. Build resilience in teams by striking a balance between short-term performance and long-term development.
4. Foster collaboration across departments to remove silos and unlock cross-functional value.
5. Measure success holistically, not only through revenue numbers but also through customer loyalty, employee engagement, and innovation.

"Without leadership commitment, Commercial Excellence remains a slide deck in strategy meetings rather than a lived organizational reality."

Without leadership commitment, Commercial Excellence remains a slide deck in strategy meetings rather than a lived organizational reality.

Five Steps Leaders Can Take to Start the Process of Commercial Excellence:

Step 1: Define a Clear Vision and Customer-Centric Strategy:

Commercial Excellence begins with clarity of purpose. Leaders must answer:

- Who are our customers, and what do they truly value?
- How do our offerings solve their most pressing challenges?
- What is our unique commercial identity that differentiates us in the market?

Practical actions for leaders:

- Develop a customer journey map to identify decision points, pain points, and opportunities for value creation.
- Communicate a clear "North Star" vision that rallies employees around customer outcomes, not just internal targets.
- Segment customers strategically, prioritizing not only by revenue potential but also by strategic fit and long-term partnership value.

A compelling vision acts as a magnet for talent, investment, and customer trust. Without it, even the best execution falls flat.

Step 2: Build Data-Driven Capabilities:

Data is the backbone of Commercial Excellence. Leaders must ensure their organizations move beyond intuition and legacy practices to a culture based on facts.

Practical actions:

- Invest in CRM systems, advanced analytics, and AI tools that provide actionable insights into customer behaviors, pricing dynamics, and pipeline health.
- Enable front-line teams with dashboards that offer visibility in key performance indicators and customer trends.
- Use predictive modeling to identify high-potential opportunities and proactively address customer churn risks.

However, data without context is meaningless. Leaders must train teams to interpret data critically, ensuring it drives better conversations with customers, not just more reporting.

Step 3: Develop Talent and Coach for Excellence:

At its core, Commercial Excellence is a people strategy. Technology and processes are important, but it is the skills, mindset, and behaviors of people that determine whether customers experience value.

Practical actions:

- Implement structured coaching programs where managers spend at least 30 to 40% of their time developing their teams.
- Move beyond product training to build consultative selling, storytelling, and negotiation skills.
- Recognize and promote leaders who excel at coaching and collaboration, not just those who hit quota.
- Encourage a culture of peer learning, where best practices are shared across regions and teams to foster a collaborative environment.

"A Gallup study found that employees who receive regular coaching are three times more engaged and 31% more productive. Leaders who invest in coaching talent not only drive performance but also build loyalty and reduce turnover."

A Gallup study found that employees who receive regular coaching are three times more engaged and 31% more productive. Leaders who invest in coaching talent not only drive performance but also build loyalty and reduce turnover.

Step 4: Align Incentives and Metrics with Desired Outcomes:

Too often, organizations measure what is easy, not what truly matters. Misaligned incentives lead to short-term wins but long-term erosion of trust and value.

Practical actions:

- Shift measurement from "input metrics" (calls made, demos scheduled) to "outcome metrics" (customer adoption, retention, ROI delivered).
- Design incentive structures that reward collaboration across functions, not just individual heroics.

- Incorporate customer satisfaction (NPS, CSAT) and employee engagement scores into leadership evaluations.
- Regularly review and update metrics to ensure they remain aligned with evolving strategy.

When employees see that what gets rewarded truly reflects the organization's values, they naturally align their behaviors to drive sustainable outcomes.

"Commercial Excellence is not a one-time project; it is a journey of continuous improvement. Leaders must instill a growth mindset where experimentation, feedback, and adaptation are celebrated."

Step 5: Embed a Culture of Continuous Improvement:

Commercial Excellence is not a one-time project; it is a journey of continuous improvement. Leaders must instill a growth mindset where experimentation, feedback, and adaptation are celebrated.

Practical actions:

- Encourage teams to pilot novel approaches in specific markets, then scale successful practices.
- Create feedback loops that enable customers to provide direct input into product and process improvements.
- Celebrate "lessons learned" with the same visibility as successes, thereby reducing the stigma associated with failure.
- Benchmark against industry leaders and adapt insights into organizational practices.

A culture of continuous improvement ensures that Commercial Excellence evolves in tandem with market conditions, rather than stagnating.

Challenges and Pitfalls to Avoid:

While the steps are clear, leaders often stumble in execution. Common pitfalls include:

- Overemphasis on tools without investing in people.
- Treating Commercial Excellence as a short-term initiative rather than a cultural transformation.
- Lack of leadership alignment, where different executives champion competing priorities.
- Failing to engage the front line, who ultimately deliver the customer experience.

Awareness of these challenges helps leaders design more resilient strategies.

Conclusion: The Leader's Call to Action:

Commercial Excellence is no longer optional; it is the differentiator between companies that thrive and those that fade into irrelevance. Leaders hold the keys to success. By defining a sharp vision, leveraging data, coaching talent, aligning metrics, and fostering continuous improvement, they unlock both commercial performance and cultural strength.

The journey demands courage, discipline, and humility, but the rewards are profound: stronger customer trust, engaged employees, and sustained business growth.

The time for Commercial Excellence is now, and the call is clear: Leaders must move their organizations from transactions to transformation.

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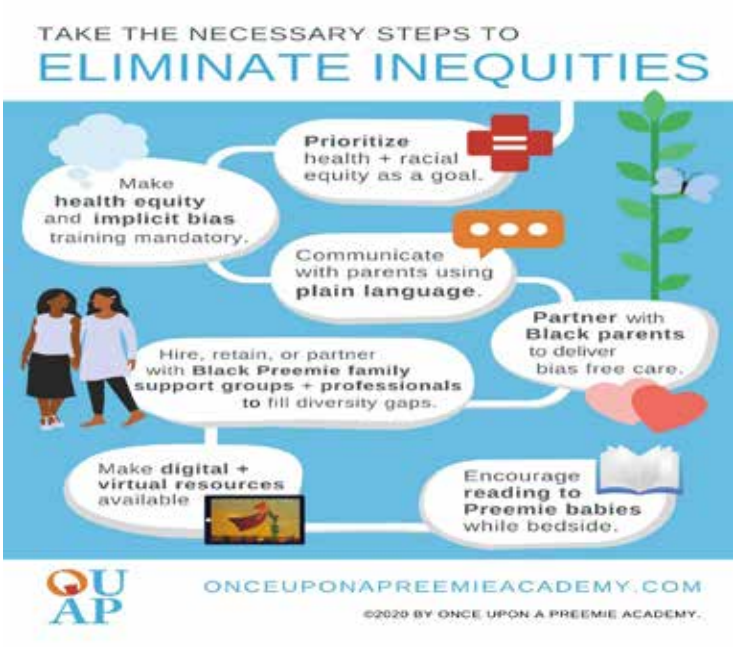
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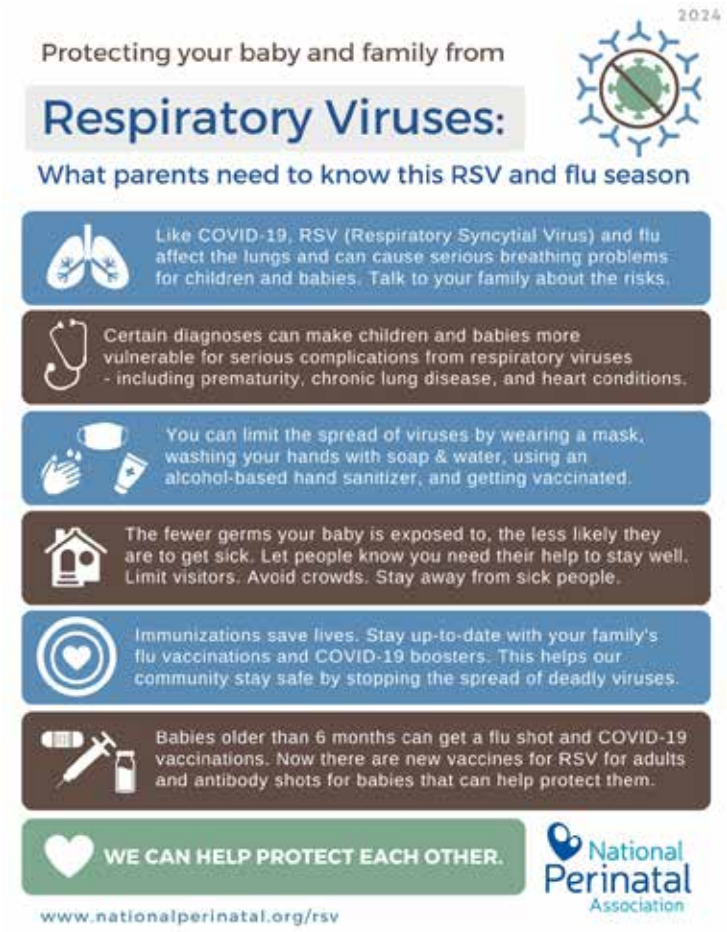
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Rody Azar Bio:

With over 20 years of leadership experience, Rody has a proven track record of driving results and developing high-performance teams. A staunch believer in fostering strong, trusting relationships, he advocates for servant leadership and is passionate about nurturing talent and human asset development. Rody emphasizes the importance of effective people leadership in guiding teams to deliver exceptional results. He has successfully promoted leaders into key mid-management and senior roles, significantly contributing to organizational success and enhancing shareholder value.

Currently, Rody serves as the Vice President of Sales and Clinical at a leading medical device manufacturing company in Orange County, CA. He is also an Organizational Leadership Coach and a faculty member in clinical education. As a proud member of the American College of Healthcare Executives (ACHE) and the American Association for Respiratory Care (AARC), he remains committed to advancing healthcare leadership and education.



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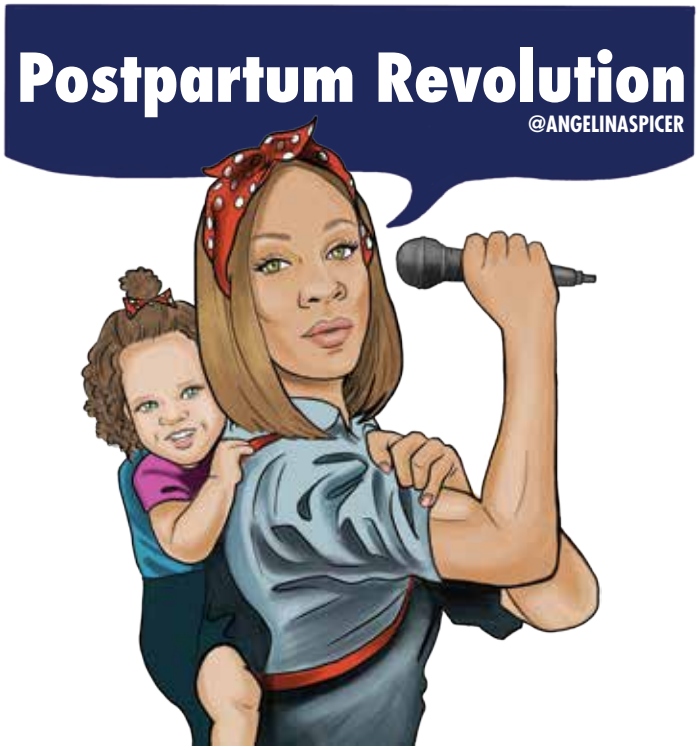
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Ethics and Wellness: Stop Calling Every Mistake a Lie: How a Culture of Blame is Hurting Neonatology

Mitchell Goldstein, MD, MBA, CML, Caroline Yu, MD, T Allen Merritt, MD, MHA, MBA

"When every imperfection is treated as a breach of ethical conduct, many leaders in NICUs force good clinicians into silence, drive mistakes underground, and compromise patient safety in the very name of protecting it. This is not accountability; it is a slow, corrosive erosion of trust that leaves both our teams and the best interests of our tiniest patients at risk. (1, 2)"

While much has been discussed about "burnout," neonatology is not just about long hours and emotional fatigue—it is about moral injury caused by a culture that confuses human error with dishonesty. When every imperfection is treated as a breach of ethical conduct, many leaders in NICUs force good clinicians into silence, drive mistakes underground, and compromise patient safety in the very name of protecting it. This is not accountability; it is a slow, corrosive erosion of trust that leaves both our teams and the best interests of our tiniest patients at risk. (1, 2)

A lie is deliberate. It is a calculated effort to deceive. It is not a misunderstanding, an imperfect recall, or an error corrected in good faith. However, in too many NICUs, any misstep is treated as a moral failing, any imperfect process is a breach of trust, and any human error is grounds for suspicion. This is not ethics—it is "fearmongering" dressed up as professionalism. (3, 4)

If a clinician recognizes an error, corrects it immediately, discloses it, apologizes, and self-reports, we should be holding that person up as an example of integrity. Instead, too often, we quietly punish them, label them as "untrustworthy" or "error prone," and whisper about their competence. In doing so, we send a clear message: *do not come forward, do not admit, do not risk being honest. (5, 6)*

"This culture does not make patients safer; it makes them less safe. Errors do not disappear because we hide them. They fester in the dark."

This culture does not make patients safer; it makes them less safe. Errors do not disappear because we hide them. They fester in the dark. Moreover, the people who could have been our greatest allies, by analyzing root cause analysis and fixing the issues, learn to keep their heads down and their mouths shut. The act of rallying against a punitive environment may be grounds for punishment or allegation of complicity. (1-3)

History should have taught us better. Suppose Dr. Alexander Fleming had been working under today's punitive, blame-first culture. In that case, the world might never have known the desirable properties of penicillin by recognizing how leaving a petri dish out allowed the penicillium mold to inhibit colonies of Streptococcus. Instead, this would be punishable. Delaying a report to facilities? Grounds for disciplinary action. Investigating an unplanned finding without immediate clearance? "Questionable integrity." We would have crushed this accidental but critical discovery. (7)

"The second victim phenomenon refers to the psychological trauma experienced by clinicians involved in adverse events, particularly when the organizational response is punitive or unsupportive.(8)"

The second victim phenomenon refers to the psychological trauma experienced by clinicians involved in adverse events, particularly when the organizational response is punitive or unsupportive. (8) The mindset of the "blame game" is not just bad science; it is unethical. It punishes virtue, erodes trust, and accelerates burnout. It takes the already high-pressure environment of the NICU and replaces curiosity and problem-solving with fear and self-protection. Lack of support in the aftermath of error not only

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increases the risk of burnout but also impairs clinicians' ability to recover and continue providing high-quality care, thereby threatening patient safety. (5, 9)

Wellness in neonatology is not about yoga classes, free snacks, or time spent in a massage chair. It is creating a culture where people feel safe to be honest, to take responsibility, and to learn from imperfection. Forgiveness and learning are part of this experience, but even more important is its recognition—rewarding those who handle errors with transparency, resourcefulness, and moral courage. (3, 10)

"To err is human," yes, but in neonatology, the divine act is to treat honesty as a strength, not a liability. If we cannot distinguish between a lie and a mistake, we have no business leading teams that hold lives in their hands. It is time we stop weaponizing ethics and start living them. (2, 8)

"'To err is human,' yes, but in neonatology, the divine act is to treat honesty as a strength, not a liability. If we cannot distinguish between a lie and a mistake, we have no business leading teams that hold lives in their hands. It is time we stop weaponizing ethics and start living them. (2, 8)"

The Call to Leaders:

If you lead a NICU, start now.

- Define and teach the difference between error, misunderstanding, and deceit.
- Build reporting systems that protect—not punish—those who self-disclose.
- Publicly, encourage and recognize staff who model transparency under pressure.
- Train supervisors to evaluate intent before assigning blame.
- Audit the leadership culture for fear-based behaviors that silence truth-telling.

Every NICU has the capacity to create a climate where safety thrives because honesty is a safe approach. The question is whether we have the courage, as leaders, to make that choice today.

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Disclosures: The authors have no disclosures

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INFANT AND FAMILY-CENTERED DEVELOPMENTAL CARE (IFCDC)

STANDARDS AND SAMPLE RECOMMENDATIONS FOR INFANTS IN THE INTENSIVE CARE UNIT

SYSTEMS THINKING IN COMPLEX ADAPTIVE SYSTEMS

- Are the baby and family central to the mission, values, environment, practice & care delivery of IFCDC in the unit?
- Are the parents of each baby fully integrated into the team and treated as essential partners in decision-making and care of the infant?
- What are the strategies and measurements used to improve and sustain IFCDC in the unit?

POSITIONING & TOUCH FOR THE NEWBORN

- Are the positioning plans therapeutic and individualized, given the care needs and development of the baby?
- Are the positioning and touch guidelines continually reviewed by the team, including the parents, and adapted to meet the changing comfort needs of the baby?

SLEEP AND AROUSAL INTERVENTIONS FOR THE NEWBORN

- Can the team confidently describe the "voice" or behavioral communication of the baby?
- Are the baby's unique patterns of rest, sleep, and activity documented by the team and protected in the plan of care?

SKIN-TO-SKIN CONTACT WITH INTIMATE FAMILY MEMBERS

- Is the practice of skin-to-skin contact supported and adjusted to the comfort needs of each baby, parent, & family member?
- Are the parents & family members supported to interact with the baby to calm, soothe, & connect?

REDUCING AND MANAGING PAIN AND STRESS IN NEWBORNS AND FAMILIES

- Are parents supported to be present and interactive during stressful procedures to provide non-pharmacologic comfort measures for the baby?
- Are there sufficient specialty professionals to support the wellbeing of the team, including parents, families, and staff? Examples include mental health, social, cultural, & spiritual specialists.

MANAGEMENT OF FEEDING, EATING AND NUTRITION DELIVERY

- Are the desires of the m/other central to the feeding plan? Is this consistently reflected in documentation with input of the m/other?
- Does the feeding management plan demonstrate a feeding & nutrition continuum from in-hospital care through the transition to home & home care?

WANT TO KNOW MORE ABOUT THE STANDARDS AND RECOMMENDATIONS?
VISIT: HTTPS://NICUDESIGN.ND.EDU/NICU-CARE-STANDARDS/

©CONSENSUS PANEL ON INFANT AND FAMILY-CENTERED DEVELOPMENTAL CARE 2022

Patients and Caregivers Deserve to Experience Care Delivery Free from Harm

Colonel Robert Erick Ridout, U.S. Army, Retired

"I have a passionate belief that patients and caregivers deserve to experience care delivery free from harm. Not just free from serious safety events and front-page newspaper headlines, but also free from any care that fails to add value."

I have a passionate belief that patients and caregivers deserve to experience care delivery free from harm. Not just free from serious safety events and front-page newspaper headlines, but also free from any care that fails to add value. Given that humans are involved in developing care delivery systems and are at the point of care, harm (non-valued-added care) may reach the bedside. I believe that no patient is immune from experiencing care that fails to add value. Further, I believe, the same principle applies to caregivers. When caregivers are placed in positions of providing care that fails to add value, they are harmed. As mentioned above, no caregiver is immune to experiencing care delivery that fails to add value. Recognizing this, in 2008, we envisioned creating a force field around every patient, and ultimately, through cultural change, every member of our team in our Level III Newborn Intensive Care Unit would utilize the IOM's Six Aims for Improvement (Figure 1). The Committee on Quality of Health Care in America at the Institute of Medicine produced the report "Crossing the Quality Chasm," which outlines how health delivery systems can innovate and improve care. This report recommended the following six aims for improvement: care delivery should be **S**afe, **T**imely, **E**ffective, **E**fficient, **E**quitable, and **P**atient-Centered (1).

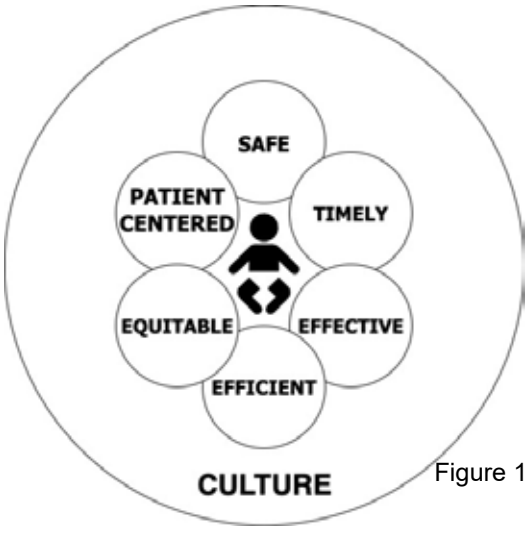


Figure 1.

We recognized that simply encircling the patient with the STEEP force field, without intentional, proactive, and iterative improvements, would not provide a dynamic and preemptive defense against latent threats like Non-Valued Added Care ~ pain, Non-Valued Added Care ~ Ionizing Radiation, Non-Valued Added Care ~ phlebotomy, and other hospital-associated injuries (CLABSI and VAP) (Figure 2).

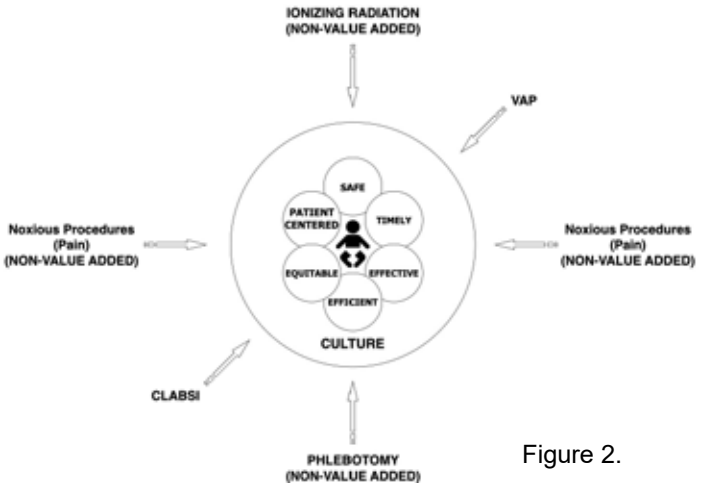


Figure 2.

We anticipated that these threats would continuously seek to breach the STEEP force field (Figure 3) and reach the patient in the same manner described in the Swiss Cheese Model of error by Dr. Reason, where latent factors and active failures combine, resulting in the defense against harm being defeated (2).

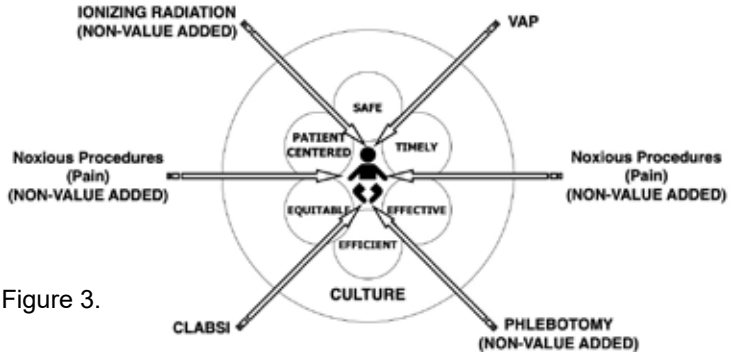


Figure 3.

We identified a Just Culture as the firm foundation upon which our entire ecosystem of care would rely to address and eliminate latent factors and active failures relentlessly (Figure 4) (3). Additionally, we identified the leadership opportunity/obligation to add value to every member of our team (figure 5), including the patient and their family, through the following: seeing each individual through a growth mindset lens and encouraging them to become the best version of themselves through self-actualization (e.g. top of Maslow's Hierarchy of Needs); to cultivate critical thinking and then leverage the genius that exists at the bedside to insure only care that adds value reaches the bedside; to flex

their psychological safety muscle to speak up and strengthen the Just Culture; to embrace principles of high reliability; to contribute to, and enjoy, a culture of praise and recognition; to nourish and strengthen the relationships in the NICU and at home (their family/ support system); and to see themselves as leaders who share the responsibly of all of the above.

Figure 4.

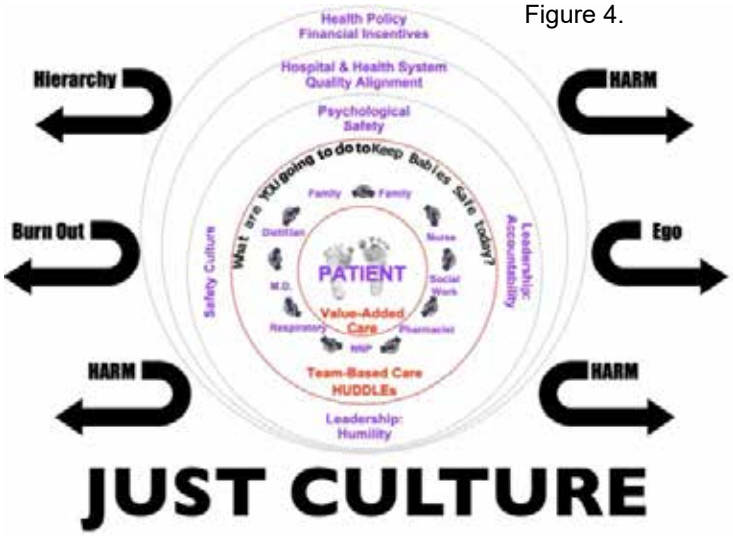


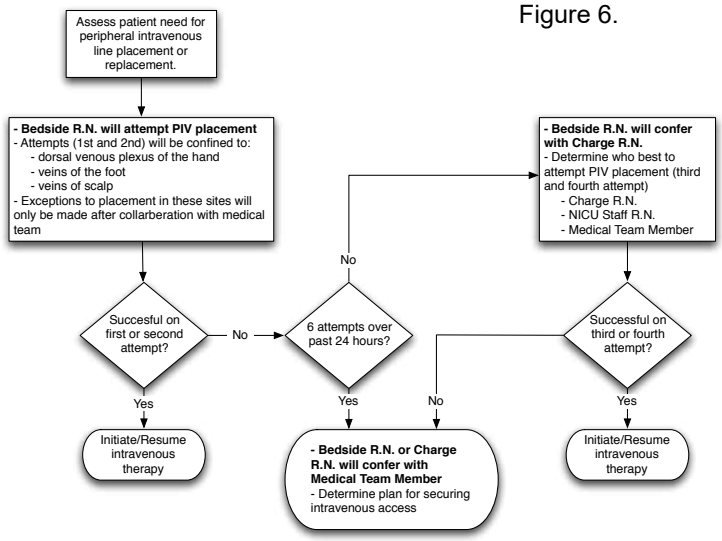


Figure 5.

"We sought to develop a care ecosystem with the following characteristics: a team-based, patient-centered care ecosystem where ALL are empowered to contribute actively, surface safety concerns, experience deep respect, and relentlessly eliminate waste, helping patients, their families, and caregivers feel safe, valued, and loved."

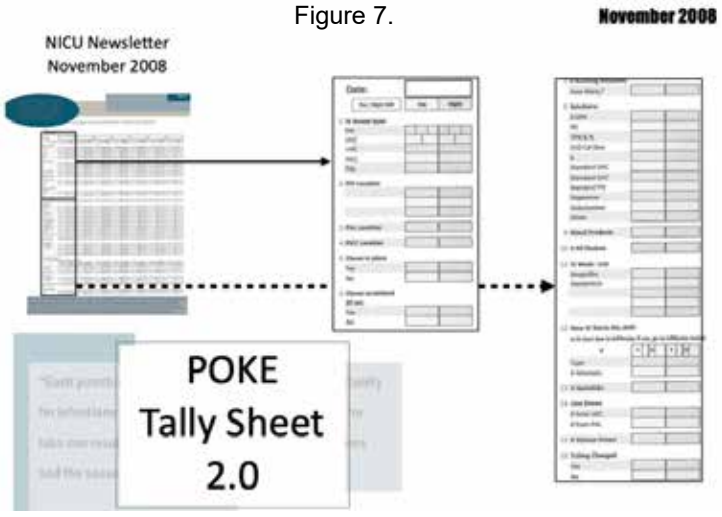
We sought to develop a care ecosystem with the following characteristics: a team-based, patient-centered care ecosystem where ALL are empowered to contribute actively, surface safety concerns, experience deep respect, and relentlessly eliminate waste, helping patients, their families, and caregivers feel safe, valued, and loved. We called this ecosystem "POKE," the reasons for which will become clear as I discuss our early efforts at measuring the care experience of every patient.

Figure 6.



In August 2008, during bedside rounds, we discussed the difficulty in securing peripheral IV access in one of our patients. Overnight, "multiple" attempts were required to secure the peripheral IV for continued provision of empiric antibiotics; however, on rounds, it was determined the patient was a candidate for discontinuation of antibiotics and, thus, would not need IV access any longer. After further discussion, we were not able to determine how many painful attempts "multiple" represented, and so we decided to charter a team to establish a standard work process for peripheral IV access and to begin measuring the care experience of every patient experiencing this peripheral IV access process, and measure the number of attempts (Figure 6). The multidisciplinary team developed a rudimentary paper-based tick list to begin assessing the number of attempts and adherence to the standard work process. The team quickly observed the much larger opportunity in creating a culture of pain prevention and maintaining skin and tissue integrity through a systematic process of reducing skin punctures. A database was programmed to facilitate aggregation and rapid cycle improvements, with the secondary benefit of collecting data on the peripheral IV process.

Figure 7.



The database aggregated the data captured on the Vascular Access, Skin Integrity, and Infection Control QA Monitor Tool. The overall project, monitoring tool, and, ultimately, care ecosystem were changed to POKE for Prevention of Pain and Organisms from sKin and Katheter Entry (Figure 7). In the next column, I will discuss what we learned and the culture and process changes that followed to proactively eliminate non-value-added care (POKEs) from reaching the bedside.

"In the next column, I will discuss what we learned and the culture and process changes that followed to proactively eliminate non-value-added care (POKEs) from reaching the bedside."

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Disclosures: *The author has no disclosures*

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Erick Ridout, MD, is blessed to be the dad to two amazing kids, granddaddy to three extraordinary grandsons and two granddaughters, and currently serves the babies, their families, and caregivers in the Newborn ICU in Southwestern Utah, the Newborn ICU in Honolulu, Hawaii, and as a Vermont Oxford Network Faculty Member. Additionally, Colonel Ridout proudly served in the United States Army for 23 years, including 11 years as the State Surgeon of the Nevada Army National Guard. He was among the first Army Medical Corps Officers to become a Lean Six Sigma Green Belt and has applied the learned principles in relentlessly eliminating patient, staff, and organizational harm in all of its forms. He has lectured nationwide on Just Culture, Harm Reduction, Value-Added Care, and Servant Leadership. He passionately believes that all patients and caregivers deserve to experience care delivery free of harm. To that end, he seeks to influence MEDICINE to embrace the principles of servant leadership and team-based family-centered care, to send all members of the care team home each day feeling Safe, Valued, and Loved, returning to the bedside fully engaged with heart and mind, all the while seeking to only do for the patient and never to the patient.

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Email: ridoutre72@gmail.com



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Brilliant! Dr. Bell bridges the journey from grief to growth. This is classic wisdom on healing from our heartbreaks and ultimately enjoying a fulfilling life.

– Christine Theard, M.D.

Post-Traumatic Thriving

The Art, Science, & Stories of Resilience



Randall Bell, Ph.D.

First Candle Launches Safe Sleep and Family Wellness Webinar Series Connecting NICU Families, Health Professionals, and Bereaved Parents

Alison Jacobson

Saving babies. Supporting families.

First Candle's efforts to support families during their most difficult times and provide new answers to help other families avoid the tragedy of the loss of their baby are without parallel.

"Each year in the United States, approximately 3,700 infants die suddenly and unexpectedly. While the Back to Sleep campaign and subsequent public health initiatives have reduced rates of SUID (Sudden Unexpected Infant Death), significant disparities persist—particularly among Black and Native American/Alaska Native families."

Each year in the United States, approximately 3,700 infants die suddenly and unexpectedly. While the Back to Sleep campaign and subsequent public health initiatives have reduced rates of SUID (Sudden Unexpected Infant Death), significant disparities persist—particularly among Black and Native American/Alaska Native families.

For neonatologists, NICU nurses, and pediatric care providers, the challenge remains: how to equip families with safe sleep practices that are realistic, culturally respectful, and trauma-informed.

This fall, First Candle is launching the **Safe Sleep & Family Wellness Webinar Series**, a three-part educational program designed for both families and professionals. The series coincides with National Infant and Child Care Awareness Month, Baby Safety Month, Safe Sleep Awareness Month, and Pregnancy & Infant Loss Awareness Month. Each session explores a different stage of the journey—from NICU to home, to engaging professionals in community-based safe sleep education, to supporting families after a devastating loss.

"This fall, First Candle is launching the Safe Sleep & Family Wellness Webinar Series, a three-part educational program designed for both families and professionals."

Webinar 1: Beyond the NICU — Thriving at Home with Your Baby

Date: Wednesday, September 17th | **Time:** Noon–1 PM ET

Speakers: Dr. Jess Daigle (pediatrician, NICU hospitalist, and founder of Mom & Me MD) and Destiny Stokes, MPH (First Candle)

Audience: Parents and families transitioning home after a NICU stay.

Focus: Coping with stress, managing trauma, and creating safe sleep environments at home while navigating medical complexities.

Register here

Webinar 2: From NICU to Home — Meeting Families Where They Are on Safe Sleep, Breastfeeding, and Bedsharing

Date: Thursday, October 16th | **Time:** Noon–1 PM ET

Speakers: Dr. Jess Daigle; Terri Miller, Georgia Department of Health; and a doula trained through *Let's Talk Community Chats*

Audience: Public health professionals, doulas, NICU staff, social service providers.

Focus: Equipping professionals with culturally sensitive, real-world approaches to discussing safe sleep and breastfeeding with families. The session will also introduce First Candle's Safe Sleep Response Training, a new 7-module self-study course designed for outreach workers and health professionals.

Register here

Webinar 3: Supporting Families After the Death of a Baby

Date: Wednesday, November 12th | **Time:** Noon–1 PM ET

Speakers: Grief and bereavement experts (to be announced).

Audience: Parents and families who have experienced the loss of a baby to SUID, stillbirth, or other causes.

Focus: Compassionate strategies for coping with grief, building community, and navigating the lifelong journey after loss. Register here

Why This Series Matters for Neonatal Professionals

For neonatologists and NICU staff, these sessions provide insight into:

- How NICU families adapt recommendations once they leave the hospital.
- The barriers families face when safe sleep guidelines conflict with cultural norms, trauma, or exhaustion.
- Effective and empathetic communication strategies that foster trust and enhance adherence.
- The importance of supporting bereaved families and recognizing grief as part of the continuum of neonatal and perinatal care.

All webinars are free to attend and will be recorded for registrants.

Safe sleep saves lives, but the way we share the message—meeting families where they are, respecting their realities, and supporting them through grief—makes all the difference.

Disclosure: *The author is the Executive Director and Chief Executive Officer of First Candle, a Connecticut-based not-for-profit 501(c3) corporation.*

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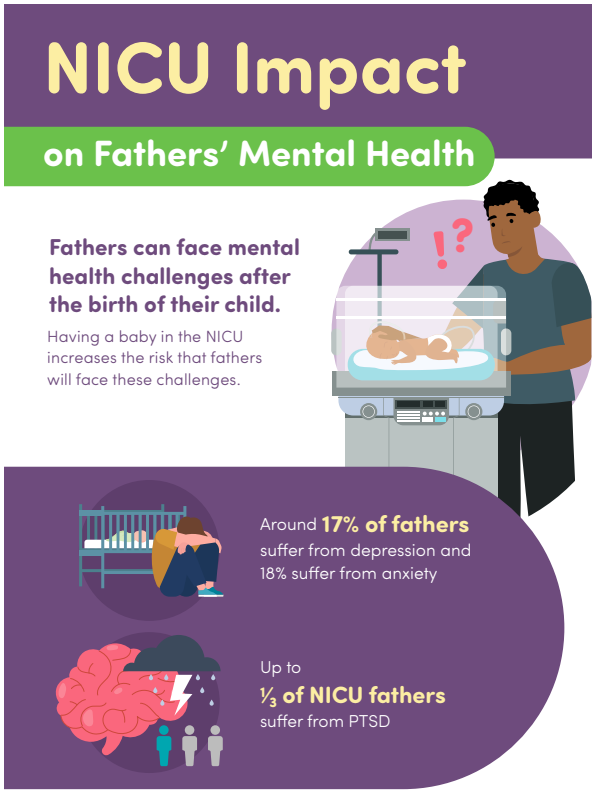
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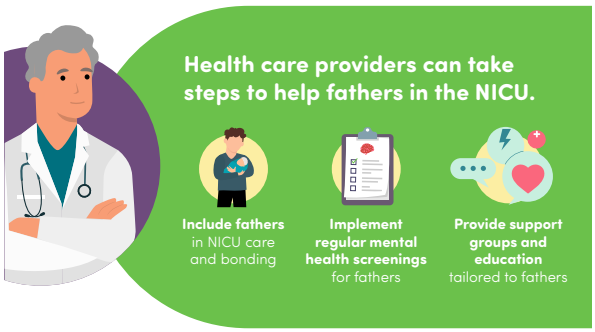
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About First Candle:

First Candle, based in New Canaan, CT, is a 501c (3) committed to eliminating Sudden Unexpected Infant Death while providing bereavement support for families who have suffered a loss. Sudden Unexpected Infant Death (SUID), which includes SIDS and Accidental Suffocation and Strangulation in Bed (ASSB), remains the leading cause of death for babies one month to one year of age, resulting in 3,700 infant deaths nationwide per year. It is also the host of the 2025 International Society for the Study and Prevention of Perinatal and Infant Death (ISPID) Conference in Houston from October 7 – 10.









Maternal Vaccines:

WHAT YOU NEED TO KNOW

CDC-Recommended Vaccines for Pregnant Women

	COVID	FLU	RSV	TDAP
Does it protect baby?	+	+	+	+
Does it protect mother?	+	+		
Is there an immunization for baby after birth?			+	

Vaccines given to pregnant women **are safe and effective.**

Maternal vaccines help the body create antibodies that can be passed to your baby and help protect them when they are born.

Talk with your health care provider to learn more about protecting yourself and your baby.

LEARN MORE ▶

NATIONAL COALITION for Infant Health

Telehealth in the NICU

The thoughtful use of telehealth technology can improve care and minimize the risks of exposure to COVID-19.

- Consult with specialists.
- Move family education and resources online.
- Use technology to help parents bond with their babies when they can't be bedside.
- Provide parents lactation support.
- Facilitate shared decision-making.
- Screen for perinatal mood and anxiety disorders (PMADs).
- Support case management.

The move to telehealth services can compound inequities and disparities. Assess each family's technology skills and needs - including the need to use their preferred language.

My Perinatal Network and My NICU Network are products of a collaboration between National Perinatal Association (NPA) and NICU Parent Network (NPN).

myNICUnetwork.org

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Advancing Neonatal-Perinatal Care: Happy September! It is officially Pumpkin Spice Season

Clara H. Song, MD, FAAP

"Your more-than-monthly update from SONPM to keep us all connected and informed!"



Happy September! It is officially Pumpkin Spice Season

1- SONPM Member Shout-out: **Dr. Eric Horowitz,** who is the creator of The Doc Is In. Eric has dedicated a significant amount of time and sweat equity to describing the pediatric workforce landscape, thereby optimizing advocacy efforts for the health of our profession.

The Doc Is In

aap.org

2- Your **VOTE** counts! **SONPM** members comprise 7% of the entire AAP and represent over one-third of all medical subspecialists within the AAP. ***Our voice matters.***

Watch out for your AAP email to vote in the National Elections and your District Elections.

3- From AAP:

Red Book Hot Topics Live Webinar: Preparing for Respiratory Virus Season

Thursday, September 11, 2025, at 6 pm CT

Join AAP President and leadership from the Committee on Infectious Diseases for a live webinar on Thursday, September 11, at 6 pm CT to hear about AAP immunization guidance to protect pediatric patients during the 25-26 fall and winter respiratory virus season. Register today and submit your questions! Please note that the webinar will be recorded and available on AAP.org following the event.

4- 2025 **SONPM** Awardees will be recognized at our **NCE** h-program in Denver, CO on **Sept 27**! 😎

The 2025 SONPM h-Program at NCE will focus on neonatal pain, management, and effects on the developing brain.

Note that the SONPM h-Program has been adjusted so that we can all attend the AAP Plenary.

Stay for the Sunday afternoon, 9/28, WiN session: **Building and Sustaining the Workforce in Neonatology** with Drs. **Satyan** Lakshminrusimha, **Eric Horowitz**, **Kerry Machut**, and **Krithika Lingappan.**



National conference plenaries include 'Dr. Glaucomflecken,' educational sessions on dating violence, workforce, more

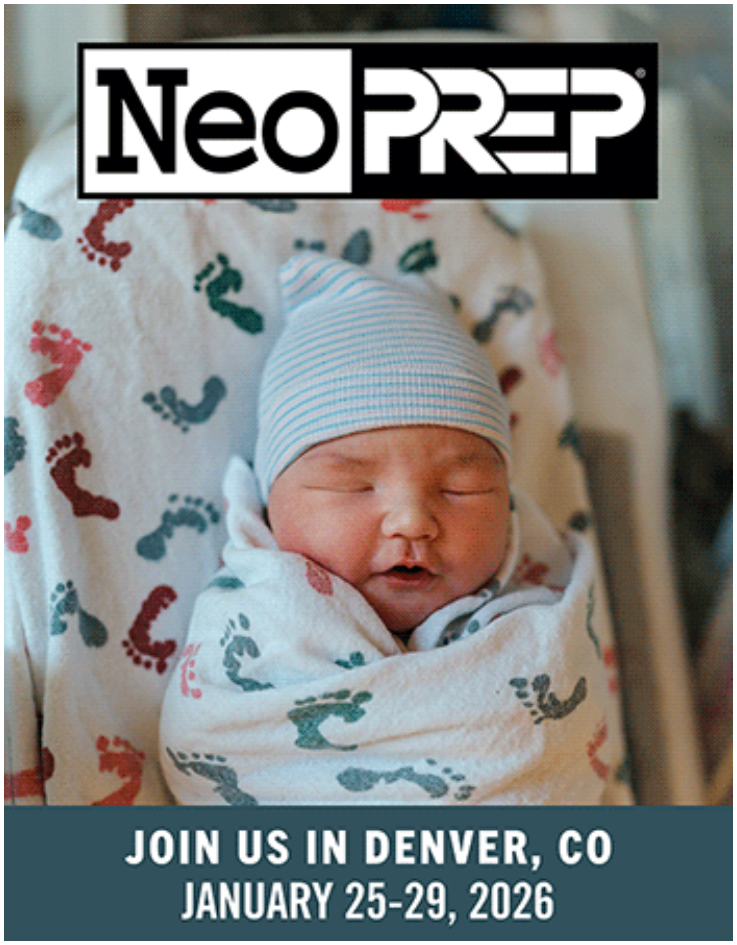
publications.aap.org

5- ICYMI: Postnatal Cord Blood Sampling: Clinical Report, from COFN

https://publications.aap.org/pediatrics/article/155/6/e2025071811/201956/Postnatal-Cord-Blood-Sampling-Clinical-Report

6- 2026 **NeoPREP:** registration is OPEN!

https://www.aap.org/2026-NeoPREP-An-Intensive-Review-and-Update-of-Neonatal-Perinatal-Medicine-Denver-CO?srsltid=AfmBOorgy3tDf0qZJDYZbF_Wqhz7Op9gDTr-OeIPX8mfDjZBh-BRHSV0G



7- 2026 spring **Workshop in Neonatal-Perinatal Practice Strategies** in Tucson: Registration is OPEN!

https://www.aap.org/2026-Workshop-on-Neonatal-Perinatal-Practice-Strategies#:~:text=The%20Workshop%20on%20Neonatal%2DPerinatal,enhance%20collaboration%20and%20career%20development.



8- From Clinical Leaders Group:

CLG Kick Off on Sep 10, 2025, 03:00 PM Eastern Time (US and Canada)

Join instructions

https://nortonhealthcare.zoom.us/meetings/96765165710/invitations?signature=ey6u2_ez6e3jkwYvUIxYS27mcFqifDt4C-NUgvglfuqY

Meeting ID: 365 167 1324

Passcode: 347567



9- Shout-out to SONPM **D6** for completing their **18th Annual District VI Assn Of Neonatologists Meeting- Clinical Controversies in Neonatal Care**!

Not pictured here are the 70+ Virtual Attendees / Not pictured here are the 70+ Virtual Attendees 😁



10- Again…. **SONPM Fair Payment Focus** update:

SONPM is working with the AAP to obtain state-specific data for four common commercial payers. SONPM and AAP have each committed $5000 ($10K total) to purchasing the payer data for **36 neonatal codes**. We plan to share this data to benefit SONPM members in their advocacy efforts to optimize payment.

The recent Executive Order requires transparency of pricing data from commercial payers:

CMS.gov



Here is sample data from 1 state and 1 payer:

Average of Negotiated Rate	Low-level inpatient 99221	Moderate inpatient 99222	Newborn exam 99460	Newborn discharge 99463	Newborn care 99462	Neonatal critical care 99468	Neonatal continuing care 99469	Complex newborn care 99477	Neonatal intensive care 99478	Extended NICU care 99479	Supervised newborn care 99466
10th Percentile	$40.81	$74.02	$98.90	$79.44	$113.31	$894.13	$520.80	$343.68	$147.82	$132.08	$134.64
Average	$43.80	$90.24	$120.10	$89.34	$125.08	$1,406.75	$777.02	$473.47	$273.78	$229.49	$224.27
90th Percentile	$46.40	$108.04	$140.00	$98.07	$141.60	$1,972.00	$1,129.00	$603.00	$419.97	$381.57	$307.21

Catch up on our groundwork on NICU-specific payment advocacy in the upcoming SONPM Newsletter.

****Fair payment ➡ improved salary:FTE ratio ➡ improved staffing ➡ decreased burnout ➡ increased workforce ➡ maintain health of our profession****

"Ultimately, payor reform will be needed to sustain growth in subspecialty compensation."

- Robin & Satyan.

Did you know that our current SONPM focus goal of Payment Parity for 2024-2026 aligns with the AAP Payment Transformation Agenda?



SONPM Goals, with *2024-2026* focus on Payment Parity:



Until next time 🤍, we are at your service. Keep in touch!

On behalf of your #SONPMexec comm:

Past Chair Munish Gupta@munishguptamd

District 1 Rep Wendy Timpson@TimpsonWendy

D2 Shetal Shah@NICUBatman

D3 Michael Posencheg@MikePosencheg

D4 Misty Good@mistygoodlab

D5 Craig Nankervis

D6 Josh Petrikin@jepetrikin

D7 John Loyd

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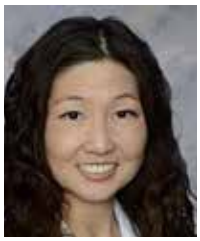
With warm regards,

Clara H. Song, MD, FAAP

Disclosures: No conflicts noted

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Chair Elect, Communication & Digital Media Chair; Women In Neonatology Steering Committee, All Pathways group Co-Chair: District IX California Chapter 4 Council Representative,
Chair, American Academy of Pediatrics, Section on Neonatal-Perinatal Medicine
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H0160: Section on Neonatal Perinatal Medicine Program: Day 1

Friday, September 26

ONTPD Meeting (CC Mile High Ballroom 2A-3A)

8AM – 4PM	**Organization of Neonatal Training Program Directors***
	ONTPD Chairs: Megan Gray, MD and Deirdre O'Reilly, MD, MPH
12:00 PM	**ONTPD and TECaN lunch***
	Sponsored by Mead Johnson Nutrition

Opening Session (CC Mile High Ballroom 2A-3A)

4:00 PM	**Welcome and Opening Remarks***
	Alexis Davis, MD, MS Epi, Program Chair
4:10 PM	**Section on Neonatal Perinatal Medicine Update***
	Clara Song, MD, SONPM Executive Committee Chair
4:30 PM	**Thomas Cone Lectureship**
	"The History of Neonatal Neurology"
	Introduction by: Clara Song, MD
	Speaker: Terrie Inder, MD
5:15 PM	**Gerald Merenstein Lecture**
	"Health Equity and Family-Centered Care"
	Introduction by: Munish Gupta, MD, MMSc
	Speaker: Susan Hwang, MD, PhD, MPH
6:00 PM	**Adjourn to Poster Session and Reception**
	Location: Colorado Convention Center, Four Seasons Ballroom 1 & 2.
	Sponsored by Abbott

**This portion of the agenda is not designated for CME credit.*

H0222: Section on Neonatal Perinatal Medicine Program: Day 2

Joint Program: Section on Neonatal-Perinatal Medicine and Section on Neurology

Saturday, September 27

CC Mile High Ballroom 2A-3A

Updates in Neonatal Neurocritical Care

8:00 AM	**Welcome and Session Introduction***
	SONPM Program Chair: Alexis Davis, MD
	Moderators: Rachel Gottlieb-Smith, MD (SoNu), Alexis Davis, MD (SONPM)
8:05 AM	**Neonatal Neurocritical Care Education Curriculum**
	Khorshid Mohammed, MD, MSc
8:35 AM	**Updated Guidance for Therapeutic Hypothermia**
	Ashley Lucke, MD
9:05 AM	**Panel Discussion**
9:15 AM	**Overview of the 2025 ACNS Guidelines for EEG monitoring**
	Adam Numis, MD
9:45 AM	**Treatment of Seizures in the Neonate**
	Shavonne Massey, MD, MSCE
10:15 AM	**Panel Discussion**
10:30 AM	**Adjourn**

**This portion of the agenda is not designated for CME credit.*

Section on Neonatal Perinatal Medicine Program: Day 2

Afternoon Sessions

Saturday, September 27

CC Mile High Ballroom 2A-3A

Original Abstracts and Award Presentations

1:40 PM	**Welcome and Opening Remarks***
	John Loyd, MD, MPH – Abstract Chair
	Top Ten Abstracts awards sponsored by Mead Johnson Nutrition
1:50 PM	**Scientific Abstract Oral Presentations**
	Moderators: Shetal Shah, MD (SONPM EC) and Grant Schafer, MD (TECaN)
3:05 PM	**Marshall Klaus & Other Awards Presentation***
	Krithika Lingappan, MD, PhD, MS – SONPM Research Committee Chair
3:20 PM	**Break***
3:30 PM	**Scientific Abstract Oral Presentations**
	Moderators: Misty Good, MD, MS (SONPM EC) and Ashley Osborne, MD (TECaN)
4:45 PM	**Section on Neonatal Perinatal Medicine Awards***
	Clara Song, MD – SONPM Executive Committee Chair
4:50 PM	**Avroy Fanaroff Neonatal Education Award – Heather French, MD, MSEd***
	Introduced by Renate Savich, MD
	Sponsored by Mead Johnson Nutrition
5:05 PM	**Maria Delivoria Papadopalous Lankmark Award – Richard Molteni, MD***
	Introduced by Marilyn Escobedo, MD
	Sponsored by Mead Johnson Nutrition
5:20 PM	**Pioneer Award – Jeffrey Perlman, MB, ChB***
	Introduced by Lisa Eiland, MD
5:35 PM	**Virginia Apgar Award – Satyan Laksminrusimha, MD, MBBS***
	Introduced by Robin Steinhorn, MD
	Sponsored by Abbott
5:55 PM	**Adjourn**

**This portion of the agenda is not designated for CME credit.*

H0323: Section on Neonatal Perinatal Medicine Program: Day 3

Joint Program: Section on Neonatal Perinatal Medicine and Section on Anesthesia and Pain

Sunday, September 28

CC Mile High Ballroom 2A-3A

Pain Assessment and Management, Withdrawal and Delirium in the NICU

8:00 AM	**Welcome and Introductions***
	Alexis Davis, MD, MS Epi – SONPM Program Chair
	Moderators: Rita Agarwal, MD (SOA) and Jessica Davidson, MD (SONPM)
8:05 AM	**Presentation of Young Investigator Awards***
	John Loyd, MD, MPH – SONPM Abstract Chair
	Sponsored by Mead Johnson Nutrition
8:15 AM	**Anesthesia and the Developing Brain**
	Lena Sun, MD
8:40 AM	**Regional Anesthesia in Neonates**
	Giorgio Veneziano, MD
9:15 AM	**Panel Discussion**
9:30 AM	**Break***
9:45 AM	**Neonatal Pain Assessment and Strategies for Pain Management in the NICU**
	Brian Carter, MD
10:20 AM	**Withdrawal from Therapeutic Drugs**
	Julie Good, MD
10:55 AM	**Delirium in the NICU**
	Ariel Tarrell, MD
11:30 AM	**Panel Discussion**
11:50 AM	**Adjourn**

**This portion of the agenda is not designated for CME credit.*

H0323: Section on Neonatal Perinatal Medicine Program
Women in Neonatology Group

Building and Sustaining the Workforce in Neonatology: Catalyzing Opportunities for WiN

Sunday, September 28

CC Mile High Ballroom 2A-3A

1:00 PM	**Welcome and Introductions***
	Krithika Lingappan, MD, PhD, MS – WiN Chair
	Moderator: Ishani Jhamb, MD and Krithika Lingappan, MD, PhD, MS
1:10 PM	**wRVUs, Wellness, Workforce & Women in Neonatology (4WiN)**
	Satyan Lakshminrusimha, MD, MBBS
1:45 PM	**Building a strong neonatology workforce: what do the data show for WiN?**
	Eric Horowitz, MD, MHA
2:30 PM	**Women in Neonatology: Shaping the Future**
	Kerri Machut, MD
3:15 PM	**Strategic Plan for WiN: The Path Forward**
	Krithika Lingappan, MD, PhD, MS
4:00 PM	**Adjourn to Women in Neonatology Reception*-** *Outdoor Terrace Bluebird Ballroom*
	Sponsored by Mead Johnson Nutrition

**This portion of the agenda is not designated for CME credit.*



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SONPM Design Contest

- We are starting a new program to recognize retiring neonatologists who have had career-long impacts
- Honorees will be recognized at the Workshop on Neonatal-Perinatal Practice Strategies, showcased in the Neonatology Hall of Honor (Itasca headquarters), honored at a reception and presented with a medal
- Your design can be featured on our career medal!
  - Submit designs in pdf format
  - Front and back designs can be submitted
  - Send to lilylou@mindspring.com, subject line: "Neonatology Career Medal"
  - Deadline: August 1, 2025



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Section on Neonatal-Perinatal Medicine Executive Committee: District Representatives from Districts III, VI, and IX

One of the most significant opportunities to engage with the Section on Neonatal-Perinatal Medicine (SONPM) is to serve on the SONPM Executive Committee (EC). The EC consists of one representative from each of the 10 AAP Districts, in addition to chair, chair-elect, past-chair, of-counsel advisor, and AAP section manager (currently Jim Couto). District representatives serve 3-year terms, and are eligible to serve a second term.

District representatives to the EC are responsible for representing all neonatologists working in their AAP districts. The district representative is a liaison between district neonatologists and the SONPM, providing members direct input into SONPM and conveying section activities and opportunities back to the members. More specifically, responsibilities of EC members include the following:

Within executive committee and SONPM broadly:

1. Attend two **required** EC meetings annually, at Scottsdale spring workshop and at NCE;
2. Attend the full SONPM program at Scottsdale spring workshop and NCE meetings annually;
3. Participate in periodic virtual SONPM EC meetings (generally once or twice per month);
4. Review and score abstract submissions to NCE and review poster and oral presentations at NCE meeting, including scoring for SONPM Young Investigator Award;
5. Suggest and select annual SONPM honorary lecturers, including the Cone, Merenstein, Butterfield and Silverman speakers;
6. Solicit and review nominations for annual SONPM awards, including the Apgar, Education, Landmark and Pioneer awards, and select awardees;
7. Participate in planning and execution of national meetings, including section program at NCE, Scottsdale conference, and NeoPREP;
8. Review applications and determine awardees for the Section Strategic Grant Program, currently offered every two years;
9. Review and provide feedback on AAP policy statements, clinical reports, and guidelines as they pertain to newborn care;
10. Participate in and support AAP and SONPM advocacy efforts, including AAP Days of Action;
11. Participate in section committees, groups, and task forces based on interest and need;
12. Participate in SONPM strategic leadership, including implementation of goals of strategic plan; and
13. Participate in SONPM administration, including maintenance and updating of section manual of operations and section budget planning.

Within district:

1. Solicit updates from district members for inclusion in section newsletter twice annually;
2. Allocate annual SONPM district grants by soliciting and evaluating grant proposals;
3. Provide regular updates to district members on relevant aspects of section activities;
4. Provide regular updates to section on district activities and needs of district members;
5. Actively participate in district activities, including attendance at regional conferences; and
6. Encourage AAP and SONPM membership from representative's district, including trainees.

The core executive committee is a productive group! Participation on the executive committee does require a commitment of time and effort, but it is a highly rewarding experience.

Letters to the Editor

Letter to the Editor: "Early propranolol treatment of infantile hemangiomas improves outcome" published in the Anais Brasileiros de Dermatologia

Dear Editor,

I am writing in response to the article titled *"Early propranolol treatment of infantile hemangiomas improves outcome"* published in the *Anais Brasileiros de Dermatologia*. The retrospective study conducted by Giachetti et al. provides compelling evidence that the earlier initiation of propranolol therapy, particularly within 3 months of age, significantly improves both the aesthetic and functional outcomes in children with infantile hemangiomas (IH).

"Notably, the high aesthetic improvement rate of 99% and functional improvement rate of 100% across 138 patients reinforces the efficacy of propranolol as a first-line treatment. Notably, the total resolution rate was significantly higher in patients who initiated treatment within 3 months (57%) compared to those who started later (40%, p = 0.05)."

The study's methodology, which utilizes both medical record analysis and comparative photographic assessment by two independent pediatric dermatologists, strengthens the reliability of the findings. Notably, the high aesthetic improvement rate of 99% and functional improvement rate of 100% across 138 patients reinforces the efficacy of propranolol as a first-line treatment. Notably, the total resolution rate was significantly higher in patients who initiated treatment within 3 months (57%) compared to those who started later (40%, p = 0.05).

"This study underscores the importance of early recognition and referral of at-risk IHs. Given the potential for permanent disfigurement, functional impairment, and associations with syndromes such as PHACE and LUMBAR, prompt diagnosis and timely initiation of therapy are essential."

This study underscores the importance of early recognition and referral of at-risk IHs. Given the potential for permanent disfigurement, functional impairment, and associations with syndromes such as PHACE and LUMBAR, prompt diagnosis and timely initiation of therapy are essential. While limitations such as the retrospective design and subjective visual assessments were acknowledged, the large sample size and objective outcome measures lend weight to the conclusions.

Since the American Academy of Pediatrics' Clinical Practice Guideline for the Management of Infantile Hemangiomas recommends that infants with higher-risk hemangiomas should begin treatment or be referred to a specialist at an early age, ideally by four to six weeks, it would be valuable to revisit this study with an earlier intervention, perhaps starting treatment at four weeks. While there is an ethical dilemma regarding withholding treatment from other infants, using the same control group as in the current study could help mitigate this concern and provide further insight into the benefits of early treatment.

I find this study highly informative. It highlights the critical role of early intervention and encourages clinicians to adopt a proactive approach in managing IHs. Further prospective studies, ideally with long-term follow-up and standardized objective assessment tools, would be valuable in corroborating and expanding upon these findings.

References:

1. Giachetti, A., Díaz, M. S., Boggio, P., & Posadas Martínez, M. L. (2023). Early propranolol treatment of infantile hemangiomas improves outcome. *Anais brasileiros de dermatologia*, *98*(3), 310–315. https://doi.org/10.1016/j.abd.2022.04.008

2. Krowchuk, D. P., Frieden, I. J., Mancini, A. J., Darrow, D. H., Blei, F., Greene, A. K., Annam, A., Baker, C. N., Frommelt, P. C., Hodak, A., Pate, B. M., Pelletier, J. L., Sandrock, D., Weinberg, S. T., Whelan, M. A., & SUBCOMMITTEE ON THE MANAGEMENT OF INFANTILE HEMANGIOMAS (2019). Clinical Practice Guideline for the Management of Infantile Hemangiomas. *Pediatrics*, *143*(1), e20183475. https://doi.org/10.1542/peds.2018-3475

Sincerely,

Rita Miwalian, B.S.

Western University of Health Sciences

Pomona, California

Dear Rita Miwalian,

The article by Giachetti et al., "Early propranolol treatment of infantile hemangiomas improves outcome," addresses a critical aspect of infantile hemangioma (IH) management: the timing of systemic therapy initiation. Their findings align with and reinforce the current consensus in pediatric dermatology, which emphasizes the importance of early intervention for IHs requiring treatment.

Recent analyses of pivotal clinical trial data have demonstrated that initiating oral propranolol at a dose of 3 mg/kg/day before 10 weeks of age yields a markedly higher success rate (86%) compared to initiation after 10 weeks (60%), with success defined as complete or nearly complete resolution at 6 months. This supports the principle that early referral and treatment are essential for optimal outcomes, particularly given the rapid proliferative phase of IHs in the first weeks of life. (1-2)

The American Academy of Pediatrics recommends oral propranolol as the first-line agent for IHs requiring systemic therapy, citing its superior efficacy and safety profile compared to corticosteroids and other modalities. The recommended regimen, based on robust randomized controlled trial data, is 3 mg/kg/day for 6 months, which has demonstrated a 60% success rate compared to 4% for the placebo, with most patients showing improvement within 5 weeks of therapy initiation. Adverse events such as bradycardia, hypotension, hypoglycemia, and bronchospasm are infrequent and generally mild when appropriate monitoring and education are provided. (2-4)

"The American Academy of Pediatrics recommends oral propranolol as the first-line agent for IHs requiring systemic therapy, citing its superior efficacy and safety profile compared to corticosteroids and other modalities. The recommended regimen, based on robust randomized controlled trial data, is 3 mg/kg/day for 6 months, which has demonstrated a 60% success rate compared to 4% for the placebo, with most patients showing improvement within 5 weeks of therapy initiation."

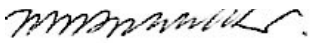
The implications of Giachetti et al.'s study are significant for clinical practice. Early identification and referral—ideally before 5 weeks of age—are crucial for maximizing therapeutic benefit and minimizing the risk of sequelae. Outpatient initiation of propranolol is appropriate for most infants, with inpatient monitoring reserved for those under 8 weeks of age or with comorbidities. The literature also emphasizes the importance of individualized risk assessment, particularly in patients with PHACE syndrome or other high-risk features, where careful titration and multidisciplinary management are necessary. (3,5)

In summary, the findings of Giachetti et al. are well-supported by the current evidence base and reinforce the paradigm shift toward early, proactive management of problematic IHs with propranolol. This approach optimizes clinical outcomes, reduces the risk of complications, and is consistent with international guidelines and best practices in pediatric dermatology. (1-3)

References:

1. Léauté-Labrèze C, Frieden I, Delarue A Early Initiation of Treatment With Oral Propranolol for Infantile Hemangioma Improves Success Rate.. Pediatric Dermatology. 2023;40(2):261-264. doi:10.1111/pde.15198.
2. Léauté-Labrèze C, Hoeger P, Mazereeuw-Hautier J, et al. A Randomized, Controlled Trial of Oral Propranolol in Infantile Hemangioma. The New England Journal of Medicine. 2015;372(8):735-46. doi:10.1056/NEJMoa1404710.
3. Krowchuk DP, Frieden IJ, Mancini AJ, et al Clinical Practice Guideline for the Management of Infantile Hemangiomas.. Pediatrics. 2019;143(1):e20183475. doi:10.1542/peds.2018-3475.
4. Fu R, Zou Y, Wu Z, et al. Safety of Oral Propranolol for Neonates With Problematic Infantile Hemangioma: A Retrospective Study in an Asian Population.. Scientific Reports. 2023;13(1):5956. doi:10.1038/s41598-023-33105-2.
5. Sebaratnam DF, Rodríguez Bandera AL, Wong LF, Wargon O. Infantile Hemangioma. Part 2: Management. Journal of the American Academy of Dermatology. 2021;85(6):1395-1404. doi:10.1016/j.jaad.2021.08.020.

Sincerely,



Mitchell Goldstein, MD, MBA, CML

Editor in Chief

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Erratum (Neonatology Today June, 2025)

There are no erratum to report for July, 2025

Corrections can be sent directly to LomaLindaPublishingCompany@gmail.com. The most recent edition of Neonatology Today including any previously identified erratum may be downloaded from www.neonatologytoday.net.

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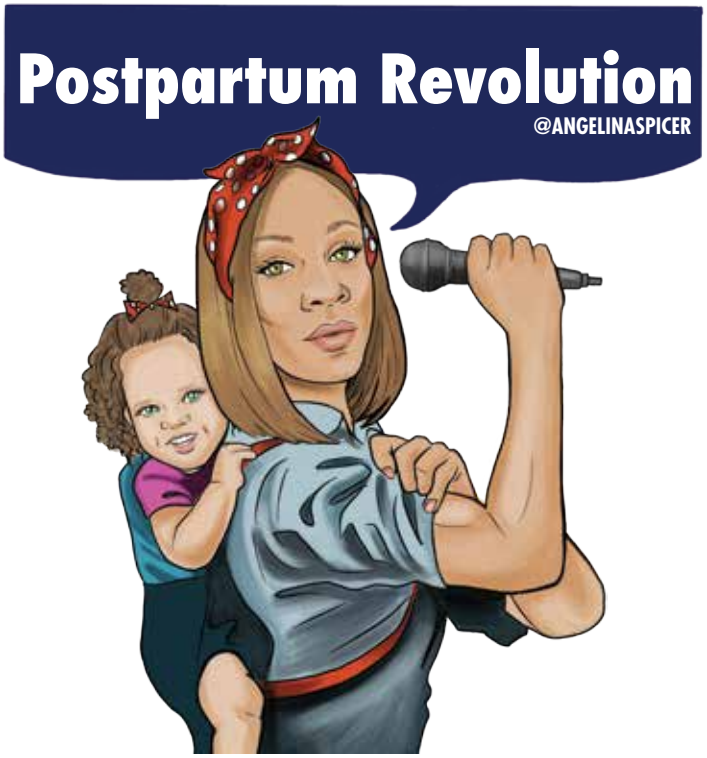
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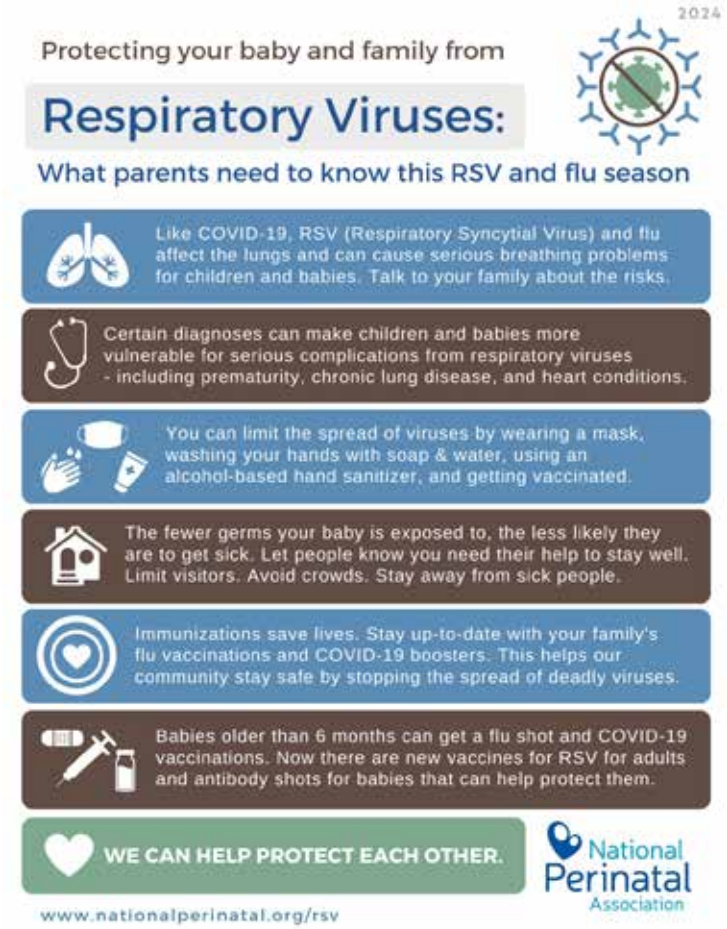


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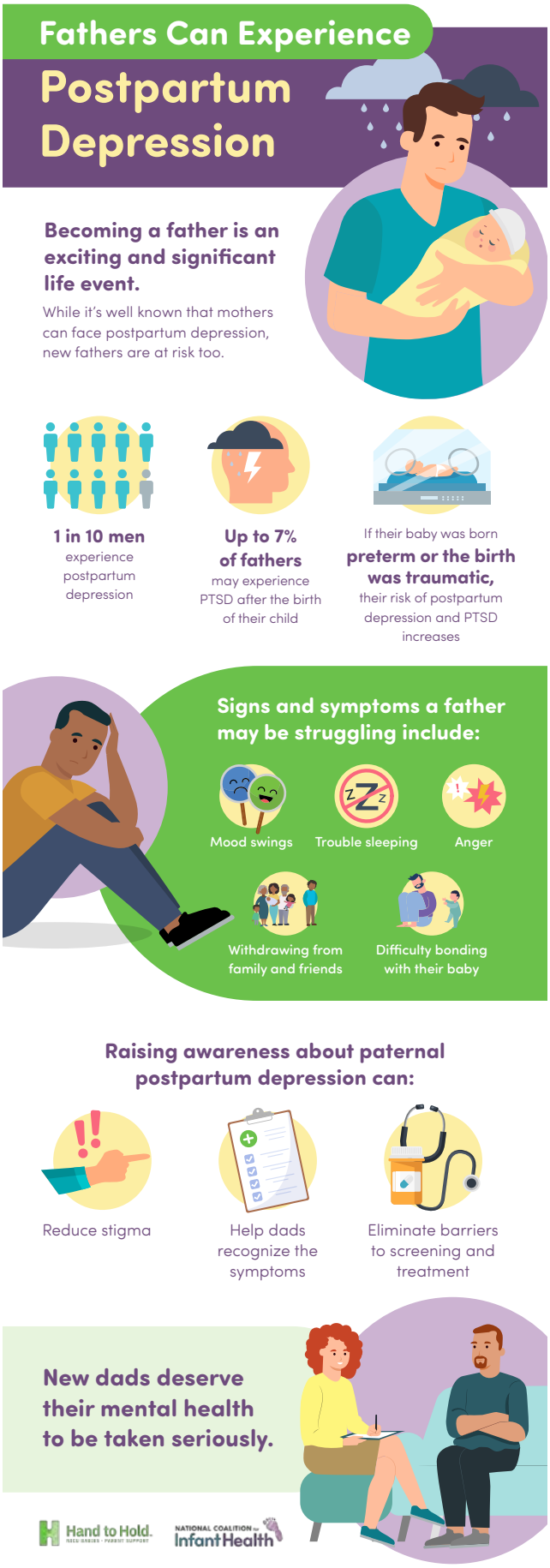
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Gravens by Design: Bringing Together Families, Technologists, and Clinicians to Advance Artificial Intelligence in the NICU

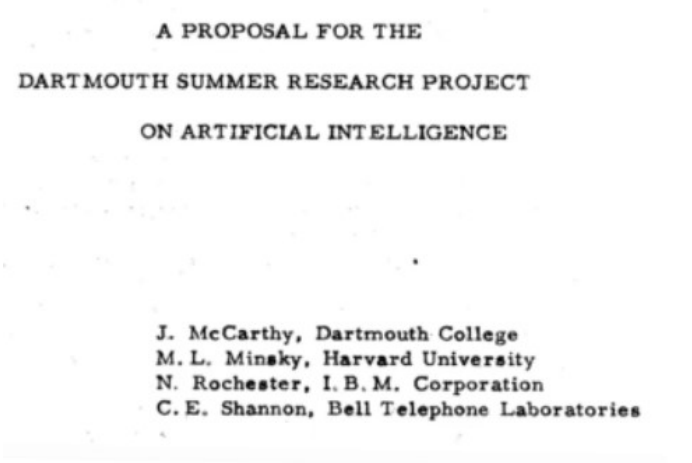
Bridget Davern, BA, James Gray, MD, MS

There is an increasing interest in and potential for the use of Artificial Intelligence in neonatal intensive care. The successful application of these innovative technologies could significantly enhance the care of high-risk infants and their families. However, important questions remain to be framed and answered about how best to structure, evaluate, and integrate AI solutions into the NICU environment. Arriving at optimal solutions to these questions will require the input of multiple stakeholders, including NICU families, clinicians, technologists, and institutional representatives.

"There is an increasing interest in and potential for the use of Artificial Intelligence in neonatal intensive care. The successful application of these innovative technologies could significantly enhance the care of high-risk infants and their families. However, important questions remain to be framed and answered about how best to structure, evaluate, and integrate AI solutions into the NICU environment. Arriving at optimal solutions to these questions will require the input of multiple stakeholders, including NICU families, clinicians, technologists, and institutional representatives."

Almost 50 years ago, the field of Artificial Intelligence (AI) was said to have been born at a summer conference held at Dartmouth College (Figure 1). Today, AI is a term used to define technologies that include natural language processing, image and speech recognition, machine learning (ML), neural networks, data analytics, cognitive computing, and more. While many definitions exist, one that is particularly helpful in framing the potential uses of these technologies comes from Max Tegmark, a physicist at the Massachusetts Institute of Technology and a New York Times best-selling author (1). He defines Intelligence as "the ability to achieve complex goals" and Artificial Intelligence as "Non-biological intelligence". During a Neonatal Intensive Care Unit (NICU) stay, it is evident that numerous complex goals must be achieved for both babies and their families. Each of the powerful technologies listed at the beginning of this section may play a role in helping to achieve these complex goals for NICU patients and their families.

Figure 1. Dartmouth Summer Conference on AI



A PROPOSAL FOR THE

DARTMOUTH SUMMER RESEARCH PROJECT

ON ARTIFICIAL INTELLIGENCE

J. McCarthy, Dartmouth College
M. L. Minsky, Harvard University
N. Rochester, I. B. M. Corporation
C. E. Shannon, Bell Telephone Laboratories

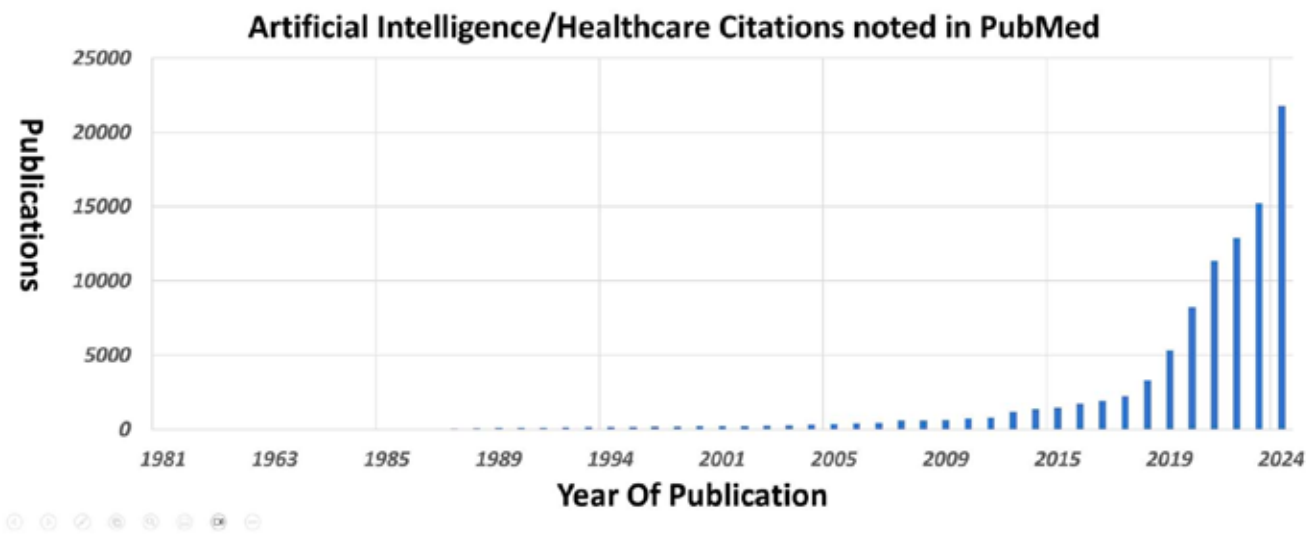
Tegmark notes, "It is not enough to make our technology powerful. We also have to figure out, if we're going to be really ambitious, how to steer it and where we want to go with it." Successfully identifying the directions that AI should take requires knowledge of technological possibilities, as well as an understanding of the needs of those who will be affected by the technologies, including NICU patients, their families, and members of the clinical team.

While the Dartmouth Summer Conference took place more than 70 years ago, there were few AI advances in the early years. However, there has been a significant boom in AI moving forward, along with the associated hype. Several factors have facilitated this forward movement, including advances in computer power, the emerging availability of highly granular, electronically available datasets, advances in machine learning (ML) techniques, and, finally, an entrepreneurial spirit.

"... there has been a significant boom in AI moving forward, along with the associated hype. Several factors have facilitated this forward movement, including advances in computer power, the emerging availability of highly granular, electronically available datasets, advances in machine learning (ML) techniques, and, finally, an entrepreneurial spirit."

These advances and hype have certainly been felt in the healthcare sector. This is evident in the exponential growth in

Figure 2. AI citations in PubMed

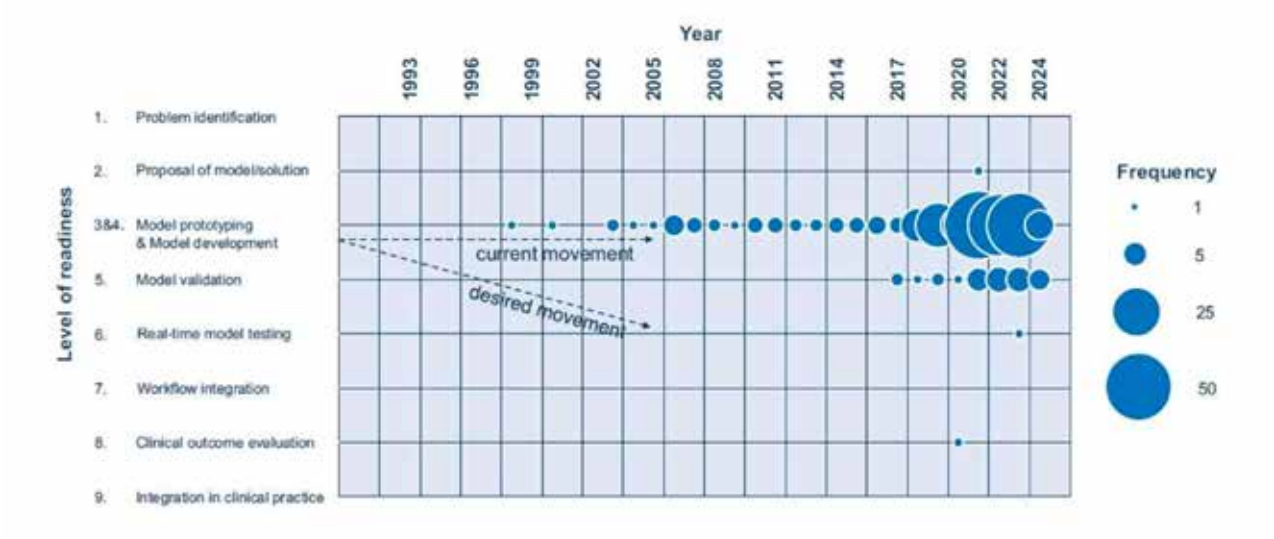


the number of healthcare AI-related publications in PubMed, an extensive bibliographic database. As seen in Figure 2, the number of Healthcare AI articles has increased significantly in recent years, with more than 20,000 cited in PubMed for 2024. Drazen and colleagues in their 2023 review for the New England Journal of Medicine cited existing healthcare AI applications across five domains with examples for each (2):

- **Public Health:** Improved contact tracing through various means and using records of internet searches to understand and identify disease outbreaks.
- **Clinical Care:** Facilitating and automating radiograph reading and reporting, machine interpretation of EKGs (an application available for decades, many of us might not have considered AI, but it fits within Tegmark's definition), diagnosing abnormalities of retinal vessels, both for adults with diabetes and preemies with Retinopathy of Prematurity (ROP).
- **Research:** Identifying potential subjects, improving recruitment and subject retention, as well as tracking outcomes to enable more efficient and generalizable studies.
- **Retrieval of Medical Information:** Aggregation of medical information from multiple sources to improve diagnostic capabilities, development of more capable search engines to hone the ability for patients/families and clinicians to identify internet-based resources, and integration of AI into EMR-based decision support.
- **Operational Organization:** Scheduling of resources and procedures, improving the efficiency of billing and revenue collection, and optimizing patient follow-up.

However, most of these PubMed citations and the above use cases are not related to the Neonatal Intensive Care Unit (NICU). Figure 3 summarizes the results of a recent systematic review of ML AI publications focused on the NICU/PICU (3). Although the trajectory of yearly increases mirrors that seen in healthcare in general, no more than 60 per year were NICU/PICU-related. Of these, two-thirds were in the NICU space.

Figure 3. Number of ML AI publiations focused on NICU/PICU



Interestingly, these authors examined not only the number of publications but also the readiness of AI applications for integration into clinical care. According to their assessments, most were at the stage of model prototyping and development, and only one was deemed by the authors to have undergone clinical outcome evaluation. As such, much work remains to be done to implement AI in real-world NICU applications. This begs the question, "What should the future of AI in the NICU be?"

Tegmark, in his *book Life 3.0: Being Human in the Age of Artificial Intelligence* (1), suggests a framework for setting goals for AI that mirrors driving an automobile. He asks three questions:

Where do we want to go? What is the destination?

How will we get there (what technology is needed)?

Who will decide on the destination, and who will "drive"?

Answering these questions requires the input of several interest-holder groups. Involvement of AI technologists and data scientists is obviously a prerequisite. They need to advise on the "basic science" of AI, what algorithms might be created to answer clinical issues, and what data is available to power these algorithms. Institutional representatives are indeed central to this decision-making process; they need to identify resources, align with institutional strategy, and establish frameworks for infrastructure and ongoing support. Clinicians are also central; the actions or inactions of the clinical team can make or break the effective use of innovative technologies. The best gee-whiz technology will fail unless it aligns with the perceived needs and workflows of clinicians. These technologies need to improve care, but ideally, they should also make clinicians work easier, not harder.

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A recent review of the literature demonstrates that it has included more discussion about the necessity of patient/family involvement, as well as best practices and tools to aid that engagement; however, this involvement remains nascent. Similar to experience-based co-design (4), healthcare workers and patients/families must have a seat at the table, not only at the design stage but also throughout the AI lifecycle. The Patient Centered Outcomes Research Institute agreed with this notion, funding a series of projects to bring interested parties together through their Eugene Washington Engagement Award Program. A recurring theme expressed during this work, encapsulated by the words of Marie Abraham, Vice-President, Programming and Publications of the Institute for Patient and Family Centered Care, was that we must "ensure that the transformations caused by AI use are positive, guided by the preferences and priorities of those who could benefit from innovative technology."

In a series of PCORI-funded discussion groups, it was clear that parents and clinicians are willing and able to understand the technology, and that technologists' work can be positively informed by their input. This collaboration can and will result in technologies that better reflect their needs and wishes. Many of the technology colleagues present expressed that they had little or no knowledge of what a NICU stay entailed, and they valued the insights they gained from parents and clinicians. They were struck by the data-rich environment of the NICU, which makes it a valuable test bed, as well as by the family experience, the intensity, duration, and newness of it all.

They also cautioned about the possibility of NICU care becoming an orphan in the AI world, due in part to the small size of the NICU market and potential litigation risk. It was suggested that partnerships with academia, entrepreneurs, and small start-ups would be essential.

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One might wonder why families and perhaps even clinicians need to be involved in the development of AI-driven NICU tools. After all, this has not been the case for other technologies. One difference is the AI hype, which is both promising and dystopian, that many people are experiencing. To educate and gain trust and acceptance of AI, interested parties such as families should be co-designers. Additionally, Patient- and Family-Centered Care has become more embedded in Quality Improvement and other, more clinically complex and technological endeavors. It is inconceivable that this approach will not be a valuable and necessary aspect of AI integration into the NICU.

One can describe AI in several different ways. For example, AI can be categorized by the technologies used (e.g., logistic regression, neural networks, and supervised or unsupervised learning). Here, we will use one method that breaks AI into two broad categories. The first of these, Pre-Generative AI, has been available for many years.

Pre-Generative AI:

Its most sophisticated forms rely on machine learning, which applies advanced statistical and computing techniques to large databases. Predictive models are created that can be used by clinicians and patients to manage specific clinical problems. Escobar and colleagues (5) used data pre-processing to create the sepsis risk calculator, the use of which has decreased NICU antibiotic utilization rates. While this might not be viewed as the fanciest form of AI, it fits the definition of "automating complex decision making." Advanced real-time analysis of the signals from physiologic monitors, such as that employed by the HERO system (6), can provide early warning systems that potentially identify infants at risk of sepsis or other complications such as necrotizing enterocolitis.

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Pre-Generative AI algorithms can also perform image recognition. The type of algorithm that allows you to find pictures on your phone can also be applied to retinal images. Systems have been developed to identify retinal vessels, potential abnormalities, and grade them for use in the management of ROP (7). Applying these technologies to radiologic images, structures can be identified and reports generated; however, special considerations may apply to pediatric populations (8).

Just as the availability of electronically stored data in our electronic health records, retinal imaging, or radiologic images has spurred the development of such systems, one must wonder whether the cameras we have in many of our units could be used to identify pain and stress in our patients. Such work is underway (9).

In addition to processing information and providing risk assessments and diagnoses, pre-generative AI techniques can also control therapies. Systems available in Europe can provide improved oxygen saturation targeting and have been shown to improve the percentage of time patients remain within desired ranges (10). Definitive evidence does not exist regarding outcome improvements; however, even if this technology only serves to decrease the time staff spend manipulating O_2 saturations, it benefits care by freeing staff up for more value-added care.

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While using technology to control critical therapies, such as oxygen administration, has great potential benefits, potential downsides must also be considered and studied. As such, pre-generative AI applications, if deemed high risk, can be regulated by organizations like the FDA (11).

Generative AI:

The primary goal of generative AI is to generate text, images, audio, or video content using machine learning (ML) and deep learning (DL) techniques. These AI models learn patterns from existing data and use this knowledge to produce new, original content. Large language models (LLMs), such as ChatGPT, can generate human-like text based on the input they receive. Examples of NICU uses might include content summarization (e.g., care plans, discharge summaries, articles), decision-making (diagnosis or treatment), or translation of written or spoken language.

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Generative AI and Translation:

Translation can be of several types, including between languages, reading levels, or even levels of sensitivity. To accomplish this translation, one enters the text to be translated into the LLM interface or uploads an existing document (multiple types are accepted) and specifies the type of translation needed in simple English instructions. One example is seen below. The authors included the wording of a draft sign intended for placement at the bedside of an infant with feeding difficulties (Figure 4a). An initial review of this draft may categorize the wording as somewhat intimidating and would identify a typographical error, as well as the use of hospital jargon, and the fact that it does not address the child's family as the reader. Many families would feel excluded when the team is described in that way. Families are often told that "you know your baby(ies) best, that you are their best advocate," yet this is negated by the wording seen here.

Figure 4a. Draft of sign for feeding difficulties



While further human-based review by the clinical members of the NICU team or members of a family advisory group would help improve the wording, LLMs may also have a role here. The authors provided this wording to ChatGPT 4.0 and, as an initial prompt, asked ChatGPT to modify the wording to "be less scary and readable at a sixth grade level." The ChatGPT-modified text is seen in Figure 4b.

Figure 4b: ChatGPT response to request to translate to sixth grade reading level and phrase in less scary terms.

Careful Swallowing Needed

The patient had a special test to check swallowing which showed some challenges with breathing while eating.

Please do not make any changes to the feeding plan (like how a patient is positioned, the thickness of their food, or the type of nipple used) without asking the whole medical team first

While the LLM model helped with the reading level and sensitivity, the family is still not acknowledged. This result is perhaps understandable as this AI technology draws its "knowledge" from electronically available resources. The impact of family-centered NICU care may be underrepresented in much of this material; however, LLMs allow their output to be modified with secondary prompting. Figure 4c shows ChatGPT's response after being prompted to "also acknowledge that the family is an important part of the care team." This human-based intervention can help improve the output.

Figure 4c: ChatGPT response after secondary prompt requesting that sign acknowledge the role of families in care and decision making

Feeding Plan Reminder

This infant is at increased risk for swallowing difficulties. It is essential that all caregivers, including family members, collaborate closely when making decisions regarding feeding.

Please consult the entire medical team before implementing any modifications to the feeding plan, such as adjustments to patient positioning, food consistency, or nipple type. Your participation and insights are highly appreciated.

This version appears even better, as the family is acknowledged; however, there is a disconnect between the decision-making process in the first and second paragraphs. The first paragraph is appropriately inclusive, but in the second, it refers to the "medical team." One wonders why not just say "the team" or "medical team", as many eyes exclude the family. While the LLM contributed to improving the content of this document, this exercise highlights the continued need for clinician and family involvement in reviewing information generated in this manner. It is essential to recall that LLMs are trained on information created by humans that is

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accessible on the internet and in other electronically available sources. As such, the output may not fully reflect the value of family-centered approaches.

Generative AI and diagnosis:

LLMs can also be used in diagnosis. An article examining the use of LLMs in arriving at diagnoses from the New England Journal of Medicine Clinical Pathologic Conferences (CPCs) is illustrative.

For those unfamiliar with the CPCs, it is a weekly feature that poses challenging diagnostic questions to an expert clinician, who then describes their diagnostic decision-making process. These cases generally involve the care of adults. Using the CPCs from a two-year period, the authors of one study (12) provided the same information given to the expert clinicians to ChatGPT, and the model was asked to provide a differential diagnosis. The accuracy of its responses was examined. They found that the LLM included the correct diagnosis in its differential diagnosis 66% of the time. While this percentage may not seem overly high, it is worth noting that the study did not compare the results achieved by the LLM to those of human performance. It is important to note that analogous studies, which have presented LLMs with Neonatal Board-type questions, have found that the LLMs achieve a passing grade (13, 14). Interesting food for thought is how these technologies might advance over the next 5–10 years.

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Integrating AI into NICU care:

AI has great potential to improve NICU care. To achieve that goal, it must be accepted and trusted by those working there and being cared for. How do we integrate these potentially disruptive technologies into the NICU? There are many layers to that question.

An article by James et al. drew some parallels between AI and the introduction of EHRs into healthcare (15). The latter represented a dramatic transformation. Within a decade, the penetration of EHRs went from 10% of hospitals to over 90%. Indeed, benefits have been observed with this introduction; however, EHRs have been shown to have both positive and negative effects, especially when viewed from the perspectives of clinicians, patients, and families. Reflecting on the early missteps with EHRs, these authors suggest that early clinician engagement is needed, along with education and a realistic understanding of the benefits and potential limitations of AI in their clinical domain.

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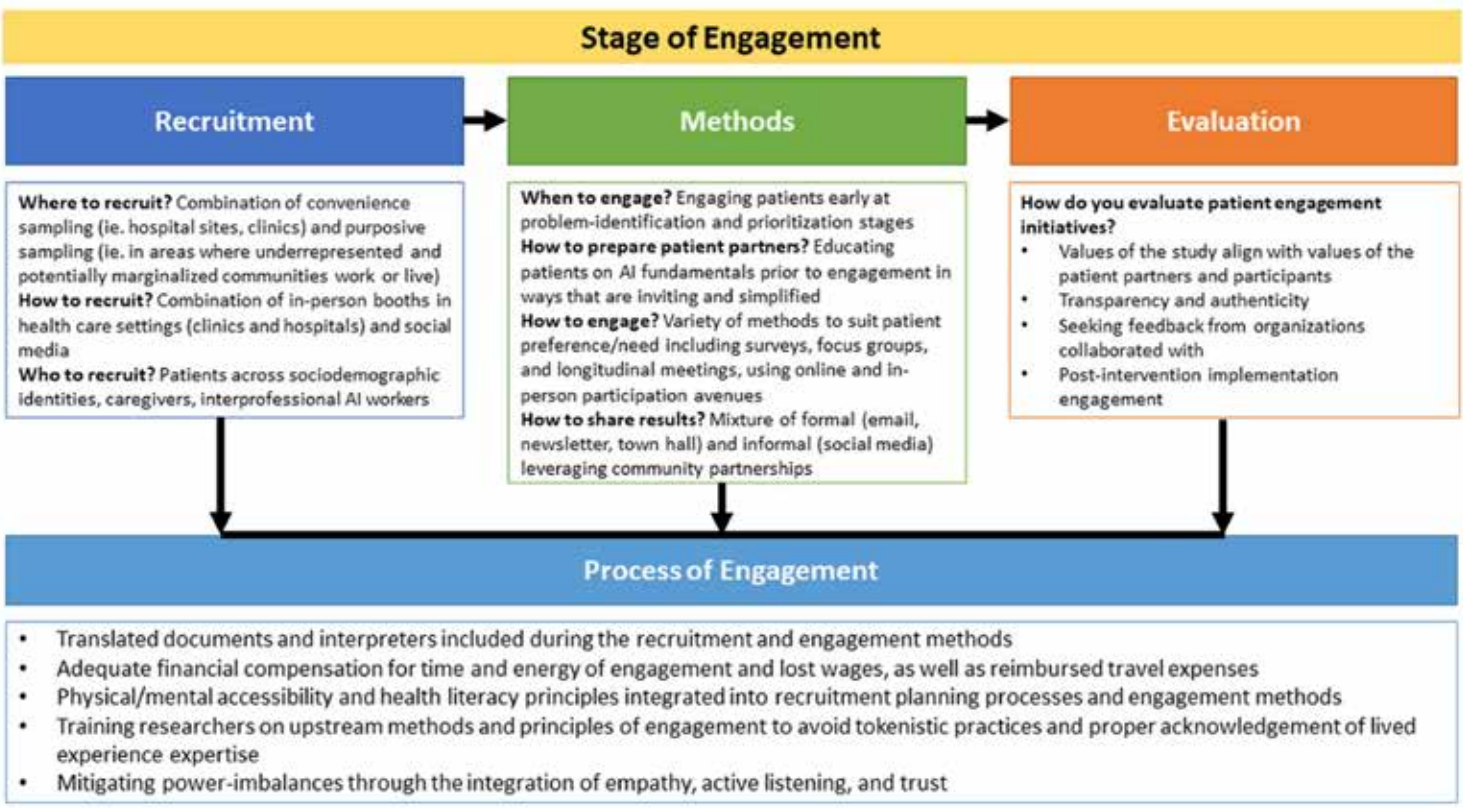
The Epic Sepsis Model in adult care utilizes AI and provides a cautionary tale regarding the integration of technology into real-world care. Implemented in hundreds of locales, a recent review showed that it performed significantly less well in identifying early sepsis and improving other outcomes than initially demonstrated in studies, highlighting the need for post-market surveillance (16).

AI and Shared Decision-Making:

As AI becomes increasingly involved in making both diagnostic and therapeutic recommendations, a key question that arises is how shared decision-making will evolve. Writing in NEJM AI, Blumenthal et al. (2) suggested that "...patients and clinicians must rethink shared decision-making as decisions may well now involve a new member of the team; an AI-derived algorithm. Ultimately, clinicians will bear much of the responsibility to successfully broker the triadic relationship that AI has in their reasoning and recommendations. Over time, this relationship is likely to change.…"

It is commendable that patients (and their families in the NICU) are included in the triad, as it is equally important that they also embrace the use of AI in the care of their babies. In AI literature, collaboration with families is often a passing or absent thought. As is the case for all interest-holders, family involvement must start from the ground up. This encompasses the entire process, from defining the clinical problem or need for improvement to participating in leadership discussions on AI design and implementation. Ideally, we advance to an era of evolving collaboration, similar to what has been seen in NICU care in general. After all, being involved in a project and having your voice heard builds trust, increases the likelihood of acceptance and adoption, and keeps expectations realistic. So how should families be involved? One framework developed in Toronto (17) (Figure 5) provides guidelines on AI patient engagement. Fortunately, when applied to the NICU, this framework embodies what we already know – involving families in the design of care. First and foremost, basic AI education and

Figure 5. Recommendation Framework for Patient Engagement in AI Healthcare Application Development (Adus et. al [17] http://creativecommons.org/licenses/by/4.0/.)



established patient/family engagement tools should be provided to help guide families through the process of AI design and implementation. Supporting families through this process may also include the need for increased communication with health care providers. In addition, drawing from families' diverse lived experiences (e.g., qualitative interviews, surveys) to evaluate new areas AI might be beneficial or to improve existing AI, and, while monitoring the evolution of AI, continue to utilize the experiences of families.

Potential Downsides or Considerations

While we hope that AI will complement and improve NICU care, there are serious considerations that need to be addressed. Among these are issues of:

- **Data Privacy:** These technologies require large datasets of patient-based information. How can it be adequately protected, and how is consent provided for an individual's information to be included?
- **Bias and Equity:** If sections of a population are excluded from the data used to train AI, recommendations may not be relevant to these subpopulations. In addition, inequities exist in our world, including in our healthcare systems. When AI learns from the past, it will inherit these inequities.

  Trust: To achieve acceptance, trust is essential. We do not always understand or believe what AI tells us. During our PCORI projects, both families and clinicians expressed concern about "Black Box" medical care: might it lead clinicians to be less engaged with families; how will the thoughts, impressions and observations of families be used to provide data to AI algorithms; could AI pit providers against machines, confusing care and treatment decisions for families and eroding their trust in the care team's interpretation of a baby's condition.
- **Relationships:** Families stress the importance of their relationships with NICU staff and vice versa. We must ensure AI preserves or even enhances human connectedness and does not diminish the sense of community valued by both families and clinicians.
- **Keeping Humans in the Loop:** This does not end at implementation; it involves ongoing incorporation of family and staff values. As we saw with the rewording of the Aspiration sign (Figure 3c), human oversight to vet data and recommendations is essential. This becomes even more important when diagnostic or therapeutic decisions are involved.
- **Hallucinations:** Just like humans, AI can plain make stuff up.
- **Job displacement:** To quote Warner Slack, M.D., "Any clinician that can be replaced by a computer should be" (18). By this, Dr. Slack did not intend to cause unemployment but rather to allow these skilled individuals to be freed from some tasks, allowing them to concentrate on other, more value-added ones.

Summary: Exciting Possibilities, but Reason for Caution and Oversight:

While it is imperative to address the issues mentioned previously, the potential of AI to improve care in the NICU, as well as during and after the transition home, is promising. How might AI be

leveraged to aid follow-through, improve outcomes and safety, and provide more efficient care? Perhaps patients or their families could avoid unnecessary ED visits by gathering information about their symptoms and self-treatment options, utilizing knowledge acquisition that goes beyond simple Google searches, which can be daunting to navigate. We are in an era of unimaginable technological advancements. This places a responsibility on all those who care for patients in the NICU, as well as technologists. Dream big. Think outside the box. Moreover, again, quoting Marie Abraham: **"…ensure that the transformations caused by AI use are positive, guided by the preferences and priorities of those who could benefit from innovative technology."**

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Bridget Davern is a NICU graduate parent and Family Advisor at M Health Fairview Masonic Children's Hospital. Her daughter, Emma, was born at 24 weeks. During Emma's five-month hospitalization, Bridget was empowered by the staff to advocate for Emma and be an equal participant on her healthcare team. Inspired by this experience and the desire to give back, she served as the unit's Vermont Oxford NICQ family representative for 15 years and was selected to serve as a Parent faculty member for the Vermont Oxford Quality Improvement Collaborative. She was employed as a Clinical Research Coordinator for the Division of Neonatology and the March of Dimes NICU Family Support Program Coordinator.

Ms. Davern served as a co-investigator on two PCORI-funded Eugene Washington Engagement projects and currently serves as a consultant to an ongoing project examining issues of equity in NICU patient assignments. She continues to support families as a member of the NICU Parent-to-Parent Program and currently serves as the family advisor on the hospital's PIVIE workgroup.

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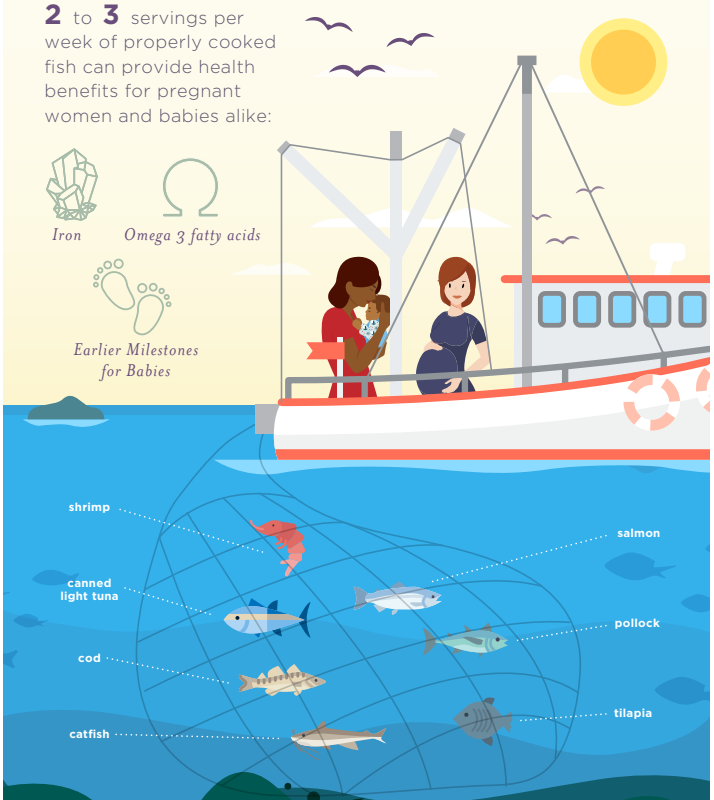
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- Continuing Respiratory Care Education (CRCE)

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PAC/LAC's core values for improving maternal and child health have remained constant for over 30 years – a promise to lead, advocate and consult with others.

Leadership

Providing guidance to healthcare professionals, hospitals and healthcare systems, stimulating higher levels of excellence and improving outcomes for mothers and babies.

Advocacy

Providing a voice for healthcare professionals and healthcare systems to improve public policy and state legislation on issues that impact the maternal, child and adolescent population.

Consultation

Providing and promoting dialogue among healthcare professionals with the expectation of shared excellence in the systems that care for women and children.

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Thirteen-year-old Emily Rose Shane was tragically murdered on April 3, 2010 on Pacific Coast Highway in Malibu, CA. Our foundation exists to honor her memory.

In Loving Memory

August 9, 1996 - April 3, 2010

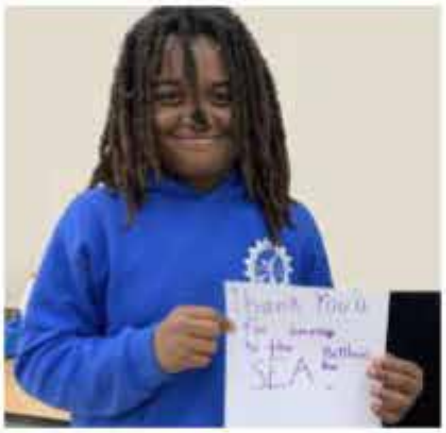


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Make a Difference in the Life of a Student in Need Today!
Please visit emilyshane.org

Sponsor a Child in the SEA Program

The average cost for the program to provide a mentor/ tutor for one child is listed below.



1 session	$15
1 week	$30
1 month	$120
1 semester	$540
1 year	$1,080
Middle School	$3,240

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The Village Son



A Life's Journey

Iranian village to a university professor in the United States of America in this memoir. As a boy, his unruly behavior was sedated by scholastic challenges as a remedy. At age twelve, he left home for junior high school in a provincial capital. At first, a lack of self-esteem led him to stumble, but he soon found the courage to tackle his subjects with vigor. He became more curious about the world around him and began to yearn for a new life despite his financial limitations. Against all odds, he became one of the top students in Iran and earned a scholarship to study medicine in Europe. Even though he was culturally and socially naïve by European standards, an Italian family in Rome helped him thrive. The author never shied away from the challenges of learning Italian, and the generosity of Italy and its people became part and parcel of his formative years. By the time he left for the United States of America, he knew he could accomplish whatever he imagined.

Houchang D. Modanlou

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National Network of NICU Psychologists
www.nationalperinatal.org/psychologists

COVID-19

FREE RESOURCES for your NICU

- Helping Children and Families Cope
- Bonding with Your Baby
- Caregivers Need Care Too

COPING WITH COVID-19

KEEP PATIENTS UP-TO-DATE WITH CHANGES IN POLICIES SO THEY KNOW WHAT TO EXPECT. LISTEN TO THEIR CONCERNS.





Provide culturally-informed and respectful care.

TELL PARENTS HOW YOU WILL KEEP THEM AND THEIR BABIES SAFE DURING THEIR NICU STAY.





Use technology like video chat apps to include family members who can't visit the NICU.

myNICUnetwork.org

and

National Perinatal Association
NICU Parent Network

My Perinatal Network and My NICU Network are products of a collaboration between NPA and NPN.

2024

Respiratory Syncytial Virus:

How you can advocate for babies this RSV season

Track national data and trends at the CDC's website www.cdc.gov/rsv



Identify the babies at greatest risk



including those with CLD, BPD, CF, and heart conditions

Teach families how to protect



their babies from respiratory infections

Advocate for broader insurance coverage for both vaccination and palivizumab prophylaxis so more babies can be protected



Use your best clinical judgement



when prescribing RSV prophylaxis

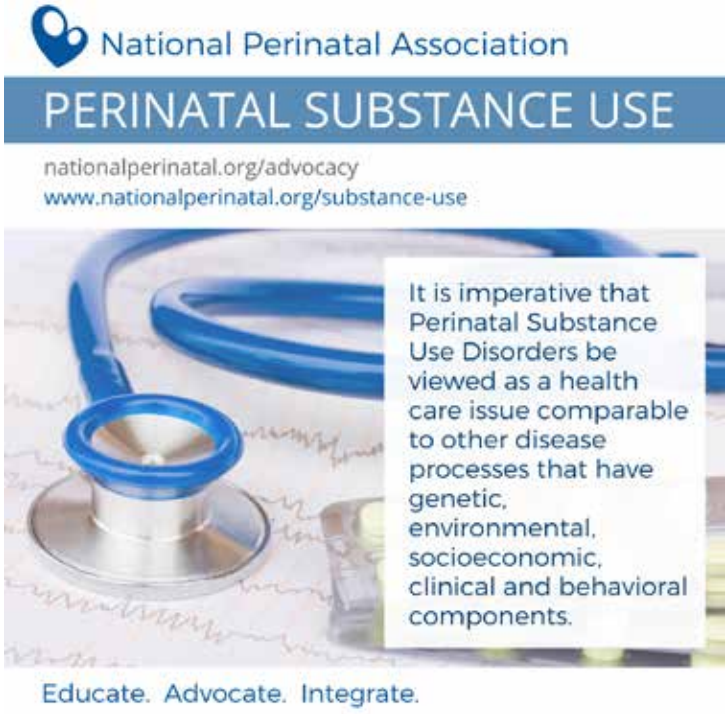
Tell insurers what families need



and provide the supporting evidence

National Perinatal Association

www.nationalperinatal.org/rsv



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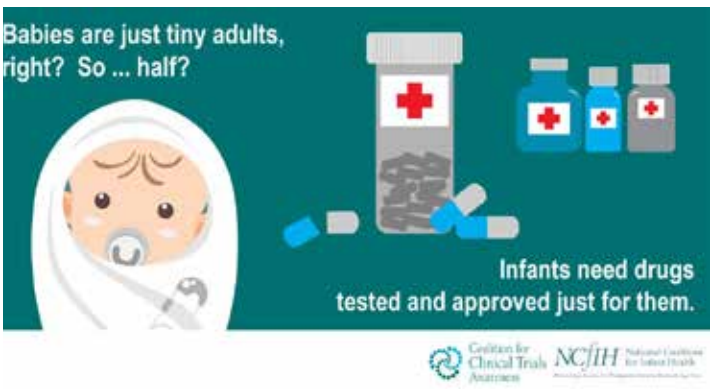
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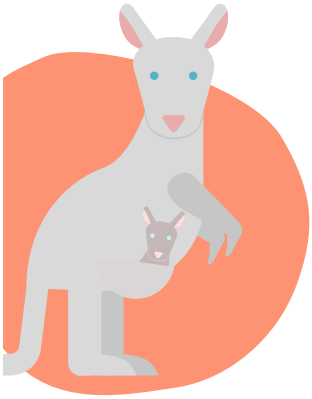






SUPPORTING KANGAROO CARE

SKIN-TO-SKIN CARE DURING COVID-19



GET INFORMED ABOUT THE RISKS + BENEFITS

work with your medical team to create a plan

GET CLEAN

WASH YOUR HANDS, ARMS, and CHEST

with soap and water for 20+ seconds. Dry well.





PUT ON FRESH CLOTHES

change into a clean gown or shirt.

IF COVID-19 + WEAR A MASK

and ask others to hold your baby when you can't be there



National Perinatal Association

nicuparentnetwork.org

NPN NICU PARENT NETWORK

nationalperinatal.org/skin-to-skin

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Raising Global Awareness of RSV

Global awareness about respiratory syncytial virus (RSV) is lacking. RSV is a relatively unknown virus that causes respiratory tract infections. It is currently the second leading cause of death – after malaria – during infancy in low- and middle-income countries.

The RSV Research Group from professor Louis Bont, pediatric infectious disease specialist in the University Medical Centre Utrecht, the Netherlands, has recently launched an RSV Mortality Awareness Campaign during the 5th RSV Vaccines for the World Conference in Accra, Ghana.

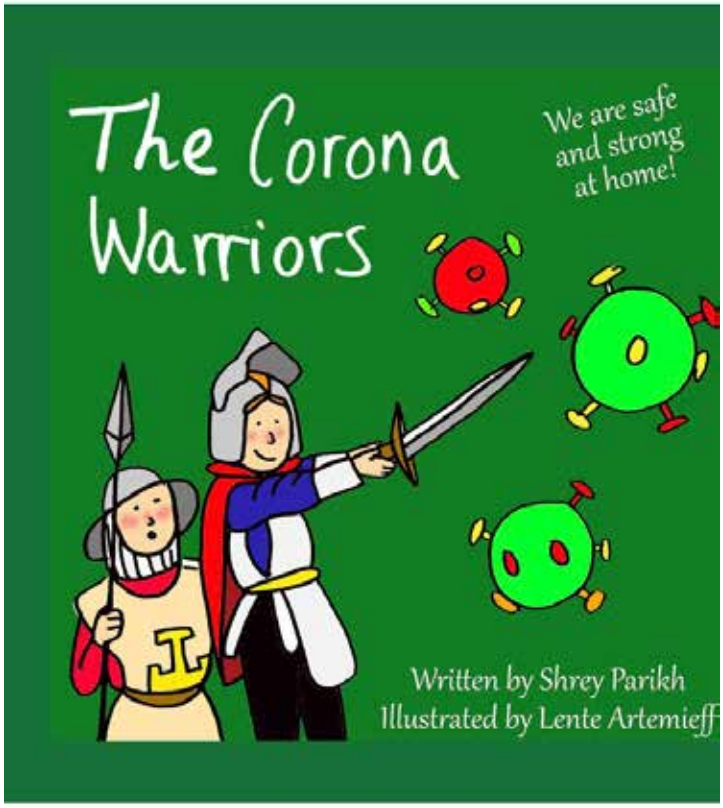
They have produced a personal video entitled "*Why we should all know about RSV*" about Simone van Wyck, a mother who lost her son due to RSV. The video is available at www.rsvgold.com/awareness and can also be watched using the QR code on this page. Please share the video with your colleagues, family, and friends to help raise awareness about this global health problem.

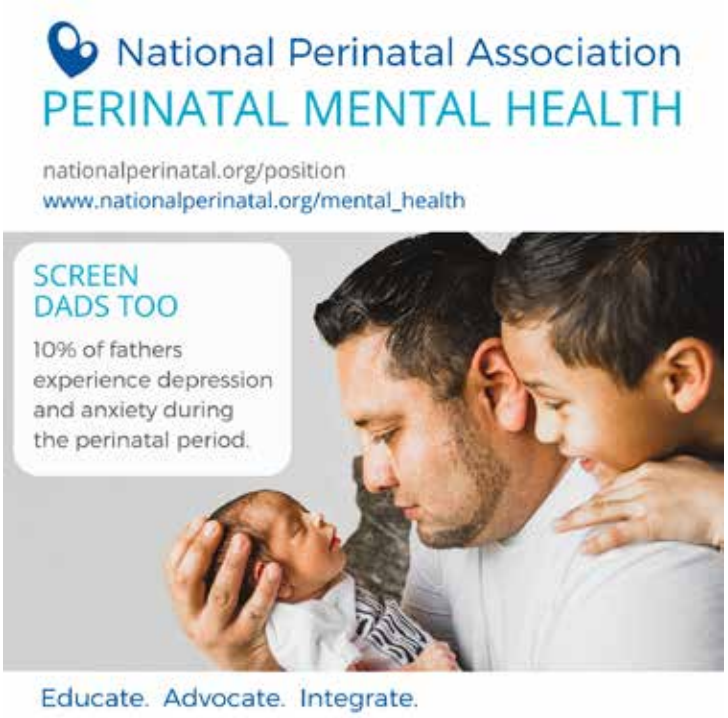


RSV GOLD

A Global Mortality Database for Children with RSV Infection

The RSV awareness video was produced in collaboration with the Bill & Melinda Gates Foundation



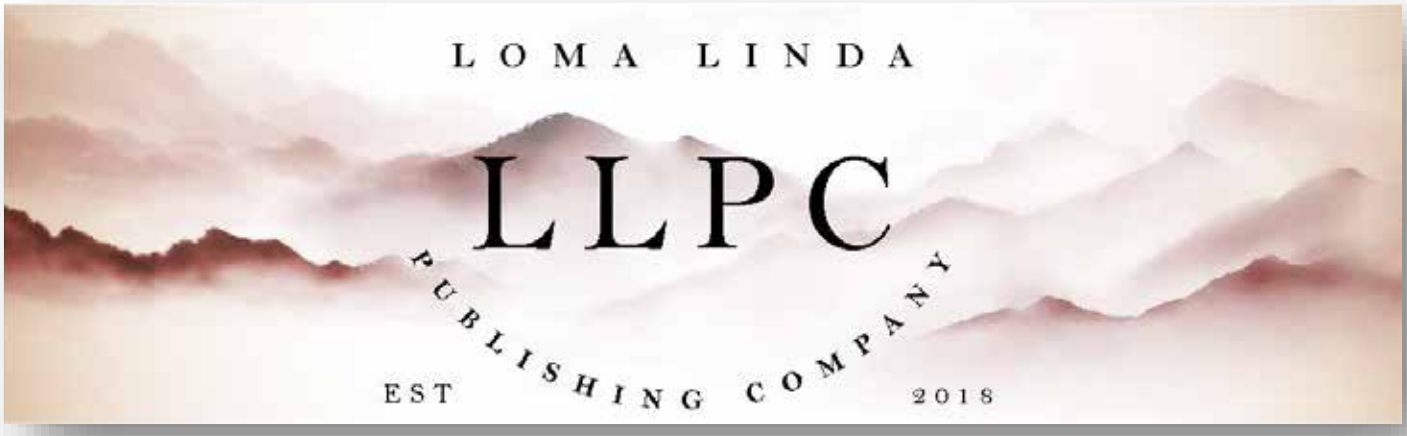


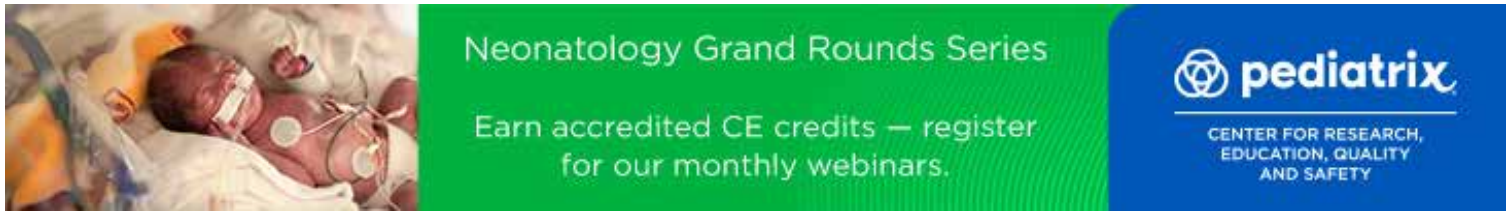
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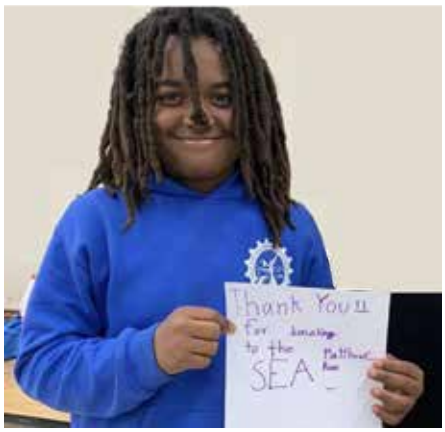


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National Coalition for Infant Health: Comprehensive NICU Discharge Planning

Craig F. Garfield, MD

NATIONAL COALITION for Infant Health

The National Coalition for Infant Health is a collaborative of more than 200 professional, clinical, community health, and family support organizations focused on improving the lives of premature infants through age two and their families. NCfIH's mission is to promote lifelong clinical, health, education, and supportive services needed by premature infants and their families. NCfIH prioritizes safety of this vulnerable population and access to approved therapies.

"The biggest challenge for families is transitioning from having multiple teams of professionals monitoring and caring for their baby to being on their own with no monitoring equipment or professionals."

"Policymakers can prioritize policies that ensure comprehensive NICU discharge planning resources are accessible and take advantage of cutting-edge technology, reduce the out-of-pocket costs families face with a medically fragile child and develop dedicated family leave policies that support NICU families."

Steering Committee

The National Coalition for Infant Health is supported by a volunteer steering committee, all of whom contribute significantly to lives of premature infants through work and parenting. Steering committee members represent national nonprofits, academic institutions, and parent organizations, and they provide leadership as well as help to mobilize partners in the field of prematurity.

AWHONN · CoINN · Expecting Health · Glo Preemies A Nest Community · HAND to HOLD · NBNA · National Perinatal Association · Neonatology Today · NPN · preemieworld

INFANT HEALTH **MATTERS**

Comprehensive **NICU Discharge Planning**



Craig F. Garfield, MD

Q: What are the biggest challenges families face when bringing their baby home from the NICU?

The biggest challenge for families is transitioning from having multiple teams of professionals monitoring and caring for their baby to being on their own with no monitoring equipment or professionals. Many parents have only experienced parenthood while in the NICU, so they do not know what to expect during their first night alone.

Q: Currently, how are parents prepared by hospital staff to take their baby home from the NICU?

The discharge process varies widely between hospitals, which is a problem in itself. Some require parents to spend the night in the NICU before the baby is discharged, while others focus on education that can be verbally communicated or printed out. Overall, there is no consistent process to assist parents with discharge and their transition home.

Q: What is comprehensive NICU discharge planning, and why is it critical for families?

Comprehensive NICU discharge planning begins when a baby is admitted and helps families understand what to expect, outcomes to achieve and criteria that must be met for discharge. It is about helping parents feel confident and competent in taking care of their baby.

Premature babies in the NICU have the highest rates of hospital readmission, which makes leaving the NICU very stressful. However, when parents receive comprehensive NICU discharge planning, their baby is less likely to be readmitted or visit the emergency room.

Q: What tools and resources help ease the transition home for NICU families?

Every family is different, so it starts with understanding a family's individual needs. Clear communication and individualized, tailored support are essential to make sure the family understands what to expect in the present and future.

One way that hospitals can support NICU families is by adopting app-based technologies that provide tailored educational resources, information and reminders that help guide families through their NICU journey and at home after their baby is discharged.

Another way that hospitals can support NICU families is through peer support groups. For example, having support groups with mothers and fathers together. In my experience leading a NICU dads' support group, what happens during delivery has a profound impact on fathers. For many, the support group is the first time they have told their story. It can be very reassuring and validating for all parents.

Q: How can hospitals address the emotional and psychological needs of parents during the discharge process?

The NICU levies an emotional toll on parents. Research shows that mothers are at greater risk of experiencing postpartum depression and anxiety during their baby's NICU stay, while fathers tend to face a greater risk later, once they are home and the immediate crisis has passed. That is why it is important to direct parents to resources that can be used throughout their NICU stay and post-discharge. It is also important to remind parents that even if they feel okay now, the anxiety and stress of having a child in the NICU may unexpectedly resurface later on.



Q: How can hospitals better support coordination between providers post-discharge?

In many cases, the family's health care providers outside the NICU are less familiar with the baby than the NICU staff. It is essential to connect with these providers, share information on the baby's medical history and NICU experience and let them know that the NICU staff is a resource for them. Existing phone applications could help with this coordination as they host detailed records from a baby's time in the NICU, can help parents track their baby's progress and help facilitate ongoing communication with their baby's providers.

Families should also understand that NICU follow-up visits are essential. The NICU team is uniquely equipped to monitor the baby's progress and recognize potential concerns after discharge.

Q: How can policymakers, health care providers and families work together to improve the discharge process and long-term outcomes for NICU families?

Policymakers can prioritize policies that ensure comprehensive NICU discharge planning resources are accessible and take advantage of cutting-edge technology, reduce the out-of-pocket costs families face with a medically fragile child and develop dedicated family leave policies that support NICU families.

NATIONAL COALITION for Infant Health

The National Coalition for Infant Health is a collaborative of professional, clinical, community and family support organizations.

The coalition focuses on education and advocacy promoting patient-centered care for all infants–whether born preterm or full term–and their families.

infanthealth.org

Disclosures: The author has no relevant disclosures.

NT

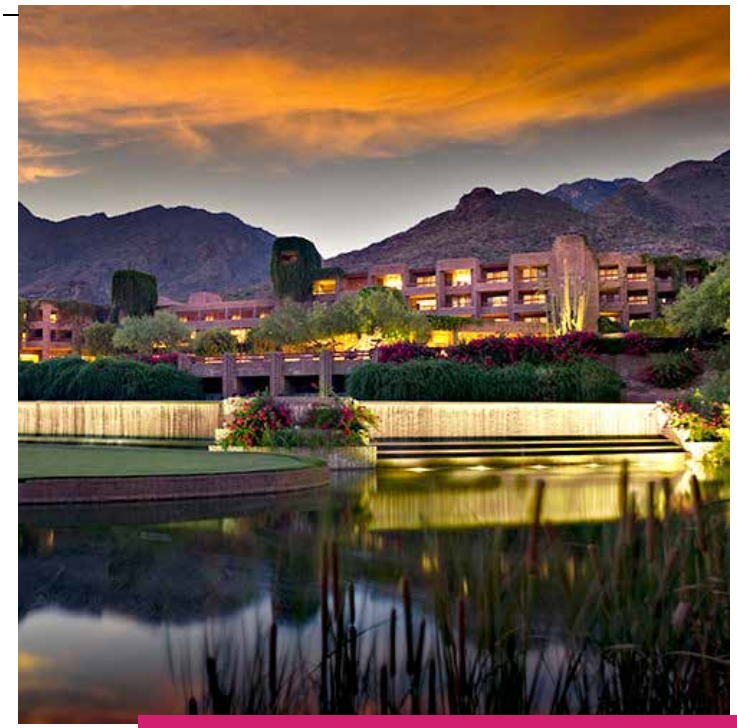
National Coalition for Infant Health Values (SANE)

Safety. Premature infants are born vulnerable. Products, treatments and related public policies should prioritize these fragile infants' safety.

Access. Budget-driven health care policies should not preclude premature infants' access to preventative or necessary therapies.

Nutrition. Proper nutrition and full access to health care keep premature infants healthy after discharge from the NICU.

Equity. Prematurity and related vulnerabilities disproportionately impact minority and economically disadvantaged families. Restrictions on care and treatment should not worsen inherent disparities.



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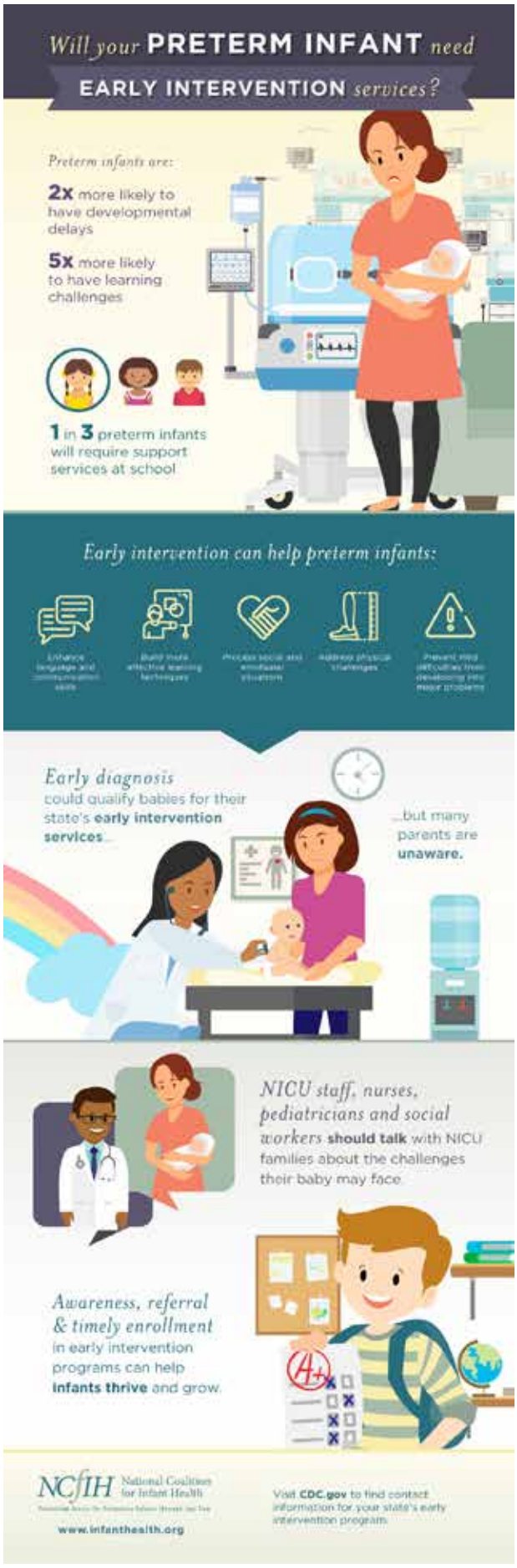
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Tucson, AZ


Will your PRETERM INFANT need
EARLY INTERVENTION services?
Preterm infants are:
2x more likely to have developmental delays
5x more likely to have learning challenges
1 in 3 preterm infants will require support services at school
Early intervention can help preterm infants:
Early diagnosis could qualify babies for their state's early intervention services...but many parents are unaware.
NICU staff, nurses, pediatricians and social workers should talk with NICU families about the challenges their baby may face.
Awareness, referral & timely enrollment in early intervention programs can help infants thrive and grow.
NCfIH National Coalition for Infant Health
www.infanthealth.org
Visit CDC.gov to find contact information for your state's early intervention program.


WHY INFANTS NEED THE
Vitamin K Shot
Newborn babies need vitamin K to help with proper blood clotting and protect them from vitamin K deficiency bleeding.
This type of bleeding is dangerous and can lead to:
Internal bleeding, including in the brain and other organs
Brain damage
Death
One out of every five babies with vitamin K deficiency bleeding dies.
Babies don't get vitamin K from their moms before they are born.
But vitamin K deficiency bleeding is easily preventable with a shot at birth.
Newborns who do not get a vitamin K shot are 81 times more likely to develop severe bleeding.
The vitamin K shot is:
Safe and effective
Routinely given to newborns
Recommended by the American Academy of Pediatrics
Not a vaccine
Protect infants from life-threatening bleeding with a vitamin K shot at birth.
National Coalition for Infant Health

Your Pregnancy and Substance Use

4 Things you can do to improve your health and lower your risk for complications



Get Prenatal Care

Start early. Go to all your visits. Empower yourself with information so you can make smart decisions. Build relationships with providers who understand Substance Use Disorders (SUDs) and know how to help. Partner with them to reach your goals. But remember, you do not need to be abstinent from substance use to get care. Go now.



Reduce Your Use

There are simple things you can do to limit the harm substances might do.

- Use fewer substances
- Use smaller amounts
- Use less often
- Learn how to use safer

Reducing or quitting smoking is a good place to start. Set your goals, then ask for help.
One of the best things you can do is to stop using alcohol. We know that even small amounts are risky. And when combined with benzos and opioids, alcohol can kill.



Use Medications for Opioid Use Disorder (MOUD) if you are opioid dependent

Methadone and Buprenorphine (Subutex® or Suboxone®) are the "Standard of Care" during pregnancy because they:

- Eliminate the risks of illicit use
- Reduce your risk for relapse
- Can be a positive step towards recovery



Take Good Care of Yourself

You deserve a healthy pregnancy & childbirth.

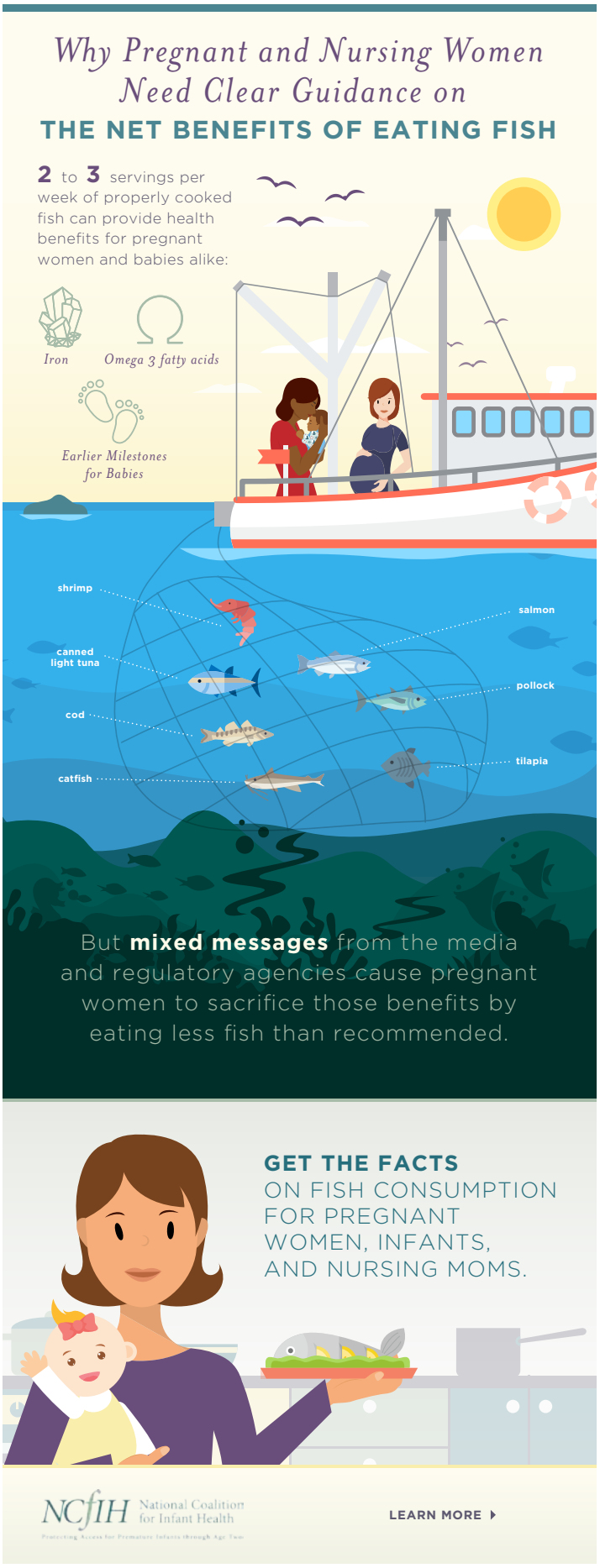
- Eat healthy and take your prenatal vitamins
- Find the right balance of rest and exercise
- Surround yourself with people who care

Your Health Matters

Academy of Perinatal Harm Reduction

National Perinatal Association

www.perinatalharmreduction.org | www.nationalperinatal.org



SHARED DECISION-MAKING PROTECTS MOTHERS + INFANTS DURING COVID-19

KEEPING MOTHERS + INFANTS TOGETHER

Means balancing the risks of...

- HORIZONTAL INFECTION
- SEPARATION AND TRAUMA





EVIDENCE

We encourage families and clinicians to remain diligent in learning **up-to-date evidence**.

PARTNERSHIP

What is the best for this unique dyad?

SHARED DECISION-MAKING

- **S** EEK PARTICIPATION
- **H** ELP EXPLORE OPTIONS
- **A** SSESS PREFERENCES
- **R** EACH A DECISION
- **E** VALUATE THE DECISION





TRAUMA-INFORMED

Both parents and providers are confronting significant...

- FEAR
- GRIEF
- UNCERTAINTY

LONGITUDINAL DATA

We need to understand more about outcomes for mothers and infants exposed to COVID-19, with special attention to:

- MENTAL HEALTH
- POSTPARTUM CARE DELIVERY



NEW DATA EMERGE DAILY. NANN AND NPA ENCOURAGE PERINATAL CARE PROVIDERS TO ENGAGE IN CANDID CONVERSATIONS WITH PREGNANT PARENTS PRIOR TO DELIVERY REGARDING RISKS, BENEFITS, LIMITATIONS, AND REALISTIC EXPECTATIONS.

Partnering for patient-centered care when it matters most.

nann.org nationalperinatal.org

National Association of Neonatal Nurses

National Perinatal Association

Peer Reviewed

Fragile Infant Forums for the Implementation of Infant Family Centered Developmental Care Standards and Competencies: The Perspective of Neonatal Nursing

Carol Jaeger, DNP, RN, NNP-BC, Carole Kenner, PhD, RN, FAAN, FNAP, ANEF, IDFCOINN



Abstract:

The Infant and Family Centered Developmental Care (IFCDC) model is grounded in interprofessional, evidence-based standards and competencies. This article examines the application of nursing standards and competencies as exemplars for IFCDC.

Introduction:

Standards and competencies are not new to nursing or to many other disciplines. For example, the International Confederation of Midwives (ICM) identified the essential competencies for midwifery practice many years ago. These competencies, updated in 2024, frame the "minimum set of knowledge, skills and professional behaviours required to use the designation of midwives…" (1) Additionally, in 2021, the American Association of Colleges of Nursing (AACN) (2) called for professional nursing education programs to move from program objectives to learning outcomes and a competency-based education model. The Council of International Neonatal Nurses, Inc. (COINN) developed standards and competencies in 2019 as part of standardized curricula to support neonatal nursing education in low-resource countries. (3) More recently, the American Association of Colleges of Nursing (AACN) called for baccalaureate and higher degree nursing programs to adopt competency-based curricula. (2) Inherent in these calls for standards and competencies are the questions: Why the recent emphasis on standards and competencies? What does this really mean, and how does this apply to frameworks like infant- and family-centered developmental care (IFCDC)?

Standards:

"Standards are defined as the guidelines and criteria for the knowledge and skills a health professional is to acquire and demonstrate. Standards articulate standardized recommendations developed by experts based on a breadth of strong evidence."

Standards are defined as the guidelines and criteria for the knowledge and skills a health professional is to acquire and demonstrate. Standards articulate standardized recommendations developed by experts based on a breadth of strong evidence. Enforcement of standards ensures quality and consistency, guides curriculum development, and establishes clear expectations for competence—thus promoting patient safety and quality care. Because they act as a benchmark for performance, they support accountability and facilitate ongoing professional learning. Standards of performance are developed by professional associations, such as the American Nurses Association (ANA) and the National Association of Neonatal Nurses (NANN), as well as expert groups, including the Consensus Committee on Standards, Competencies, and Best Practices for Infant and Family-Centered Developmental Care (IFCDC) in the Intensive Care Unit. In turn, they are used by accrediting and regulatory bodies such as the Commission on Collegiate Nursing Education (CCNE) and state boards of nursing.

Competencies:

"Competencies are specific, measurable, achievable, relevant, and time-bound (SMART) statements that define performance expectations based on the knowledge, skills, and behaviors necessary to promote safe, quality nursing care. They are dynamic and focused on outcomes."

Standards embody and articulate competencies. Competencies are specific, measurable, achievable, relevant, and time-bound (SMART) statements that define performance expectations based on the knowledge, skills, and behaviors necessary to promote safe, quality nursing care. They are dynamic and focused on outcomes. Notably, both standards and competencies are tailored to the specific population being served. As such, they can be applied to interprofessional work, such as in intensive care units serving babies and their families.

Competency-Based Education (CBE):

Competency-based education (CBE) emerged in response to concerns about patient safety and the increasing number of medical errors occurring in hospital settings. (4) CBE was used in teacher education in the 1960s and by nursing in the 1990s. (4) Other disciplines have since subscribed to this educational method. The Interprofessional Education Collaborative (5) has advocated for the development of interprofessional competencies. According to the AACN, CBE includes instruction, assessment, demonstration of skills and knowledge-competencies with feedback from the evaluator and self-reflection from the student. (2)

"Competency-based education (CBE) emerged in response to concerns about patient safety and the increasing number of medical errors occurring in hospital settings."

Competency-Based Practice (CBP)

In the clinical setting, CBE has led to competency-based performance (CBP) in practice for entry- and advanced-level nurses. The essential nursing core domains drive the practice standards and competencies. They include person-centered care, population health, scholarship, quality and safety, system-based focus, informatics and healthcare technology, interprofessional partnerships, and personal, professional, and leadership development. (2) The standards and competencies of quality and safety are accomplished using evidence-based practice (EBP). This systems-based process of continuing improvement facilitates the reduction of medical errors, increased use of safety measures, and enhances fiscal efficiency.

"The essential nursing core domains drive the practice standards and competencies. They include person-centered care, population health, scholarship, quality and safety, system-based focus, informatics and healthcare technology, interprofessional partnerships, and personal, professional, and leadership development."

Evidence-based practice (EBP) is defined by the American Nurses Association (ANA) as "a life-long problem-solving approach to the delivery of health care that integrates the best evidence from well-designed studies (i.e., external evidence) and integrates it with a patient's preferences and values and a clinician's expertise, including internal evidence gathered from patient data. When EBP is delivered in a context of caring and a culture, as well as an ecosystem or environment that supports it, the best clinical decisions are made that yield positive patient outcomes." (6) Key elements of EBP include person-focused (baby) and family-centered care, teamwork and collaboration, continuous quality improvement, and a data-driven platform for evaluation.

"Evidence-based practice (EBP) is defined by the American Nurses Association (ANA) as "a life-long problem-solving approach to the delivery of health care that integrates the best evidence from well-designed studies (i.e., external evidence) and integrates it with a patient's preferences and values and a clinician's expertise, including internal evidence gathered from patient data."

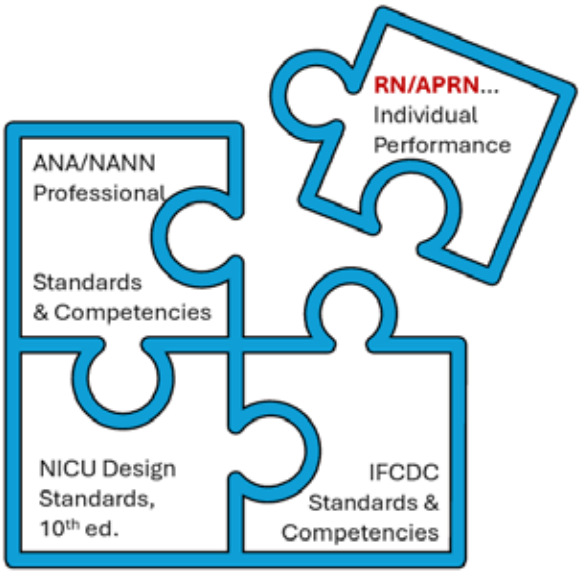
As an example of the importance of evidence and competency-based practice, the NICU Design Standards, now in its 10th edition (2023), guides the evidence-based ecosystem or environment of neonatal intensive care from which neonatal EBP is delivered. (7) In this context, recommendations for neuroprotective physical space and a healing environment are provided to ensure continuity of developmental care for the baby and parent(s) from birth through the stay in the NICU to transition to home. Healing factors that are inherent in the standards include space, privacy, safety, temperature, touch, proprioception (the subconscious sense of the body's position and movement), smell, taste, and sound.

Neonatal Nursing Standards and Competencies:

The American Nurses Association (ANA), National Association of Neonatal Nurses (NANN), and the Council of International Neonatal Nurses (COINN) emulate the domains of practice standards and competencies of the ANA and those of the AACN Competency Based Education (CBE) and the EBP process to guide the scope and practice of nurses and advanced practice nurses specializing in the care of premature and sick babies and their families. (3, 9) The nursing standards of practice, with associated competencies, include assessment, diagnosis, outcome identification, planning, implementation, and coordination of care, health teaching and promotion, and education. The standards of professional performance include ethics, culturally congruent practice,

communication, collaboration, leadership, education, evidence-based practice and research, quality of practice, professional practice evaluation, resource utilization, and an environmentally respectful culture and practice of Infant and family-centered developmental care. They are singularly identified in a set of competencies specific to IFCDC. (See Fig. 1)

Figure 1: Connection between Individual Nurse Performance based on ANA/NANN Neonatal Nursing Scope and Standards of Practice, NICU Design Standards, and IFCDC Standards and Competencies



"The establishment of evidence-based practice (EBP) competencies for registered nurses and advanced practice nurses is essential for improving healthcare quality, reliability, and patient outcomes while reducing costs."

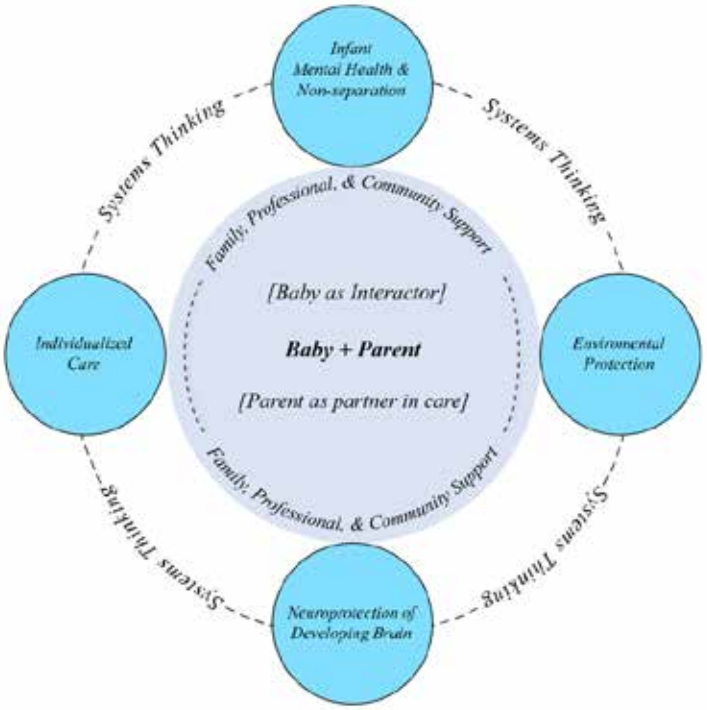
The establishment of evidence-based practice (EBP) competencies for registered nurses and advanced practice nurses is essential for improving healthcare quality, reliability, and patient outcomes while reducing costs. (6) The neonatal nurse is the consistent healthcare professional who influences the continuity of care provided to patients/babies and families. Consequently, they should be competent in the EBP process and integral with the quality improvement team. However, a cross-sectional descriptive study conducted by Melnyk et al. over 2,300 nurses across the United States reported a lack of meeting evidence-based practice (EBP) competencies, highlighting a critical need for enhanced education and support in EBP to improve healthcare quality and patient outcomes. (8)

"The neonatal nurse is the consistent healthcare professional who influences the continuity of care provided to patients/babies and families. Consequently, they should be competent in the EBP process and integral with the quality improvement team."

Infant and Family Centered Developmental Care (IFCDC)

The IFCDC standards, competencies, and best practice recommendations (10) provide an evidence-based model of care that promotes neuroprotection of the infant and support for the family in intensive care. The model (Fig. 2) emphasizes principles of developmental care that are baby-led, family-centered, interprofessional, and dynamic. (11) They are considered dynamic because, as the evidence grows, interventions may change based on evolving knowledge and skills. Having standards and competencies that are updated periodically by an interprofessional consensus panel provides a consistent basis for the education, training, and practice of the health professional team that provides developmental, family-centered care. Consistency in education and training/training and the implementation of standardized competence performance promotes quality care, improved health outcomes, and the well-being of babies and their families.

Figure 2: The IFCDC Model depicting the relationship of the principles to practice



"The IFCDC standards, competencies, and best practice recommendations provide an evidence-based model of care that promotes neuroprotection of the infant and support for the family in intensive care."

The IFCDC Standards section on Systems Thinking in Complex Adaptive Systems, as in a NICU, identifies the standards required to establish the structure, policies, and implementation of IFCDC in intensive care, including the following:

- infrastructure and framework,
- interprofessional collaborative practice,
- evidence-based practice, including data monitoring and continuous improvement,
- practice resources/support, and
- transition to home.

The competencies of each standard define the expectations of knowledge, skills, and behaviors necessary to provide and promote safe, quality care, resulting in an optimal outcome for each baby, parent(s), and family member(s). (10)

IFCDC in Neonatal Nursing Practice:

The IFCDC standards, competencies, and best practices encompass the underlying assumptions of neonatal nursing for the registered nurse (RN) and Advanced Practice Registered Nurse (APRN). The assumptions are outlined in the ANA and NANN Neonatal Nursing Scope and Standards of Practice, 2021 (9) and include the following:

- The standards primarily focus on the process of providing nursing care to newborns, infants, and their families.
- The nurse recognizes that the family is the integral unit for care.
- Nursing care is individualized to meet the unique needs of each newborn or infant and family.

"The IFCDC standards, competencies, and best practices encompass the underlying assumptions of neonatal nursing for the registered nurse (RN) and Advanced Practice Registered Nurse (APRN)."

Further, the nurse

- Considers and respects the family's goals and preferences when developing and implementing a care plan.
- Respects culture and diversity in all aspects of newborn or infant care and family care, and administers nursing care accordingly.
- Respects the privacy rights of the newborn or infant and their family, and manages all information accordingly.
- Provides information to the family so that informed decisions can be made regarding the care of the newborn or infant and the family's needs.
- Functions within the Nurse Practice Act of the state and the established policies and procedures as described by the healthcare institution in which the nurse is practicing.
- Works in coordination and collaboration with other healthcare providers to deliver care to the newborn or infant and their family.
- Strives to provide the highest quality of care while utilizing available resources.
- Strives to promote optimal outcomes within the confines of current practice standards.
- Strives to ensure the use of evidence-based care when possible and advocates for research in areas lacking evidence to support practice.

The assumptions of neonatal nursing have a global perspective. Examples of leadership and teamwork standards from the COINN Neonatal Nursing Competency Framework (3) include:

- Engages in collaborative practice to achieve planned outcomes.
- Provides a supportive environment for colleagues.
- Manages the use of staff and physical resources.

Associated competencies from COINN (2019) include the following:

- Demonstrates leadership skills with nursing practice.
- Actively strives to attain skills and knowledge in neonatal care.
- Provides an ongoing portfolio of continuing education.
- Takes responsibility for developing themselves and others.
- Contributes to the overall unit operation where employed.
- Actively contributes to neonatal working groups.
- Contributes to the orientation of new staff.
- Collaborates with outside agencies and community health facilities.
- Manages resources effectively.
- Participates in clinical governance.

Parallels Between Neonatal Nursing and IFCDC Standards

Evidence-based practice areas of IFCDC to perform neuroprotective developmental care in the neonatal intensive care unit are synonymous with neonatal nursing care. Systems

Thinking is applied to all evidence-based practices that are clinical practice exemplars of IFCDC and are within the domain of nursing practice. They include reducing and managing pain and stress in both newborns and family members, sleep and arousal interventions for the baby, positioning and touch for the baby, skin-to-skin contact of the baby with intimate family members, and the management of baby-led feeding, eating, and nutrition delivery. Each of the sections identifies evidence-based standards and competencies to guide the performance of neuroprotective and family-centered care for the baby, aiming for optimum outcome and well-being.

"Evidence-based practice areas of IFCDC to perform neuroprotective developmental care in the neonatal intensive care unit are synonymous with neonatal nursing care. Systems Thinking is applied to all evidence-based practices that are clinical practice exemplars of IFCDC and are within the domain of nursing practice."

Kenner and McGrath, Neonatal Developmental Care, 3rd edition (2023), have published the use of IFCDC in neonatal practice. (12) The resulting recommendations are that IFCDC standards and competencies should be incorporated into nursing orientation/on-boarding education, updates/continuing education, simulation learning, performance evaluation, policies, clinical guidelines, and procedure protocols. Nurses, in their multiple roles, are instrumental leaders in the implementation of all the IFCDC Standards, whether they function as administrators, managers, advanced practice providers, caregivers, instructors, preceptors, mentors, researchers, quality improvement coordinators, clinical specialists, case managers, regional educators, transport team coordinators/members, and/or parent advisors.

"Nurses, in their multiple roles, are instrumental leaders in the implementation of all the IFCDC Standards, whether they function as administrators, managers, advanced practice providers, caregivers, instructors, preceptors, mentors, researchers, quality improvement coordinators, clinical specialists, case managers, regional educators, transport team coordinators/members, and/or parent advisors."

Measures for Continuing Quality Improvement

Continuous monitoring of measures/metrics is essential to improving, maintaining, and sustaining quality care for premature and sick babies in the NICU. Schouten et al. (13) published a standardized set of 21 core outcomes for neonates, developed through a consensus-driven process. Monitoring outcomes can enhance global neonatal care and facilitate more effective follow-up and comparison of physical, mental, and social functioning outcomes across various settings. Jaeger and Altimier (14) provide metrics for babies and parents engaged in close contact, specifically in NICU Couplet Care, to evaluate healthcare performance, FCC practices, and neuroprotective outcomes over time. Jaeger (15) discusses changing the perspective of nursing to engage in neuroprotective practices for the baby, parent(s), and family, supporting optimal outcomes and well-being.

"Continuous monitoring of measures/metrics is essential to improving, maintaining, and sustaining quality care for premature and sick babies in the NICU."

Conclusion:

In summary, CBE learner-based competencies have replaced program-focused objectives in the entry-level professional and advanced nursing curricula. Consequently, nursing standards and performance competencies are gradually being integrated/implemented in the clinical practice setting. Since nurses play a significant role in the care of premature and sick babies and their families in the intensive care unit, they must be critical thinkers who continuously learn, monitor evidence, and evaluate data.

"It is essential to provide high-quality care, which, if systematically and consistently applied within a healing environment and respectful culture, will yield an optimum outcome and well-being for the baby and family."

IFCDC is not new. It is a core element in the framework of neonatal care. Infant and family-centered developmental care is baby- and family-centered, integral to the biophysical, psychosocial, and neuroprotective care of the baby, and essential for the well-being of the family. It is not soft-skilled care. It is ***essential*** to provide high-quality care, which, if systematically and consistently applied within a healing environment and respectful culture, will yield an optimum outcome and well-being for the baby and family. After all, the natural environment for the baby is *WITH* the parents, so maintaining an intensive care environment that is comfortable, private, and quiet will reduce stress and anxiety for the baby, parents, and caregivers. The parents are team members and

primary caregivers for the baby, so learning competent IFCDC care with the team is necessary to enhance the culture of respect, trust, open communication, and a sense of belonging.

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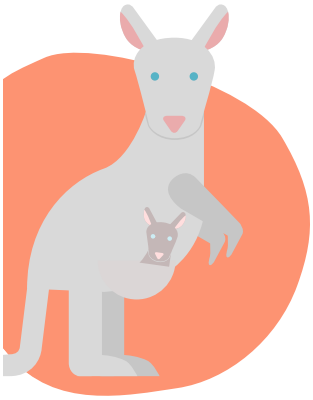
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with soap and water for 20+ seconds. Dry well.





PUT ON FRESH CLOTHES

change into a clean gown or shirt.

IF COVID-19 + WEAR A MASK

and ask others to hold your baby when you can't be there



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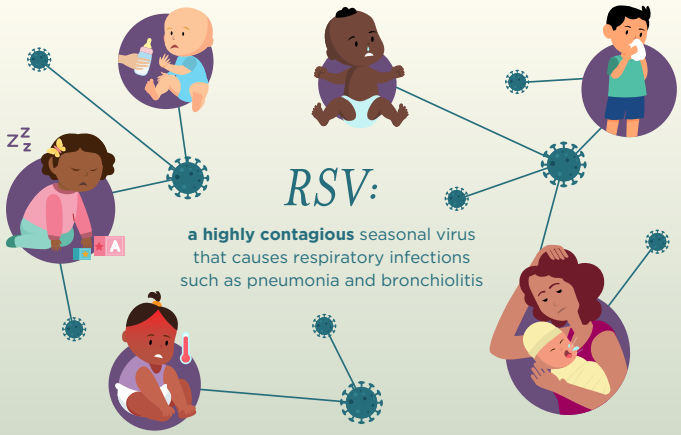
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Respiratory Syncytial Virus

DID YOU KNOW?



RSV:

a highly contagious seasonal virus that causes respiratory infections such as pneumonia and bronchiolitis

Infants under age 1

RSV is the **leading cause** of hospitalization

16x more likely to get RSV than the flu





Kids under age 5 experience

500,000 emergency room visits for RSV each year

57,000 hospitalizations for RSV each year

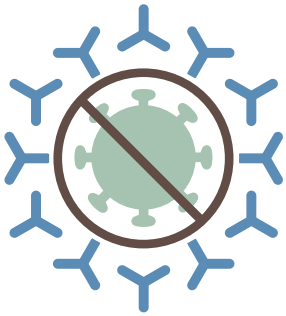
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What parents need to know this RSV and flu season

Like COVID-19, RSV (Respiratory Syncytial Virus) and flu affect the lungs and can cause serious breathing problems for children and babies. Talk to your family about the risks.

Certain diagnoses can make children and babies more vulnerable for serious complications from respiratory viruses - including prematurity, chronic lung disease, and heart conditions.

You can limit the spread of viruses by wearing a mask, washing your hands with soap & water, using an alcohol-based hand sanitizer, and getting vaccinated.

The fewer germs your baby is exposed to, the less likely they are to get sick. Let people know you need their help to stay well. Limit visitors. Avoid crowds. Stay away from sick people.

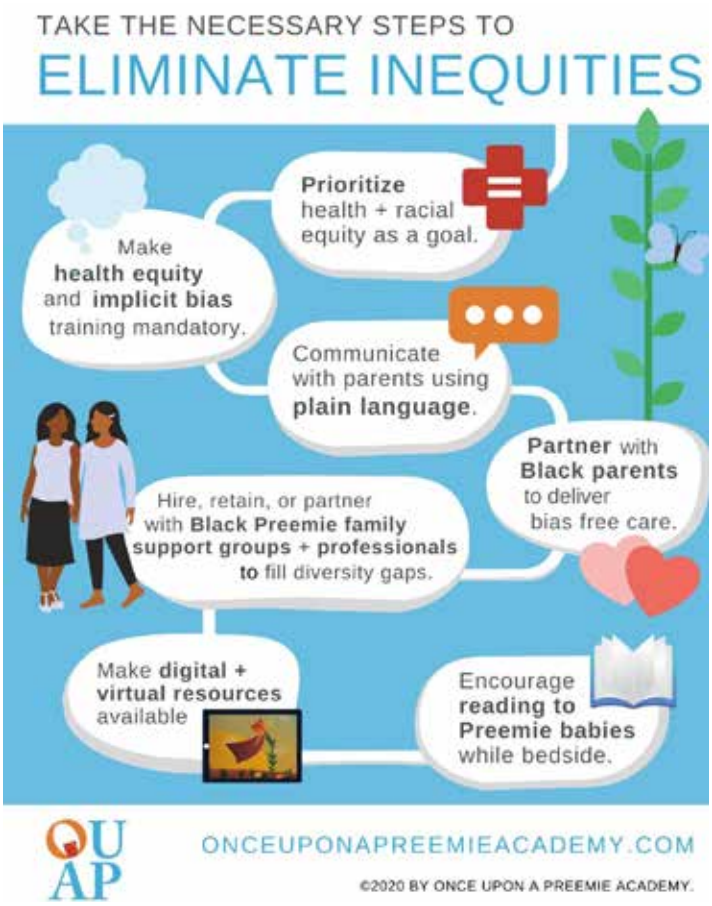
Immunizations save lives. Stay up-to-date with your family's flu vaccinations and COVID-19 boosters. This helps our community stay safe by stopping the spread of deadly viruses.

Babies older than 6 months can get a flu shot and COVID-19 vaccinations. There is no vaccine for RSV, but monthly antibody shots during RSV season can help protect them.

WE CAN HELP PROTECT EACH OTHER.

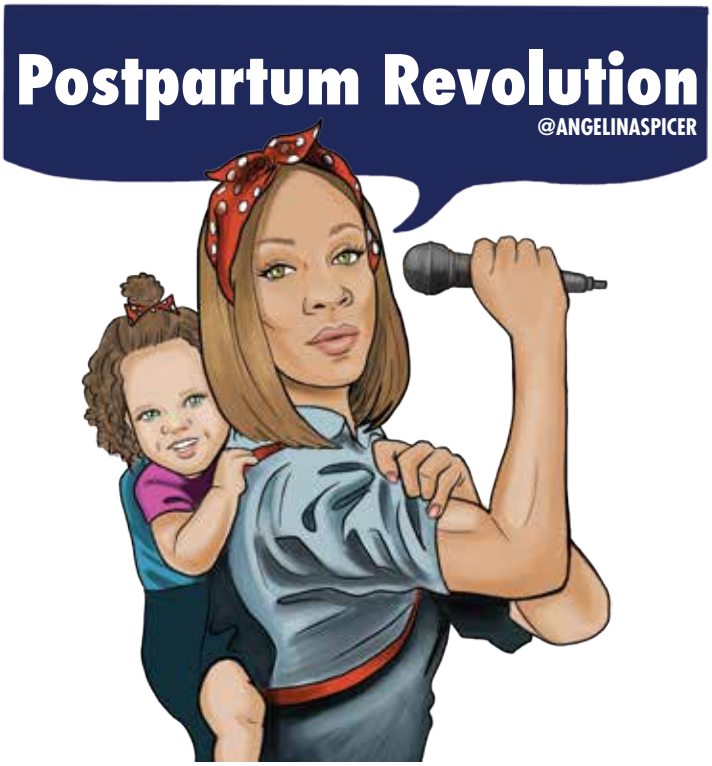
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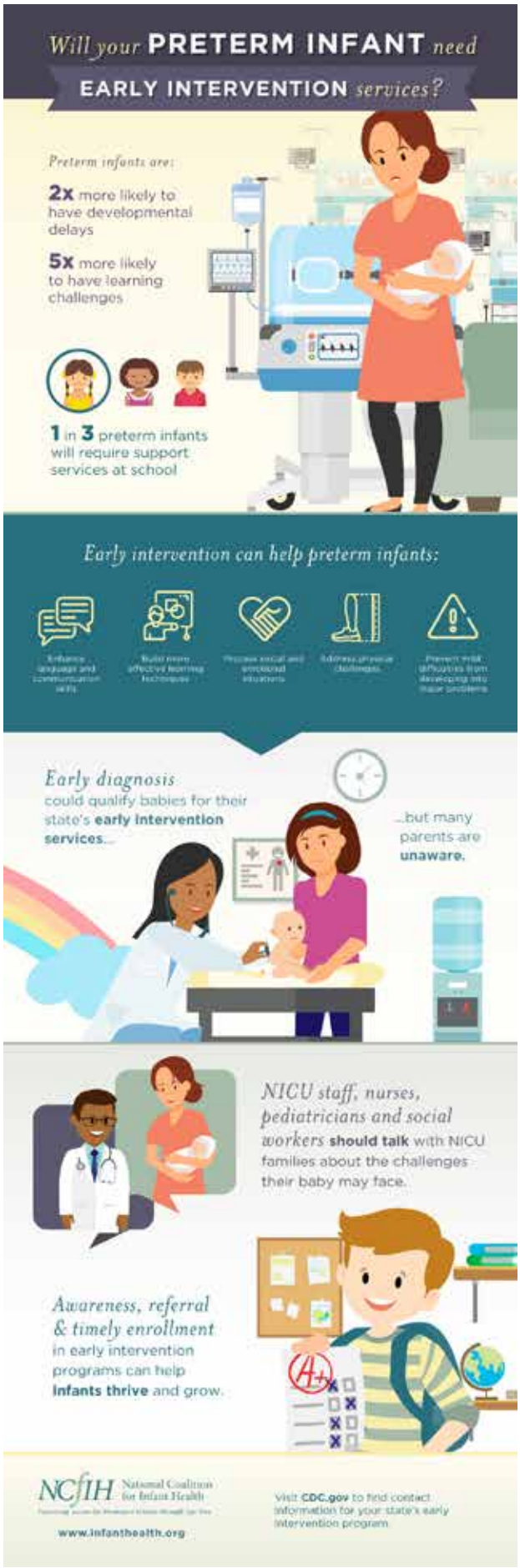
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As we indicated last month, we look forward to a number of new features as well.

1. An online submission portal: Submitting a manuscript online will be easier than before. Rather than submitting by email, we will have a devoted online submission portal that will have the ability to handle any size manuscript and any number of graphics and other support files. We will have an online tracking system that will make it easier to track manuscripts in terms of where they are in the review process.
2. Reviewers will be able to review the manuscript online. This portal will shorten the time from receipt of review to getting feedback to the submitting authors.
3. An archive search will be available for journals older than 2012.
4. A new section called news and views will enable the submission of commentary on publications from other journals or news sources. We anticipate that this will be available as soon as the site completes the beta phase
5. Sponsors will be able to sign up directly on the website and submit content for both the digital and PDF issues of Neonatology Today.

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DID YOU KNOW?

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HDFN can lead to:

- **Severe anemia**
- **Jaundice**
- Fetal or infant **death**

To reduce their baby's risk

pregnant mothers should talk to their health care provider to:

- **Identify** potential blood incompatibilities
- **Monitor** the baby
- **Treat** the condition if it occurs



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Which Infants are More Vulnerable to Respiratory Syncytial Virus?

RSV is a respiratory virus with cold-like symptoms that causes 90,000 hospitalizations and 4,500 deaths per year in children 5 and younger. It's 10 times more deadly than the flu. For premature babies with fragile immune systems and underdeveloped lungs, RSV proves especially dangerous.

But risk factors associated with RSV don't touch all infants equally.*

*Source: Respirator Syncytial Virus and African Americans

Caucasian Babies	Risk Factor	African American Babies
11.6%	Prematurity	18.3%
58.1%	Breastfeeding	50.2%
7.3%	Low Birth Weight	11.8%
60.1%	Siblings	71.6%
1%	Crowded Living Conditions	3%

AFRICAN AMERICAN BABIES bear the brunt of RSV. Yet the American Academy of Pediatrics' restrictive new guidlines limit their access to RSV preventative treatment, increasing these babies' risk.

AfPA Alliance for Patient Access

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FREE for our NICU COMMUNITY

- Helping Children and Families Cope
- Bonding with Your Baby
- Caregivers Need Care Too



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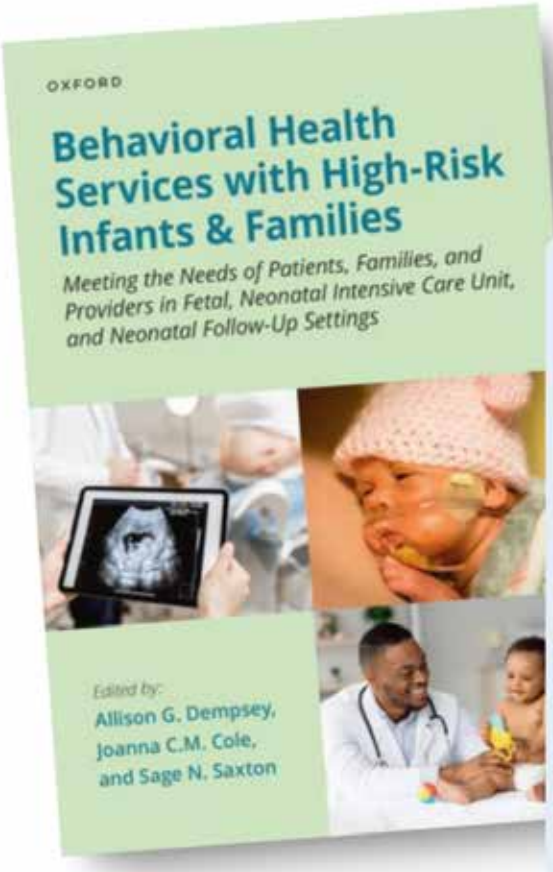
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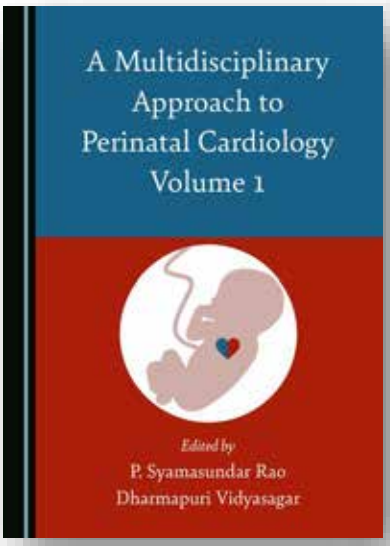
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A Multidisciplinary Approach to Perinatal Cardiology *Volume 1*

Edited by P. Syamasundar Rao and Dharmapuri Vidyasagar



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Book Description

Recent developments in diagnostic and therapeutic aspects of cardiac and neonatal issues have advanced the care of the newborn. To achieve excellence in cardiac care, however, close interaction and collaboration of the pediatric cardiologists with neonatologists, pediatricians, general/family practitioners (who care for children), anesthesiologists, cardiac surgeons, pediatric cardiac intensivists, and other subspecialty pediatricians is mandatory. This book provides the reader with up-to-date evidence-based information in three major areas of neonatology and prenatal and neonatal cardiology. First, it provides an overview of advances in the disciplines of neonatology, prenatal and neonatal cardiology, and neonatal cardiac surgery in making early diagnosis and offering treatment options. Secondly, it presents a multidisciplinary approach to managing infants with congenital heart defects. Finally, it provides evidence-based therapeutic approaches to successfully treat the fetus and the newborn with important neonatal issues and congenital cardiac lesions. This first volume specifically explores issues related to perinatal circulation, the fetus, ethics, changes in oxygen saturations at birth, and pulse oximetry screening, diagnosis, and management.

About the Editors

Dr P. Syamasundar Rao, MD, DCH, FAAP, FACC, FSCAI, is Professor of Pediatrics and Medicine and Emeritus Chief of Pediatric Cardiology at the University of Texas-Houston Medical School. He received his medical degree from Andhra Medical College, India, and subsequently received post-graduate training both in India and the USA before joining the faculty at the Medical College of Georgia, USA, in 1972. He has also served as Chairman of Pediatrics at King Faisal Specialist Hospital and Research Center, Saudi Arabia, and Professor and Director of the Division of Pediatric Cardiology at the University of Wisconsin and St. Louis University, USA. He has authored 400 papers, 16 books and 150 book chapters, and is a recipient of numerous honors and awards.

Dr Dharmapuri Vidyasagar, MD, MSc, FAAP, FCCM, PhD (Hon), is currently Professor Emeritus in Pediatrics at the University of Illinois, Chicago, where he served as Professor of Pediatrics for four decades. He is a graduate of Osmania Medical College, India. He has published over 250 papers and authored several books with a focus on prematurity, neonatal pulmonary diseases and neonatal ventilation. His goal is to reduce neonatal mortality in the USA and around the world, and he has received multiple awards and honors including the Ellis Island Award.

A Multidisciplinary Approach to Perinatal Cardiology Volume 1 is available now in Hardback from the Cambridge Scholars website, where you can also access a free 30-page sample.

My NICU Network
My Perinatal Network

National Perinatal Association + NICU Parent Network

Online L&D Staff Education Program

Caring for Pregnant Patients & Their Families:

Providing Psychosocial Support During Pregnancy, Labor and Delivery

WWW.MYPERINATALNETWORK.ORG



Continuing education credits provided by

pac-lac

About the Program

- **WHO SHOULD TAKE THE PROGRAM?** This program is designed for both office and hospital staff in all disciplines that interact with pregnant patients and their families. A key focus is recognizing risk factors for perinatal mood and anxiety disorders, and mitigating their impact through provision of trauma-informed care.

- **WHY TAKE THE PROGRAM?** Families will benefit when staff have improved skills, through enhanced parental resilience and better mental health, and improved parent-baby bonding leading to better developmental outcomes for babies. Benefits to staff include improved skills in communicating with patients; improved teamwork, engagement and staff morale; reduced burnout, and reduced staff turnover.

- **HOW DOES THE PROGRAM ACHIEVE ITS GOALS?** Program content is representative of best practices, engaging and story-driven, resource-rich, and developed by a unique interprofessional collaboration of obstetric and neonatal professionals and patients. The program presents practical tips and an abundance of clinical information that together provide solutions to the emotional needs of expectant and new parents.

- **HOW WAS THE PROGRAM DEVELOPED?** This program was developed through collaboration among three organizations: a multidisciplinary group of professionals from the National Perinatal Association and Patient + Family Care, and parents from the NICU Parent Network. The six courses represent the different stages of pregnancy (antepartum, intrapartum, postpartum), as well as perinatal mood and anxiety disorders, communication techniques, and staff support.

Program Objectives

- Describe principles of trauma-informed care as standards underlying all communication during provision of maternity care in both inpatient and outpatient settings.
- Identify risk factors, signs, and symptoms of perinatal mood and anxiety disorders; describe treatment options.
- Define ways to support pregnant patients with high-risk conditions during the antepartum period.
- Describe obstetric violence, including ways that providers may contribute to a patient's experience of maternity care as being traumatic; equally describe ways providers can mitigate obstetric trauma.
- Describe the importance of providing psychosocial support to women and their families in times of pregnancy loss and fetal and infant death.
- Define the Fourth Trimester, and identify the key areas for providing psychosocial support to women during the postpartum period.
- Identify signs and symptoms of burnout as well as their ill effects, and describe both individual and systemic methods for reducing burnout in maternity care staff.

Continuing education credits will be provided for physicians, clinic and bedside nurses, social workers, psychologists, and licensed marriage and family therapists. CEUs will be provided by Perinatal Advisory Council: Leadership, Advocacy, and Consultation.

PROGRAM CONTENT



COMMUNICATION SKILLS CEUs offered: 1

Learn principles of trauma-informed care, use of universal precautions, how to support LGBTQ patients, obtaining informed consent, engaging in joint decision-making, delivering bad news, dealing with challenging patients.

Faculty: Amina White, MD, MA, Clinical Associate Professor, Department of OB/Gyn, University of North Carolina, Chapel Hill, NC; Sue Hall, MD, MSW, FAAP, St. John's Regional Medical Center, Oxnard, CA; Karen Saxer, CNM, MSN, University of North Carolina Maternal-Fetal Medicine, UNC Women's Hospital, Chapel Hill, NC; Tracy Pella, Co-Founder & President, Connected Forever, Tecumseh, NE.



PERINATAL MOOD AND ANXIETY DISORDERS CEUs offered: 1

Identify risk factors for and differential diagnosis of PMADs (perinatal mood and anxiety disorders), particularly perinatal depression and/or anxiety and posttraumatic stress syndrome. Learn the adverse effects of maternal depression on infant and child development, and the importance of screening for and treating PMADs.

Faculty: Linda Baker, PsyD, psychologist at Unstuck Therapy, LLC, Denver, CO; Sue Hall, MD, MSW, FAAP, neonatologist at St. John's Regional Medical Center, Oxnard, CA; Angela Davids, Founder of Keep 'Em Cookin', Baltimore, MD; Brittany Boet, Founder of Bryce's NICU Project, San Antonio, TX.



PROVIDING ANTEPARTUM SUPPORT CEUs offered: 1

Identify psychosocial challenges facing high risk OB patients, and define how to provide support for them, whether they are inpatient or outpatient. Recognize when palliative care is a reasonable option to present to pregnant patients and their families.

Faculty: Amina White, MD, MA, Clinical Associate Professor, Department of OB/Gyn, University of North Carolina, Chapel Hill, NC; Sue Hall, MD, MSW, FAAP, neonatologist at St. John's Regional Medical Center, Oxnard, CA; Angela Davids, Founder of Keep 'Em Cookin', Baltimore, MD; Erin Thatcher, BA, Founder and Executive Director of The PPROM Foundation, Denver, CO.



PROVIDING INTRAPARTUM SUPPORT CEUs offered: 1

Describe how to manage patient expectations for labor and delivery including pain management; identify examples of obstetric violence, including identification of provider factors that may increase patients' experience of trauma; learn how to mitigate patients' trauma, and how to provide support during the process of labor and delivery.

Faculty: Sara Detlefs, MD, Fellow in Maternal-Fetal Medicine, Baylor College of Medicine, Houston, TX; Jerry Ballas, MD, MPH, Associate Clinical Professor, UCSD Health System, Maternal-Fetal Medicine, Department of Obstetrics, Gynecology and Reproductive Sciences, University of California at San Diego, San Diego, CA; MaryLou Martin, MSN, RNC-NIC, CKC, Women's and Children's Services Nurse Educator, McLeod Regional Medical Center, McLeod, SC; Claire Hartman, RN, IBCLC, Labor & Delivery, University of North Carolina Hospital, Chapel Hill, NC; Crystal Duffy, Author of Twin To Twin (from High Risk Pregnancy to Happy Family), and NICU Parent Advisor, Houston, TX; Erin Thatcher, Founder and Executive Director of The PPROM Foundation, Denver, CO.



PROVIDING POSTPARTUM SUPPORT CEUs offered: 1

Define the 4th Trimester and the importance of follow-up especially for high risk and minority patients, learn to recognize risk factors for traumatic birth experience and how to discuss patients' experiences postpartum; describe the application of trauma-informed care during this period, including support for patients who are breastfeeding and those whose babies don't get to go home with them.

Faculty: Amanda Brown, CNM, University of North Carolina Hospital, Chapel Hill, NC; ; Sue Hall, MD, MSW, FAAP, neonatologist at St. John's Regional Medical Center, Oxnard, CA; Crystal Duffy, Author of Twin To Twin (from High Risk Pregnancy to Happy Family), and NICU Parent Advisor, Houston, TX.



SUPPORTING STAFF AS THEY SUPPORT FAMILIES CEUs offered: 1

Define burnout and compassion fatigue; identify the risks of secondary traumatic stress syndrome to obstetric staff; describe adverse impacts of bullying among staff; identify the importance of both work-life balance and staff support.

Faculty: Cheryl Milford, EdS, Consulting NICU and Developmental Psychologist, Director of Development, National Perinatal Association, Huntington Beach, CA; Sue Hall, MD, MSW, FAAP, neonatologist at St. John's Regional Medical Center, Oxnard, CA; Erin Thatcher, BA, Founder and Executive Director, The PPROM Foundation, Denver, CO

Cost

- RNs: $10/CEU; $60 for the full program
- Physicians, licensed clinical social workers (LCSWs), licensed marriage and family therapists (LMFTs): $35/CEU; $210 for the full program
- Although PACLAC cannot award CEs for certified nurse midwives, they can submit certificates to their own professional organization to request credit. $35/CEU; $210 for the full program

Contact help@myperinatalnetwork.org to learn more.

Faculty

Linda Baker, PsyD
Psychologist at Unstuck Therapy, LLC, Denver, CO.

Jerasimos (Jerry) Ballas, MD, MPH
Associate Clinical Professor, UCSD Health System, Maternal-Fetal Medicine, Department of Obstetrics, Gynecology and Reproductive Sciences, University of California at San Diego, San Diego, CA.

Amanda Brown, CNM, MSN, MPH
University of North Carolina-Chapel Hill Hospitals, Chapel Hill, NC.

Sara Detlefs, MD
Fellow in Maternal-Fetal Medicine, Baylor College of Medicine, Houston, TX.

Sue L. Hall, MD, MSW, FAAP
Neonatologist, Ventura, CA.

Claire Hartman, RN, IBCLC
Labor & Delivery, University of North Carolina Hospital, Chapel Hill, NC.

MaryLou Martin, MSN, RNC-NIC, CKC
Women's and Children's Services Nurse Educator, McLeod Regional Medical Center, McLeod, SC.

Cheryl Milford, EdS.
Former NICU and Developmental psychologist, in memoriam.

Karen Saxer, CNM, MSN
University of North Carolina Maternal-Fetal Medicine, UNC Women's Hospital, Chapel Hill, NC.

Amina White, MD, MA
Clinical Associate Professor, Department of Obstetrics and Gynecology, University of North Carolina, Chapel Hill, NC.

Parent/Patient Contributers:

Brittany Boet
Founder, Bryce's NICU Project, San Antonio, TX.

Angela Davids
Founder, Keep 'Em Cookin', Baltimore, MD.

Crystal Duffy
Author of Twin To Twin (from High Risk Pregnancy to Happy Family), and NICU Parent Advisor, Houston, TX.

Tracy Pella, MA
Co-Founder and President, Connected Forever, Tecumseh, NE.

Erin Thatcher, BA
Founder and Executive Director, The PPROM Foundation, Denver, CO.

CANCELLATIONS AND REFUNDS

- For Individual Subscribers:
  - If you elect to take only one course, there will be no cancellations or refunds after you have started the course.
  - If you elect to take more than one course and pay in advance, there will be no cancellations or refunds after payment has been made unless a written request is sent to help@myperinatalnetwork.com and individually approved.
- For Institutional Subscribers:
  - After we are in possession of a signed contract by an authorized agent of the hospital and the program fees have been paid, a 50% refund of the amount paid will be given if we are in receipt of a written request to cancel at least 14 (fourteen) days prior to the scheduled start date for your hospital's online program.
  - Refunds will not be given for staff members who neglect to start the program. Also, no refunds for those who start the program, but do not complete all 6 courses within the time frame allotted.

For Physicians: This activity has been planned and implemented in accordance with the Institute for Medical Quality and the California Medical Association's CME Accreditation Standards (IMQ/CMA) through the Joint Providership of the Perinatal Advisory Council: Leadership, Advocacy and Consultation (PAC/LAC) and the National Perinatal Association. PAC/LAC is accredited by the Institute for Medical Quality/California Medical Association (IMQ/CMA) to provide continuing education for physicians. PAC/LAC takes responsibility for the content, quality and scientific integrity of this CME activity. PAC/LAC designates this activity for a maximum of 6 *AMA PRA Category 1 Credit(s)TM*. Physicians should only claim credit commensurate with the extent of their participation in the activity. This credit may also be applied to the *CMA Certification in Continuing Medical Education*.

For Nurses: The Perinatal Advisory Council: Leadership, Advocacy and Consultation (PAC/LAC) is an approved provider by the California Board of Registered Nursing Provider CEP 5862. When taken as a whole, this program is approved for 7 contact hours of continuing education credit.

For CAMFT: Perinatal Advisory Council: Leadership, Advocacy, and Consultation (PAC/LAC) is approved by the California Association of Marriage and Family Therapists to sponsor continuing education for LMFTs and LCSWs. CE Provider #128542. PAC/LAC maintains responsibility for the program and its content. Program meets the qualifications for 6 hours of continuing education credit for LMFTs and LCSWs as required by the California Board of Behavioral Sciences. You can reach us at help@myperinatalnetwork.org.

SHARED DECISION-MAKING PROTECTS MOTHERS + INFANTS DURING COVID-19

KEEPING MOTHERS + INFANTS TOGETHER

Means balancing the risks of...

- **HORIZONTAL INFECTION**
- **SEPARATION AND TRAUMA**





EVIDENCE

We encourage families and clinicians to remain diligent in learning **up-to-date evidence**.

PARTNERSHIP

What is the best for this unique dyad?

SHARED DECISION-MAKING

- **S** EEK PARTICIPATION
- **H** ELP EXPLORE OPTIONS
- **A** SSESS PREFERENCES
- **R** EACH A DECISION
- **E** VALUATE THE DECISION





TRAUMA-INFORMED

Both parents and providers are confronting significant...

- **FEAR**
- **GRIEF**
- **UNCERTAINTY**

LONGITUDINAL DATA

We need to understand more about outcomes for mothers and infants exposed to COVID-19, with special attention to:

- **MENTAL HEALTH**
- **POSTPARTUM CARE DELIVERY**



NEW DATA EMERGE DAILY. NANN AND NPA ENCOURAGE PERINATAL CARE PROVIDERS TO ENGAGE IN CANDID CONVERSATIONS WITH PREGNANT PARENTS PRIOR TO DELIVERY REGARDING RISKS, BENEFITS, LIMITATIONS, AND REALISTIC EXPECTATIONS.

Partnering for patient-centered care when it matters most.

nann.org nationalperinatal.org

National Association of Neonatal Nurses

National Perinatal Association

FREE ONLINE EDUCATION

Coping with COVID-19





A viral pandemic

A racial pandemic within a viral pandemic









Will mental illness be the next inevitable pandemic?

WWW.MYNICUNETWORK.ORG

and

National Perinatal Association
NICU Parent Network

My Perinatal Network and My NICU Network
are products of a collaboration between NPA and NPN.
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Alliance for Patient Access: CDC Budget Cuts Could Roll Back Progress on Maternal Health

Josie Cooper

The Alliance for Patient Access (allianceforpatientaccess.org), founded in 2006, is a national network of physicians dedicated to ensuring patient access to approved therapies and appropriate clinical care. AfPA accomplishes this mission by recruiting, training and mobilizing policy-minded physicians to be effective advocates for patient access. AfPA is organized as a non-profit 501(c)(4) corporation and headed by an independent board of directors. Its physician leadership is supported by policy advocacy management and public affairs consultants. In 2012, AfPA established the Institute for Patient Access (IfPA), a related 501(c)(3) non-profit corporation. In keeping with its mission to promote a better understanding of the benefits of the physician-patient relationship in the provision of quality healthcare, IfPA sponsors policy research and educational programming.

AfPA | Alliance for Patient Access

IfPA | Institute for Patient Access

"Proposed federal budget cuts now threaten two of the nation's most important maternal health programs (1): the CDC's Safe Motherhood and Infant Health program and the Pregnancy Risk Assessment Monitoring System (PRAM). These programs collect essential data (2) that shape maternal health standards and services nationwide. "

Proposed federal budget cuts now threaten two of the nation's most important maternal health programs (1): the CDC's Safe Motherhood and Infant Health program and the Pregnancy Risk Assessment Monitoring System (PRAM). These programs collect essential data (2) that shape maternal health standards and services nationwide. Without them (3), identifying risks and responding to crises would become more challenging, and recent progress on maternal mortality rates could be reversed.

"CDC data show that maternal mortality declined overall from 2021 to 2023. However, that trend did not hold for everyone. Black mothers still face mortality rates more than three times higher than white mothers. Even education and income offer little protection; a Black woman with a college degree is still more likely to die from childbirth complications than a white woman with only a high school education."

Health Disparities in Maternal Health:

CDC data show that maternal mortality declined overall from 2021 to 2023. However, that trend did not hold for everyone. Black mothers still face mortality rates more than three times higher than white mothers. Even education and income offer little protection; a Black woman with a college degree is still more likely to die from childbirth complications than a white woman with only a high school education.

Rural women and Alaskan natives also face statistically significant challenges in accessing care. (4) Understanding and addressing these inequities demands targeted solutions, not program cutbacks.

Funding Debate Still Unfolding:

The President's Fiscal Year 2026 budget proposal suggests eliminating funding for the Safe Motherhood program. However, Secretary of Health and Human Services Robert F. Kennedy Jr. acknowledged the importance of the program during a House Energy and Commerce Committee hearing, signaling a willingness to restore it, and noted the disproportionate impact on Black communities.

"We need to protect our moms, we need to protect our kids, and we need to do a lot better," Secretary Kennedy said, in response to Congressional leaders' concern that the cut was a mistake. (5)

Bipartisan efforts are underway to ensure the program's funding continues.

Without Data, Progress Stalls:

The value of the Safe Motherhood program and PRAMS goes far beyond simple data collection. Together, they create an information infrastructure to help experts understand why women die from

pregnancy-related causes and what can be done to prevent it.

"By supporting smarter public health investments, including preventative services, the program has begun to reduce the number of maternal deaths, but experts say a large percentage of remaining deaths are also preventable. Without steady funding, fragile gains could be lost. As budgets and agencies shift, maternal health monitoring must remain a national priority."

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2. https://www.healthaffairs.org/content/forefront/public-data-disappear-we-lose-and-why-matters
3. https://www.washingtonpost.com/health/2025/04/19/cdc-cuts-maternal-mortality-fertility/
4. https://www.yahoo.com/news/researchers-moms-babies-going-hurt-010000088.html
5. https://www.dailymotion.com/video/x9magkc

Disclosure: Josie Cooper is the Executive Director of the Alliance for Patient Access. This article was also published at healthpolicytoday.org.

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Immunizing Yourself Against **COVID-19**

COVID-19 vaccines have been shown to:

- Lessen the severity of symptoms[1]
- Reduce disease transmission[3]
- Reduce risk of mortality[2]
- Make communities healthier and safer[4]

Understanding the Options

COVID-19 vaccines are available for children, adolescents and adults. There are 3 types to choose from.

mRNA VACCINES

New to market, but research has been ongoing since the 1990s.

HOW THEY WORK: **Instruct cells to make COVID-like proteins that trigger the immune system to fight the virus.**

PROTEIN SUBUNIT VACCINES

Used for three decades against the flu, whooping cough and hepatitis B.

Deliver harmless versions of the COVID protein that train the immune system to fight the virus.

VECTOR VACCINES

Used for decades against chickenpox, malaria and tuberculosis.

Use a modified virus, such as a common cold, to teach the body to fight off COVID.

COVID vaccines are recommended for everyone ages 6 months and older, and boosters for everyone ages 5 years and older, if eligible.[5]

Safe and Sound

COVID vaccines have been:

- **Thoroughly tested** through multi-phase trials with tens of thousands of participants[6]
- **Proven safe and effective** for adults as well as children[7]
- **Vetted and approved** by the US FDA and EMA and endorsed by the WHO[8-10]

Get Your Jab

Vaccines are available at your:

- **Doctor's office**
- **Neighborhood pharmacy**
- **Community health center**



Talk to your **health care provider** or **pharmacist** about which vaccine is right for you.

1. https://www.mayoclinic.org/diseases-conditions/coronavirus/symptoms-causes/syc-20479963
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GAfPA Global Alliance for Patient Access

NCPA NATIONAL COMMUNITY PHARMACISTS ASSOCIATION

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www.CongenitalCardiologyToday.com

Still a **Preemie?**

Some preemies are born months early, at extremely low birthweights. They fight for each breath and face nearly insurmountable health obstacles.

But that's not every preemie's story.

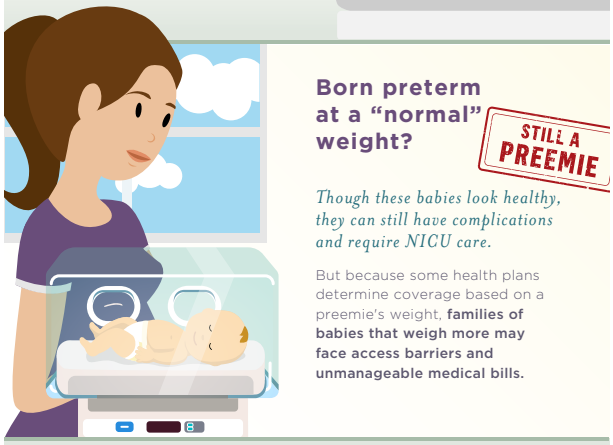
Born between 34 and 36 weeks' gestation?

STILL A PREEMIE

Just like preemies born much earlier, these "late preterm" infants can face:

Jaundice | Feeding issues | Respiratory problems

And their parents, like all parents of preemies, are at **risk for postpartum depression and PTSD.**



Born preterm at a "normal" weight?

STILL A PREEMIE

Though these babies look healthy, they can still have complications and require NICU care.

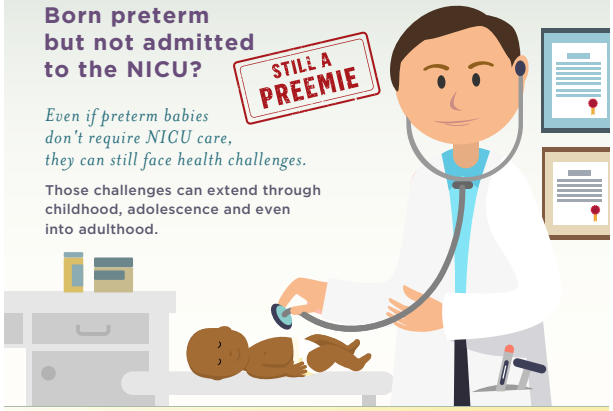
But because some health plans determine coverage based on a preemie's weight, **families of babies that weigh more may face access barriers and unmanageable medical bills.**

Born preterm but not admitted to the NICU?

STILL A PREEMIE

Even if preterm babies don't require NICU care, they can still face health challenges.

Those challenges can extend through childhood, adolescence and even into adulthood.



Some Preemies

- Will spend weeks in the hospital
- Will have lifelong health problems
- Are disadvantaged from birth

All Preemies

- Face health risks
- Deserve appropriate health coverage
- Need access to proper health care

NCfIH National Coalition for Infant Health

Protecting Access for Premature Infants through Age Two

www.infanthealth.org

The Gap Baby: An RSV Story



A collaborative of professional, clinical, community health, and family support organizations improving the lives of premature infants and their families through education and advocacy.



The National Coalition for Infant Health advocates for:

- **Access to an exclusive human milk diet** for premature infants
- **Increased emotional support resources** for parents and caregivers suffering from PTSD/PPD
- **Access to RSV preventive treatment** for all premature infants as indicated on the FDA label
- **Clear, science-based nutrition guidelines** for pregnant and breastfeeding mothers
- **Safe, accurate medical devices** and products designed for the special needs of NICU patients

www.infanthealth.org

iCAN August Newsletter: Soaring into Summer with iCAN Youth! Our Youth Members are Taking Flight Towards the 2025 iCAN Summit

Abby Clark

Get involved today and Join the iCAN Parent Council!

"iCAN, the International Children's Advisory Network, is the premier global pediatric platform working to empower the patient voice in healthcare, driven by youth for youth. As a worldwide network of 40+ KIDS (Kids Impacting Disease through Science) advisory groups that spans four continents (as well as virtually), iCAN's dedicated youth member groups work in unison to provide a voice for children and families in medicine, research, science, and innovation."

iCAN, the International Children's Advisory Network, is the premier global pediatric platform working to empower the patient voice in healthcare, driven by youth for youth. As a worldwide network of 40+ KIDS (Kids Impacting Disease through Science) advisory groups that spans four continents (as well as virtually), iCAN's dedicated youth member groups work in unison to provide a voice for children and families in medicine, research, science, and innovation. To foster greater global understanding about the importance of the pediatric patient and caregiver voice in healthcare, clinical trials, and research, iCAN's young people continue to drive incredible change in the global health landscape.

"On average, our youth are between the ages of eight and eighteen years old, most of whom are living with chronic, rare, and complicated diagnoses; although, not all of iCAN's youth members have a medical diagnosis or medical condition. iCAN celebrates the understanding that all patients, even the youngest, have valuable insights into improving the healthcare experience."

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All children, regardless of their location, are welcome to participate in iCAN's programming. iCAN also supports young adults, as well as the voices of parents and siblings. We continue to be an ecosystem of schools, children's hospitals, academia, and other like-minded non-profits.

"Our mission is to ensure that youth are placed in positions where their voices are heard and make a difference in pediatric healthcare through interactions with industry professionals, presenting original research at conferences, innovating new solutions, and sharing their stories."

Our mission is to ensure that youth are placed in positions where their voices are heard and make a difference in pediatric healthcare through interactions with industry professionals, presenting original research at conferences, innovating new solutions, and sharing their stories. iCAN continues to empower the pediatric patient voice through community partnerships with organizations such as the FDA, the Everylife Foundation for Rare Diseases, the PFMD, MRCT, iSPI, and the AAP.

Whether you are a patient, family member, friend, healthcare

professional, or simply an individual looking to make a difference, you are welcome to visit our website at www.icanresearch.org to learn more about our mission, programs, and initiatives. Join us today in ensuring that every child's voice is enshrined in the effort to improve healthcare for all pediatric patients.



iCAN KIDS Spotlight:

Inaaya and *Sickening (Not Just Medically)* podcast

This August, iCAN is proud to highlight a youth member who has gone above and beyond to share her peers' stories and triumphs. Inaaya (KIDS Illinois) is the creator and host of the "Sickening (Not Just Medically)" Podcast, where she emphasizes the teenage perspective on illness, disability, and hospitalization.

Each episode brings together incredible stories from the young adult perspective on aspects of their medical journeys. Inaaya and her guests touch on topics ranging from how a diagnosis inspired one guest to develop a new desire to live life to the fullest at every moment to how another guest's treatment affects their school life, and all the moments in between.

There are currently five incredible episodes available on YouTube as well as Spotify - we cannot emphasize how impressed we are with Inaaya's community. Make sure to check out the episodes and hear firsthand from youth on how community, diagnosis, and empowerment affect their lives and encourage them for the future.

Link to Podcast: https://www.instagram.com/sickening.podcast/

Reflecting on the Event of the Summer: iCAN Youth Members and Parents Share Their Takeaways from the 2025 iCAN Summit

Click Here to Watch this month's Ask the Experts episode!

On August 16, we welcomed seven standout individuals from iCAN chapters around the world to share the learnings they gained from the iCAN Summit and what attending the Summit meant to them. Leo (KIDS Walter Payton), Phyllis (PTN and KIDS Research), Eleri (KIDS Moorfields Eye), Victoria (KIDS Connecticut), Inaaya (KIDS Illinois), and Anvita and Gauri (KIDS CHOC), generously donated a portion of their Saturdays to give personal anecdotes, muse on the iCAN 2025 Summit's most significant moments, and emphasize the importance of pediatric empowerment.

During their discussion, Anvita touched on her pick for the most inspiring moment of the Summit. She shared that it was the act of being able to speak directly with sponsors and healthcare representatives on a level playing field that empowered her the most. "It was empowering to know that my thoughts, ideas, and lived experiences were valued and could influence how these organizations approach pediatric care. That kind of direct engagement made me feel like my voice had a real impact."

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All of the speakers emphasized the incredible impact being together in the room with each other had on the depth of conversations and the extent to which they shared connections. The beauty of the



Summit is that it creates a space where barriers are broken down, leaving human connection and a willingness to learn from one another in their place. Leo emphasized the importance of that connection, "...that support helps break down any barriers so that kids like me can share our ideas and experiences, no matter our background or where we come from."

Thank you to all of our incredible speakers for sharing their unique perspectives on the 2025 iCAN Summit. Your experiences demonstrate that when children are empowered to raise their voices and share their insights, pediatric healthcare becomes that much more patient-centered.

Stay tuned for more updates and chances to connect with experts! Next month's session will take place on September 29 at 10 am EST with special guest, Dr. Charles Posternack (CEO of Avulux).

Want to be part of our next *Ask the Experts* Session? Please reach out to sabina@icanresearch.org.

Looking Ahead: How Youth are Transforming the World of Healthcare Advocacy this Summer and Beyond

- **Ask the Experts**

  - Ask the Experts is a monthly webinar series hosted by iCAN to connect our young people to changemakers and experts in health. By engaging directly with these healthcare transformers, our youth can learn about topics they are interested in, explore careers, and discover additional ways to engage in the broad world of healthcare.

  - Mark your calendars- iCAN invites you to another installment of Ask the Experts on September 20 with special guest, Dr. Charles Posternack (CEO of Avulux), with over 30 years of experience in healthcare. Dr. Posternack turned personal challenges into groundbreaking solutions for migraine and light sensitivity.

    - Register:

      https://www.icanresearch.org/event-details/ican-ask-the-experts-september-2025

  - Want to be part of our next *Ask the Experts* Session? Please reach out to sabina@icanresearch.org.

- **iCAN Youth Speaking at FDA Townhall**

  - Three iCAN youth members and iCAN President Leanne West will share their insights with the FDA and the wider healthcare network on September 15.

  - Tune in to hear their expert thoughts and stories - Implementation of the Best Pharmaceuticals for Children Act and Pediatric Research Equity Act: Monday September 15, 2025, from 9 am to 4:30 pm ET.

- **iCAN Shine: iCAN's first virtual talent show fundraiser**

  - Get ready to showcase your skills for a cause! iCAN is excited to announce our upcoming Virtual Talent Show Fundraiser, iCAN Shine: Global Talent Showcase, where kids from around the globe can share their unique talents while helping raise funds to support our 2026 Summit.

  - Whether you sing, dance, juggle, play an instrument, perform magic tricks, tell jokes, or have another hidden talent, this is your chance to shine on a worldwide stage, right from your own home!

  - We will be selling tickets to this amazing showcase. More information to come! (Adults and Youth Members are both welcome to submit a talent.) Event Webpage: https://www.icanresearch.org/ican-shine-2025



"Our annual Summit serves as a transformative platform for innovation, compassion, and collaboration in pediatric healthcare. The shifting landscape in the current healthcare industry has made an in-person Summit for 2026 uncertain. The lasting impact of this annual event on the youth who attend, the iCAN Network, and the broader healthcare community as a whole cannot be measured."

The 2026 iCAN Summit

Our annual Summit serves as a transformative platform for innovation, compassion, and collaboration in pediatric healthcare. The shifting landscape in the current healthcare industry has made an in-person Summit for 2026 uncertain. The lasting impact of this annual event on the youth who attend, the iCAN Network, and the broader healthcare community as a whole cannot be measured. Together, we continue to make a tangible and meaningful impact on pediatric healthcare. By giving every child a seat at the table through discussion and co-creation, both current and future pediatric patients are empowered and transformed. We invite you to be part of this life-changing event by contributing in three meaningful ways:

1. Sponsor the 2026 Summit: Your sponsorship will play a vital role in ensuring a transformative experience for all attendees.

2. Sponsor a Child to Attend: Your sponsorship directly impacts a child's life by granting them the opportunity to attend the Summit in Canada. Your support will cover travel, accommodation, and participation, offering them a world of learning and empowerment.

Together, we are shaping a brighter future for pediatric healthcare. Your contribution—big or small—makes a significant difference in prioritizing the patient voice and driving positive change. Your generosity and dedication are deeply valued. Let us unite in Canada to create a summit experience that empowers the pediatric community for years to come.

3. Contribute to the GoFundMe for the iCAN 2026 Summit: We want our next Summit to be in person—and we can only do that with your support! Our goal is to raise $200,000 by December 1, 2025. Please share or donate to our GoFundMe:

   - https://gofund.me/525439b3
   - www.icanresearch.org

Let us work together to make our 2026 Summit even bigger by bringing more kids to share their voices! To contribute to the funding for next year's Summit, please click here to sponsor or make a donation.



Disclosures: *There are no reported disclosures*

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NEONATOLOGY TODAY is interested in publishing manuscripts from Neonatologists, Fellows, NNPs and those involved in caring for neonates on case studies, research results, hospital news, meeting announcements, and other pertinent topics.

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Navigating toward Neonatology: Interview with Dr. Gilbert Martin

Benjamin Hopkins, DO, Gilbert Martin, MD

"Welcome back to another installment. My name is Benjamin Hopkins, and I am currently a post-grad year one pediatric resident at the University of California, San Francisco—Fresno. 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 a post-graduate year two pediatric resident at the University of California, San Francisco—Fresno. "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.

I have just completed an away rotation at Benioff Children's Hospital Oakland, where I worked with many residents from various programs around California. I have been fortunate to work with exceptional physicians from many specialties who encourage and educate residents while simultaneously providing evidence-based care for our pediatric patients.

I had the privilege of speaking with Dr. Gilbert Martin, a neonatologist, researcher, and professor. We discussed his journey into Neonatology, what makes an excellent neonatologist, how to get medical students and residents interested in Neonatology, and what he is currently working on.

"I had the privilege of speaking with Dr. Gilbert Martin, a neonatologist, researcher, and professor. We discussed his journey into Neonatology, what makes an excellent neonatologist, how to get medical students and residents interested in Neonatology, and what he is currently working on."

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

It's having an interest in newborn medicine, and when I talk about interest in newborn medicine, it also encompasses maternal-fetal medicine and pregnancy. The scope of the entire specialty of Neonatology is not solely taking care of the newborn but also caring for the mother and the rest of the family. Your patient is often one who was delivered too early, where they should still be going through the pregnancy process and developing internally, but now we're getting to manage that outside of the womb. It's important to remember that it's not just the baby we're treating but the mom and the rest of their family.

"It's having an interest in newborn medicine, and when I talk about interest in newborn medicine, it also encompasses maternal-fetal medicine and pregnancy. The scope of the entire specialty of Neonatology is not solely taking care of the newborn but also caring for the mother and the rest of the family."

2. What caused you to pursue a career in Neonatology?

When I started, there was no neonatology; there was pediatrics, and people interested in newborn medicine. Neonatology was a term that Dr. Alexander Shaeffer coined, and it breaks down into "neo," meaning "new" or newborn, and "ology," meaning "study" or care. The care of the neonate and newborn has become more important over time. It was developed based on the interests of the country in newborn medicine. The criteria back then were a one-year fellowship, then a two-year fellowship, and then a three-year fellowship, broken up into research and clinical time. It is still a changing playing field that is ministered by the American Academy of Pediatrics' Neonatal Section, which changes very often, as does the criteria for intensive care. The thing that hasn't changed is the ability for people who are interested in Neonatology to continue to pursue it.

"It is still a changing playing field that is ministered by the American Academy of Pediatrics' Neonatal Section, which changes very often, as does the criteria for intensive care. The thing that hasn't changed is the ability for people who are interested in Neonatology to continue to pursue it."

I think about what morbidity and mortality have been over the years, and the thought of ever saving a 23/24 weeker in the early days was unheard of. The ability to begin nutrition so early, as we are doing today, is so different from what our approach was then.

Now, there are undoubtedly different pathways for individuals to take. The beauty of all this is that those pathways can be modified, adjusted, and taken depending upon the candidate's interest. They can follow a path to clinical Neonatology, laboratory neonatology, bench research, etc. Those pathways are still available, and many people are doing a hybrid, where you can do almost anything, depending on your interest, especially if you have an institution that will support and assist you.

"Now, there are undoubtedly different pathways for individuals to take. The beauty of all this is that those pathways can be modified, adjusted, and taken depending upon the candidate's interest."

3. How should we be trying to draw more trainees toward Neonatology because of the decreased interest in the field?

Yes, the ability to take medical students and draw them in will depend upon the opportunities to experience Neonatology and see the fulfillment they can get in the field. At Queen of the Valley Hospital, through our affiliations with Western University and Loma Linda University, we have three or four medical students in our unit daily. Those students are assigned patients and are under the wing of the neonatologists working within the unit. We have a weekly meeting with the NICU committee, which has a nutritionist, respiratory therapist, pharmacist, etc, so we don't leave any stone unturned, and the medical students are included in these meetings. If more NICUs embraced medical schools like that, it would help draw more people into this field. Getting other facilities and medical schools to connect with NICUs and have their students do rotations at sites like that would be very beneficial to getting more of them interested in the field.

"Getting other facilities and medical schools to connect with NICUs and have their students do rotations at sites like that would be very beneficial to getting more of them interested in the field."

The next important thing is a mentor. Often, you'll have a student who bonds with one of the docs and considers that physician a mentor. Frequently, with good guidance, that mentor can encourage the medical student and help them understand some of the available opportunities.

4. What would you encourage a future neonatologist to prioritize and be involved in?

Something I would encourage them to pursue is a mentor who is involved in the type of research they would like to do—academic research versus clinical research, which is more involved with clinical medicine. These mentors can advise third- and fourth-year medical students on current options.

"Something I would encourage them to pursue is a mentor who is involved in the type of research they would like to do—academic research versus clinical research, which is more involved with clinical medicine. These mentors can advise third- and fourth-year medical students on current options."

You can get involved in research and publishing. One thing that you know a lot about is the journal *Neonatology Today*, which Mitch Goldstein formed. When we started a journal in the early days, it was the *Journal of the California Perinatal Association*, which was formed at Queen of the Valley in 1981. That then became the *Journal of Perinatology*, which is still around today. What has happened with *Neonatology Today* is due to the change in publishing status; people are looking online much differently than ever. Being able to look online, download and read articles, and make comments is much different today than it used to be. Once, I gave Mitch advice and said, "I don't think you're going to be successful until there is a printed copy of the journal." I don't feel that way anymore. The way we are as a society, looking not only at AI but also where physicians get their information, is now very much in the cloud.

"The way we are as a society, looking not only at AI but also where physicians get their information, is now very much in the cloud."

You can develop a patient for a specific area of study and focus, which, for me, is nutrition. If I were to ask you what the most important innovation we have made in the last 20 years to benefit neonatal and newborn medicine is, what would it be if you had to come up with one word? The one word that I would use is nutrition. Because without nutrition, divided correctly into the amounts of protein, glucose, fat, etc, you're not going to have the production of new cells. Without the production of new cells, the need for surfactant or ventilation would not come to fruition.

In the early days, we used to take one can of Carnation milk and add one can of water. We would then add sugar, and we actually used honey for a bit, then we would customize that taste so that the baby would be able to suck and swallow it. Back then, it was our understanding that taste buds in the first third of the tongue cannot differentiate something horrible tasting. In those days, we would do this without any evidence-based scientific knowledge. It was solely based on the calories we wanted to provide. Now, in this day and age, we can customize TPN and decide how much protein, sugars, and fats we will give to be optimal in trying to mimic the gold standard, which still is breast milk. Is it more

confusing? Definitely yes. We used to have these round tables at Abbott Labs where we would sit, eight or ten neonatologists, and discuss what each of us would do for feeds. We're better off now, but it is more confusing in many ways. Now, it allows the physician to decide and modify the nutrition and, consequently, that person's development.

"If I were to ask you what the most important innovation we have made in the last 20 years to benefit neonatal and newborn medicine is, what would it be if you had to come up with one word? The one word that I would use is nutrition."

5. What do you think about the rise of burnout? And how should we counter it?

People of your age are developing families; they are looking for where they will get the biggest bang for their buck, not only academically but also where they will be happy. You've got to consider the financial reparations involved. If I were to go to an institution that would pay me 200 or 250 grand a year versus one that would be better academically, but would pay me 160 or 180, I would consider the importance of the financial aspect of it versus the academic opportunities.

It is also essential to think about how you would do a fellowship. Is it necessary to do three years? Well, I don't think so. It's too much, but it's an opportunity to involve yourself in different aspects of newborn medicine and find how you want to practice and divide your time. I have been doing this for 52 years. I just celebrated my 52nd anniversary and love what I'm doing. Whether at Loma Linda or Queen of the Valley, I still enjoy seeing patients, and even more importantly, working with families. The things we do in the newborn period affect babies that will grow up and have 50, 60, or 70 years of longevity. This is dramatically different than if you were doing internal medicine, where your impact is shorter; what a big difference. Think about your influence on a baby with a lifetime ahead of them.

"The things we do in the newborn period affect babies that will grow up and have 50, 60, or 70 years of longevity. This is dramatically different than if you were doing internal medicine, where your impact is shorter; what a big difference. Think about your influence on a baby with a lifetime ahead of them."

6. What are you currently working on?

Neonatology moves much faster than other fields, and constant developments exist. What we're trying to do in nutrition is to take TPN solutions and mimic the baby's caloric needs. This is based upon "x" amount of protein, "x" amount of fat, and "x" amount of glucose to provide a basic number of calories. We used surface area rather than kilograms per body weight in the early days. Now we're looking at the need for 130 calories per kg, which is different from what it was five years ago. With this, we're trying to develop new cells and cell lines. We had our meeting yesterday. In our meeting, our nutritionists provided us with baby "John Doe" and how many calories they were getting per kilogram, and where we could change the amount of protein, fats, or sugars to mimic breast milk as closely as possible. As we continue working closer and closer to get a formula as similar to breast milk as possible, we will make an enormous advancement for NICU babies and all newborns.

"As we continue working closer and closer to get a formula as similar to breast milk as possible, we will make an enormous advancement for NICU babies and all newborns."

We have developed things over time, not only in nutrition but also in ventilation. Not only high frequency, but we can now also use a humidified high flow nasal cannula so much more. With this, we want to see how it provides semi-CPAP to expand the lungs. Lastly, genetically, we're now looking at chromosomes and some of the factors necessary for development to get an optimal result.

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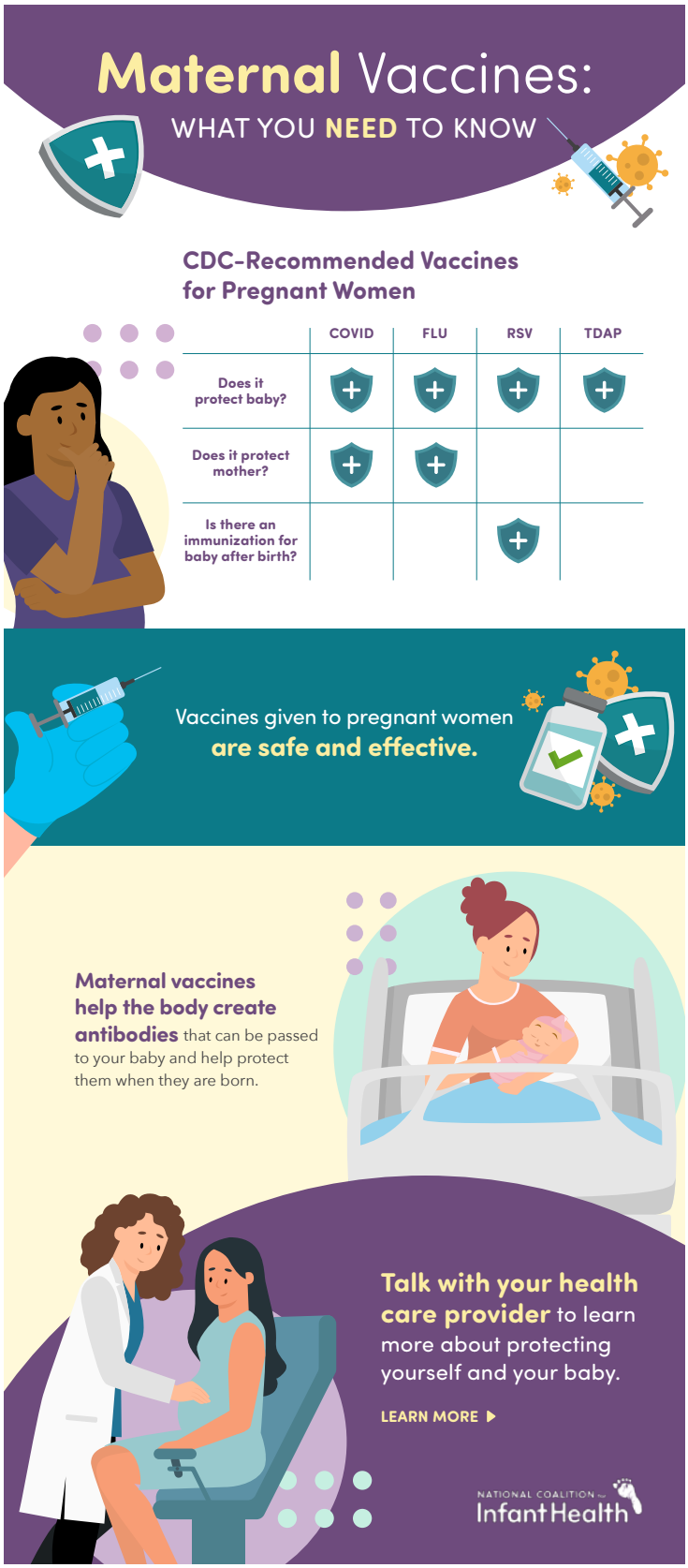
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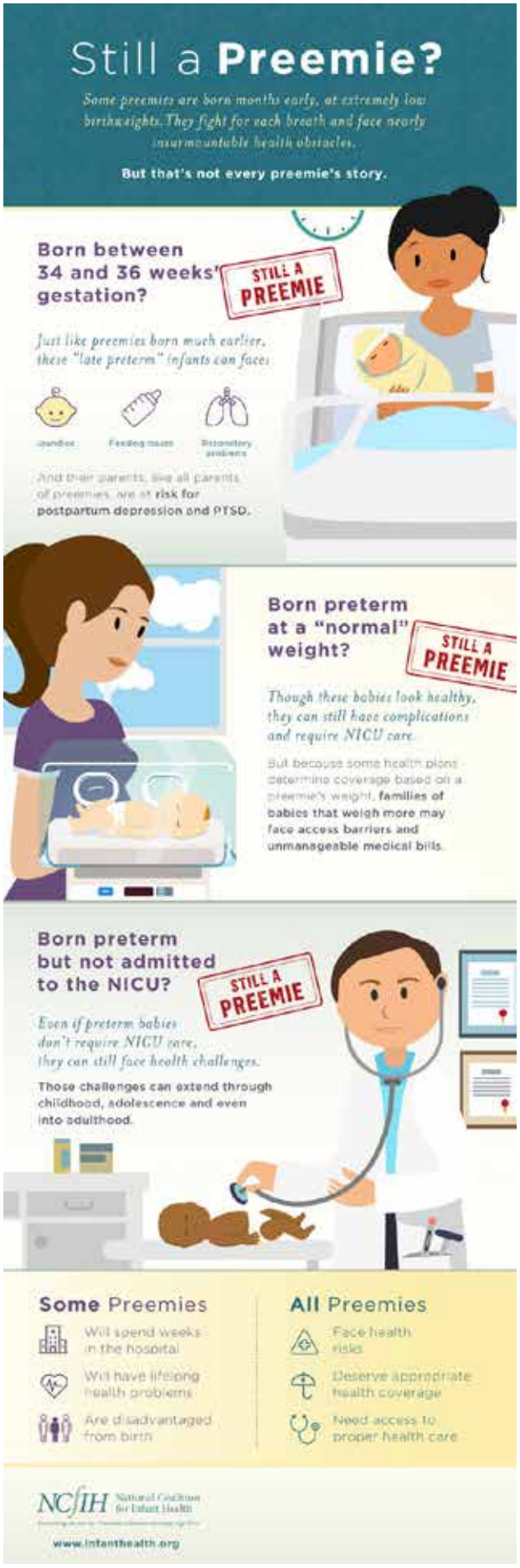


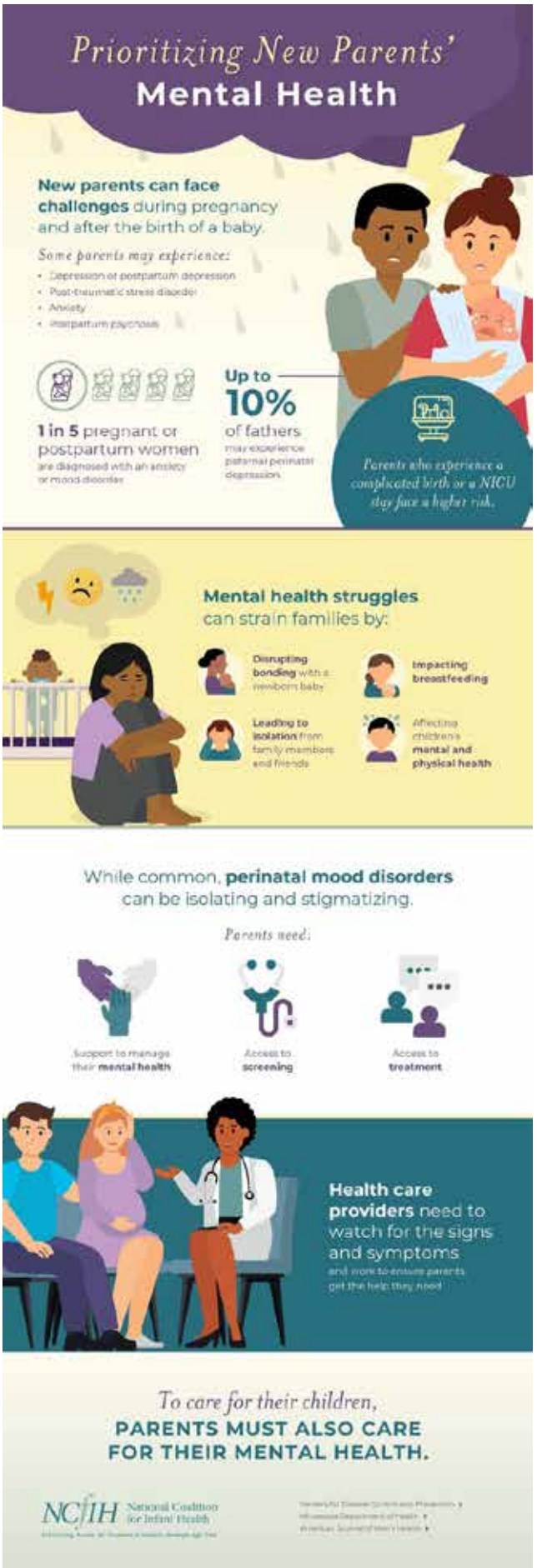
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Still a Preemie?
Some preemies are born months early, at extremely low birthweights. They fight for each breath and face nearly insurmountable health obstacles.
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Affecting children's mental and physical health
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Parents need:
Support to manage their mental health
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Access to treatment
Health care providers need to watch for the signs and symptoms and work to ensure parents get the help they need
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Join iCAN's Virtual Focus Group!



We warmly welcome all individuals within the age ranges of 8-10 and 12-18, including those with:

- Learning disabilities (example: dyslexia)
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- Stay home when you can.
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- Wear a face mask when out.
- Change your clothes when you get home.
- Tell others what you're doing to stay safe.

Provide Protective Immunity

- Hold your baby skin-to-skin.
- Give them your breast milk.
- Stay current with your family's immunizations.



Take Care of Yourself

- Stay connected with your family and friends.
- Drink more water and eat healthy foods.
- Seek mental health support.
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WARNING

Never Put a Mask on Your Baby

- Because babies have smaller airways, a mask makes it hard for them to breathe.
- Masks pose a risk of strangulation and suffocation.
- A baby can't remove their mask if they're suffocating.



If you feel sick or are positive for COVID-19

- Wash with soap and water and put on fresh clothes before holding or feeding your baby.
- Wear a mask to help stop the virus from spreading.
- Watch out for symptoms like fever, confusion, or trouble breathing.
- Ask for help caring for your baby and yourself while you recover.



We can help protect each other.
www.nationalperinatal.org/rsv

National Perinatal Association

PROTECT YOUR FAMILY FROM

RESPIRATORY VIRUSES

flu coronavirus pertussis RSV



WASH YOUR HANDS
often with soap and warm water.

GET VACCINATED
for flu and pertussis. Ask about protective injections for RSV.





COVER COUGHS AND SNEEZES.
Sneeze and cough into your elbow.

USE AN ALCOHOL-BASED HAND SANITIZER.





STAY AWAY FROM SICK PEOPLE
Avoid crowds. Protect vulnerable babies and children.

National Perinatal Association

www.nationalperinatal.org

FREE RESOURCES FOR YOUR NICU

Coping During COVID-19

Targeted interventions to improve the mental health of parents, infants, families, and providers

BONDING WITH YOUR BABY



HELPING CHILDREN AND FAMILIES COPE

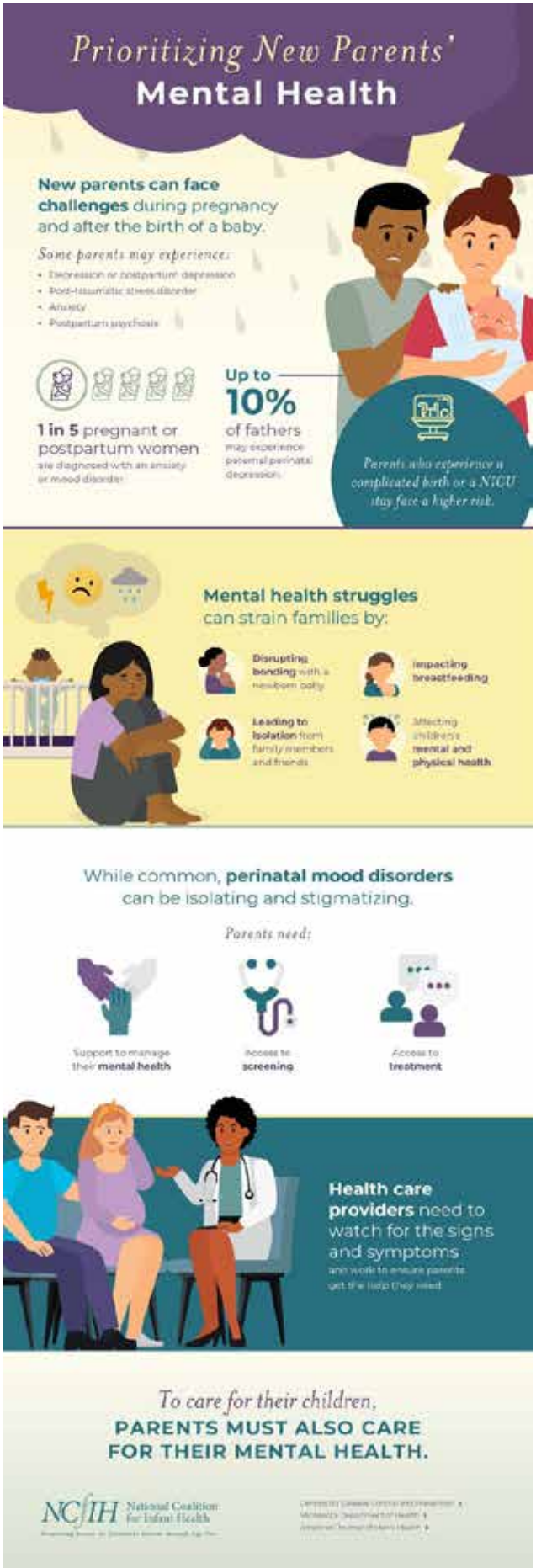


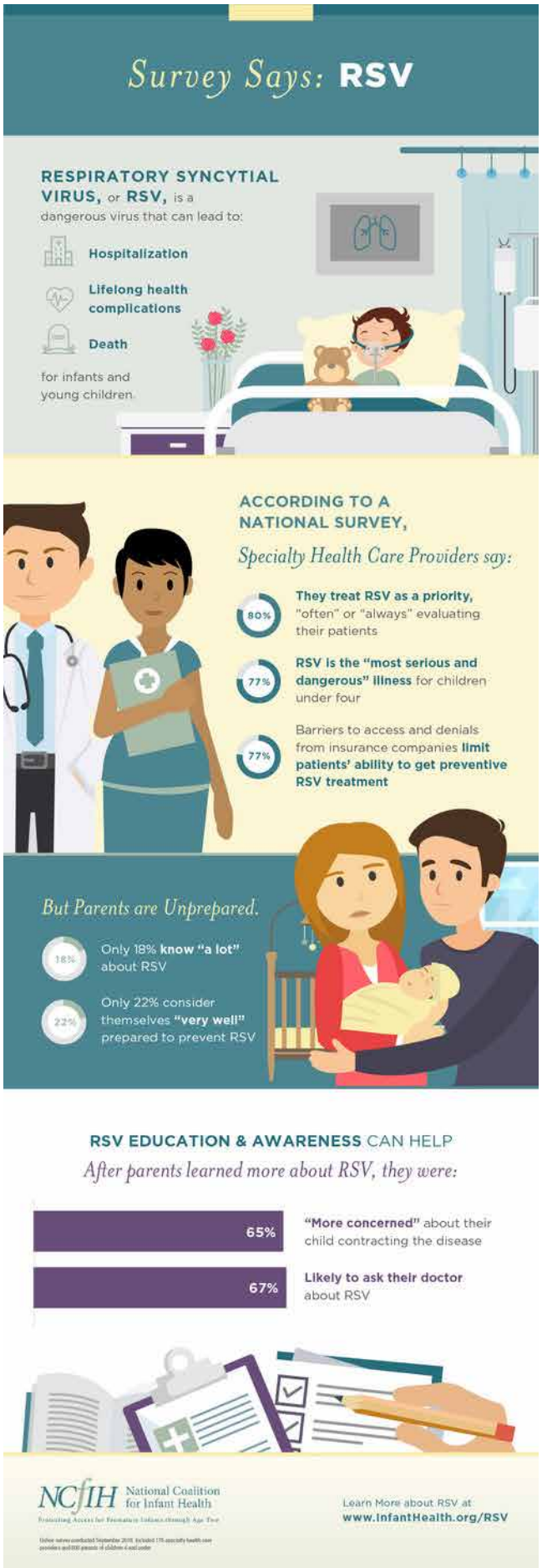
CAREGIVERS NEED CARE TOO



National Network of NICU Psychologists

nationalperinatal.org/psychologists


Prioritizing New Parents' Mental Health
New parents can face challenges during pregnancy and after the birth of a baby.
Some parents may experience:
Depression or postpartum depression
Post-traumatic stress disorder
Anxiety
Postpartum psychosis
1 in 5 pregnant or postpartum women are diagnosed with an anxiety or mood disorder
Up to 10% of fathers may experience paternal perinatal depression
Parents who experience a complicated birth or a NICU stay face a higher risk.
Mental health struggles can strain families by:
Disrupting bonding with a newborn baby
Impacting breastfeeding
Leading to isolation from family members and friends
Affecting children's mental and physical health
While common, perinatal mood disorders can be isolating and stigmatizing.
Parents need:
Support to manage their mental health
Access to screening
Access to treatment
Health care providers need to watch for the signs and symptoms and work to ensure parents get the help they need
To care for their children,
PARENTS MUST ALSO CARE FOR THEIR MENTAL HEALTH.
NCIH National Coalition for Infant Health


Survey Says: RSV
RESPIRATORY SYNCYTIAL VIRUS, or RSV, is a dangerous virus that can lead to:
Hospitalization
Lifelong health complications
Death
for infants and young children
ACCORDING TO A NATIONAL SURVEY,
Specialty Health Care Providers say:
80%
They treat RSV as a priority, "often" or "always" evaluating their patients
77%
RSV is the "most serious and dangerous" illness for children under four
77%
Barriers to access and denials from insurance companies limit patients' ability to get preventive RSV treatment
But Parents are Unprepared.
18%
Only 18% know "a lot" about RSV
22%
Only 22% consider themselves "very well" prepared to prevent RSV
RSV EDUCATION & AWARENESS CAN HELP
After parents learned more about RSV, they were:
65%
"More concerned" about their child contracting the disease
67%
Likely to ask their doctor about RSV
NCIH National Coalition for Infant Health
Learn More about RSV at www.InfantHealth.org/RSV

Peer Reviewed

The Presentability of Neonatal Herpes Simplex Disease: Are Delays in Evaluation and Intervention Responsible for Adverse Outcomes of Herpes Simplex Virus?

Maureen Sims, MD, Barry Schifrin, MD

"A 37 5/7 w 2.9 kg infant was delivered by normal spontaneous vaginal delivery to a 21-year-old G1P0 mother with a prenatal history complicated by chlamydia in the first trimester and a urinary tract infection, treated with Kefzon, 2 weeks prior to labor."

A 37 5/7 w 2.9 kg infant was delivered by normal spontaneous vaginal delivery to a 21-year-old G1P0 mother with a prenatal history complicated by chlamydia in the first trimester and a urinary tract infection, treated with Kefzon, 2 weeks prior to labor. No history was elicited or recorded regarding herpes infection in the mother or partner. Cervical and recto-cervical cultures were negative for Group B streptococcus. There was no testing for herpes antibodies. Apgar scores were 9^{1}, and 9^{5}, respectively. Physical examination was consistent with an early-term female infant with a normal examination except for "fluid-filled, minimally erythematous vesicles vs. blisters on the center of the back," leading to the dermatological diagnosis of "pustular melanosis."

The newborn was sent to room-in with the mother. The following day, the mother developed a temperature of 101.1˚F. Mother refused to have her blood drawn for a CBC and blood culture. Her urinalysis was unremarkable. Later that day, the mother's temperature further increased to 102.9°F. Clindamycin and gentamicin were added. Ampicillin was ordered for the mother. Furthermore, she was discharged at 48 hours. A source for the fever was not found, and the placenta was not examined.

At 4 days of age, the infant was brought to the pediatrician because of vomiting and nasal congestion. The examination was unremarkable; the recommended care was suctioning of the nasal passages. However, 12 hours after the visit, the mother called the ambulance because the baby turned blue, began gagging, and had trouble breathing. When the baby arrived at the emergency department, she was pale and jaundiced, but had normal vital signs. A "brownish blister 5 mm" on her back was noted, but a specimen from the lesion was not submitted for either bacterial culture or viral PCR. A lumbar puncture (LP) revealed: 4 white blood cells, 150 red blood cells, a glucose level of 41 mg/dL, and a protein level of 89 mg/dL. The cerebrospinal fluid (CSF) was sent for bacterial cultures, but a polymerase Chain Reaction (PCR) for HSV was not performed. The electrolytes were unremarkable. His CBC showed a hematocrit of 34%, a white blood count of 8.6 $x10^{3}$/L, and a platelet count of 85 x 10^{3}/ml. The differential diagnoses included "rule out sepsis." Ampicillin and gentamicin were started. The infant developed apnea and became dusky in the ED and was referred to a Children's Hospital. Eight hours after admission to the ED, the baby was admitted to a Pediatric Intensive Care Unit, where evaluation for HSV was performed and Acyclovir was begun. Quickly thereafter, her clinical condition deteriorated and she developed liver failure, disseminated intravascular coagulation, respiratory failure requiring intubation, hypotension requiring multiple pressors, and renal failure. The infectious disease evaluation results showed a positive serum HSV-2 by polymerase chain reaction (PCR). Despite maximum support, the baby died 2 days after admission. The following day, the mother sought medical attention for severe genital pain and was diagnosed with herpetic lesions. Guidelines for HSV evaluation were not present in the hospital.

"Eight hours after admission to the ED, the baby was admitted to a Pediatric Intensive Care Unit, where evaluation for HSV was performed and Acyclovir was begun. Quickly thereafter, her clinical condition deteriorated and she developed liver failure, disseminated intravascular coagulation, respiratory failure requiring intubation, hypotension requiring multiple pressors, and renal failure. The infectious disease evaluation results showed a positive serum HSV-2 by polymerase chain reaction (PCR)."

The hospital, the pediatrician at the birthing facility, and the outpatient clinic were sued.

Plaintiff allegations:

Proper standards of care were violated when:

- The neonatal caregivers failed to evaluate the baby's vesicles shortly after birth properly.
- Failed to properly inform the obstetrician about the baby's skin lesions and request an evaluation of the mother postpartum for HSV, given the baby's vesicles and the maternal fever
- Failed to entertain the diagnosis (perform a differential diagnosis) to include consideration of the diagnosis of HSV. Doing so required obtaining a PCR HSV test at both the delivering hospital and the pediatrician's office.
- Given the positive diagnosis, this would have required the immediate administration of Acyclovir and the performance

of an LP, surface cultures, and PCR for Herpes.

- With timely diagnosis and prompt treatment with Acyclovir, the baby would have survived intact.
- The failure to timely diagnose and treat the HSV permitted the prognosis to worsen with each passing day.
- Failure of the hospital to have guidelines in place to exclude Herpes in the face of maternal and neonatal signs.

Defense response:

Earlier diagnosis and intervention would not have changed the outcome.

Disposition of the case:

The case settled without going to trial.

Discussion:

HSV is a chronic, lifelong viral infection involving two types: HSV-1 and HSV-2. HSV-2 causes most cases of recurrent genital Herpes. Somewhat over 10 % of persons aged 14–49 and between 20-30% of those of reproductive age are estimated to be infected in the United States. The majority of these are asymptomatic and unaware of their previous exposure or the potential for spreading the disease to a partner through genital contact or to their offspring through vaginal delivery. The painful, vesicular, or ulcerative lesions classically associated with HSV are often absent in many infected persons at the time of clinical evaluation. The classification of maternal HSV follows:

- **Primary infection** - Acquisition of HSV-1 / HSV-2 without prior exposure – antibody negative
- **Non-primary infection** - Acquisition of HSV-2 / HSV-1 in a patient with antibodies to the other virus type.
- **Reactivation -** Presence of virus despite antibodies,
- **Symptomatic shedding** Characteristic lesions of genital Herpes with detectable HSV-1 / HSV-2 from the lesions by culture or PCR,
- **Subclinical shedding** - Detection of HSV-1 / HSV-2 from genital mucosa by culture or PCR in the absence of genital lesions
- Compared to the transmission patterns of HSV-2, the transmission rate of HSV-1 is higher, irrespective of whether the infection is primary or recurrent (10).

"HSV is a chronic, lifelong viral infection involving two types: HSV-1 and HSV-2. HSV-2 causes most cases of recurrent genital Herpes. Somewhat over 10 % of persons aged 14–49 and between 20-30% of those of reproductive age are estimated to be infected in the United States. The majority of these are asymptomatic and unaware of their previous exposure or the potential for spreading the disease to a partner through genital contact or to their offspring through vaginal delivery."

Recurrences and subclinical shedding are much more frequent for HSV-2 genital herpes infection than for HSV-1 genital herpes. It is estimated that approximately 10% of HSV-2 seronegative women are living with a seropositive partner and hence at risk for acquisition of genital Herpes during pregnancy. Estimates of seroconversion during pregnancy, however, are less than 5%. The majority of women who acquire genital HSV infection during pregnancy are either asymptomatic or have non-specific symptoms. Recurrence during pregnancy of previously acquired infection is commonplace, estimated at 75% with about 14% having prodromal symptoms or lesions at the time of delivery. Somewhat fewer than 0.5% of all pregnant women shed genital HSV in the genital tract around the time of delivery, irrespective of prior history of HSV, an incidence that increases to 0.77-1.4% among women with prior history of recurrent genital Herpes.

Despite the prevalence of herpes infection in the reproductive age population, the incidence of neonatal HSV infection in the United States remains quite low, though it has increased over the past 2 decades to approximately 1 in 2000 live births. It receives heightened attention because of the potentially devastating consequences for the newborn, including death and lifelong handicap.

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The transmission of HSV from an infected mother to a neonate occurs most often during birth through an infected genital tract but can be caused by an ascending infection through ruptured or intact amniotic membranes. Other less common sources of neonatal infection include antenatal acquisition, postnatal transmission from a parent, sibling, or other caregiver, most often from a non-genital infection (eg, mouth or hands), or transmission from a religious circumcision.

The risk of transmission of HSV to the neonate remains significantly higher with primary maternal infections acquired closer to the time of delivery compared with recurrent infections (50-60% with primary infections vs <3% for recurrent infections), most likely due to lack of transplacentally acquired antibodies in the neonate of women with primary infection as well as exposure in the birth canal of those women to larger quantities of virus for longer durations of time (9).

Primary herpes simplex virus (HSV) infection is unrecognized in approximately 70–80% of pregnant patients. Routine serologic screening for HSV in asymptomatic pregnant persons is not recommended by the American College of Obstetricians and Gynecologists, the United States Preventive Services Task Force, and the CDC, due to the high prevalence of unrecognized infection and limitations of current serologic tests. All pregnant women should be explicitly queried about any history of genital symptoms or concerns about HSV infection in themselves or a partner. At the onset of labor, all women should be questioned thoroughly about symptoms of genital Herpes, e.g., complaints of pain or burning may arise before any lesion appears. Moreover, she should undergo a speculum examination to look for herpetic lesions. Women without symptoms or signs of genital Herpes or its prodrome can deliver vaginally. In the presence of lesions or a provocative history, Cesarean delivery before the onset of labor is almost invariably effective in preventing the transmission of HSV to the neonate. Neonatal HSV cases have occurred despite cesarean delivery, especially in cases of prolonged rupture of the membranes or the application of a fetal scalp electrode (contraindicated).

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The presentation of the neonate:

In the absence of characteristic skin lesions, the presentation of HSV is often non-specific, and a high index of suspicion should prompt the clinician to consider HSV early in the evaluation of various problems with the neonate, including:

(1) Disseminated disease - involving multiple organs, most prominently liver and lungs, and in 60% to 75% of cases also involving the central nervous system (CNS) – 25%;

(2) CNS disease, (may have skin, eye, or mouth involvement) (CNS disease)-30%

(3) SEM disease - disease localized to the skin, eyes, and/or mouth - 45%

The initial presentation of HSV central nervous system (CNS) disease may be indistinguishable from other causes of neonatal sepsis or meningitis. However, since the consequences of delayed treatment for HSV are high morbidity and mortality, HSV should be considered in the differential diagnosis of sick neonates. It is imperative to consider HSV as a causative agent in neonates with fever (especially within the first 3 weeks after birth), a vesicular rash, or abnormal CSF findings.

Both HSV type 1 (HSV-1) and type 2 (HSV-2) can cause any of these manifestations of neonatal HSV disease. More than 80% of neonates with SEM disease have skin vesicles; those without vesicles have infection limited to the eyes and/or oral mucosa. Approximately two-thirds of neonates with disseminated or CNS disease have skin vesicles, but these lesions may not be present at the time of onset of symptoms. Disseminated infection should be considered in neonates with sepsis syndrome with negative bacteriologic culture results, severe liver dysfunction, consumptive coagulopathy, or suspected viral pneumonia.

"The initial presentation of HSV central nervous system (CNS) disease may be indistinguishable from other causes of neonatal sepsis or meningitis. However, since the consequences of delayed treatment for HSV are high morbidity and mortality, HSV should be considered in the differential diagnosis of sick neonates."

The diagnosis of neonatal HSV disease:

The diagnosis of neonatal HSV disease requires sampling of multiple sites. HSV surface cultures and PCR testing should be performed on swabs from the infant's conjunctivae, mouth, nasopharynx, and anus. Viral culture is the test of choice for detecting HSV in surface specimens. Surface cultures are positive in more than 90% of cases and provide the highest diagnostic yield of all methods for detecting HSV, regardless of disease classification.

Positive cultures in specimens obtained from these sites more than 12 to 24 hours after birth indicate viral replication and suggest infection, rather than contamination from intrapartum exposure. Culture and PCR testing should be performed on specimens of skin vesicles. CSF and whole blood specimens should undergo PCR testing for HSV. All neonates with suspected HSV, even infants who appear to have isolated skin, eye, or mucous membrane disease (SEM disease), should undergo a lumbar puncture because clinical findings may be absent early in the course of CNS disease. PCR is the test of choice for detecting CNS involvement, with a sensitivity of 75% to 100% and a specificity of 71% to 100%. Viral culture of CSF sample is less sensitive (25%-40%).

All infants with neonatal HSV disease, regardless of disease

classification, should undergo an ophthalmologic examination and neuroimaging to establish a baseline of brain anatomy. Magnetic resonance imaging is the most sensitive imaging modality, but may require sedation; therefore, computed tomography or ultrasonography of the head is an acceptable alternative. CT and magnetic resonance imaging scans may be normal initially, but over several days to a week into the illness, neuroimaging may show parenchymal brain edema, hemorrhage, or destructive lesions. Affected infants often have an abnormal encephalogram (EEG) early in the course.

"PCR is the test of choice for detecting CNS involvement, with a sensitivity of 75% to 100% and a specificity of 71% to 100%. Viral culture of CSF sample is less sensitive (25%-40%)."

Prevention:

Prevention of neonatal Herpes depends both on preventing the acquisition of genital Herpes during late pregnancy and avoiding exposure of the neonate to herpetic lesions and viral shedding during delivery. Mothers of newborns who acquire neonatal Herpes often lack histories of clinically evident genital Herpes. The risk for transmission to the neonate from an infected mother is high (30%–50%) among women who acquire genital Herpes near the time of delivery and low (<1%) among women with prenatal histories of recurrent Herpes or who acquire genital Herpes during the first half of pregnancy.

The American College of Obstetricians and Gynecologists (ACOG) recommends that people with a primary or non-primary first-episode outbreak in pregnancy, as well as those with a clinical history of genital Herpes, be offered suppressive antiviral therapy at or beyond 36 weeks of gestation. This approach is not universally successful, as cases of neonatal HSV disease have occurred among infants born to people who received antiviral prophylaxis. There may be continued shedding of the virus for several weeks after the lesions resolve.

Maternal immunization to induce virus-specific antibodies has been proposed as a potentially efective strategy to prevent vertical transmission and neonatal HSV. The 2024 American Academy of Pediatrics Red Book now recommends comprehensive HSV evaluation and initiating acyclovir treatment for all newborns when there is maternal primary HSV infection in the third trimester. Emerging point-of-care diagnostics, particularly rapid polymerase chain reaction, and hospital protocols to expedite HSV testing can enhance the timely detection of neonatal HSV infection.

Antiviral medication:

With the advent of antiviral therapy, all forms of HSV disease have dramatically improved outcomes. The goals for the use of antiviral medications to treat genital herpes infection are to treat or prevent (suppress) genital herpes recurrences and suppress the virus to prevent transmission to sexual partners or the neonate.

Systemic antiviral drugs can partially control the signs and symptoms of genital Herpes when used as daily suppressive therapy, those with recurrence during late pregnancy, or prophylactically in those with a positive history. These benefits notwithstanding, antiviral drugs neither eradicate latent virus nor affect the risk, frequency, or severity of recurrences after the drug is discontinued.

Acyclovir is considered safe for use during all trimesters of pregnancy and while breastfeeding. Suppressive acyclovir treatment starting at 36 weeks' gestation reduces the frequency of cesarean delivery among women who have recurrent genital Herpes by diminishing the frequency of recurrences at term. However, such treatment might not protect against transmission to neonates in all cases. There is no data to support the use of antiviral therapy among asymptomatic HSV-seropositive women without a history of genital Herpes.

"With the advent of antiviral therapy, all forms of HSV disease have dramatically improved outcomes. The goals for the use of antiviral medications to treat genital herpes infection are to treat or prevent (suppress) genital herpes recurrences and suppress the virus to prevent transmission to sexual partners or the neonate."

Parenteral Acyclovir is the **treatment** of choice for neonatal HSV infections. The dosage of Acyclovir is 60 mg/kg per day in 3 divided doses (20 mg/kg/dose), administered intravenously for 14 days in SEM disease and for a minimum of 21 days in CNS disease or disseminated disease. All infants with CNS involvement should have a repeat lumbar puncture performed near the end of therapy to document that the CSF is negative for HSV DNA on NAAT; in the unlikely event that the NAAT (Nucleic Acid Amplification Test) result remains positive near the end of a 21-day treatment course, intravenous Acyclovir should be administered for another week, with repeat CSF NAAT performed near the end of the extended treatment period and another week of parenteral therapy if the result remains positive. Parenteral antiviral therapy should not be stopped until the CSF NAAT result for HSV DNA is negative. Consultation with a pediatric infectious diseases specialist is warranted in these cases.

Topical ophthalmic drug (1% trifluridine or 0.15% ganciclovir), in addition to parenteral antiviral therapy, may be indicated in infants with ocular involvement attributable to HSV infection, including a positive virologic test result from a conjunctival swab sample, and an ophthalmologist should be involved in the management and treatment of acute neonatal ocular HSV disease. Finally, Alanine aminotransferase should be measured as an indicator of hepatic involvement.

Infants surviving neonatal HSV disease of any classification (disseminated, CNS, or SEM) should receive oral acyclovir suppression at 300 mg/m²/dose, administered three times daily for 6 months after completion of parenteral therapy for acute disease; the dose should be adjusted monthly to account for growth. Absolute neutrophil counts should be assessed at 2 and 4 weeks after initiating suppressive acyclovir therapy and then monthly during the treatment period. Longer durations or higher doses of antiviral suppression do not further improve neurodevelopmental outcomes. Valacyclovir has not been studied for longer than 5 days in young infants, so it should not be used routinely for antiviral suppression in this age group. The older topical antiviral

agents vidarabine and iododeoxyuridine are no longer available in the United States.

"The classic presentation of dermal HSV perinatally transmitted is grouped vesicles on an erythematous base, but cutaneous findings at birth are highly variable and often not necessarily vesicular initially."

Differential Diagnosis:

The crux of this case regarded the failure to test a neonatal skin lesion for HSV. Neonatal HSV acquired from exposure of the fetus to infected maternal genital secretions (85%) typically presents within the first 2 weeks of life with skin, eye, and mouth manifestations. Intrauterine (congenital) HSV accounts for only about 5% of neonatal HSV. The classic presentation of dermal HSV perinatally transmitted is grouped vesicles on an erythematous base, but cutaneous findings at birth are highly variable and often not necessarily vesicular initially. The time lag in their appearance causes a delay in diagnosis and treatment. Lesions from congenital HSV are frequently non-vesicular or atypical with erosions, ulcerations, crusted papules/plaques, scarring/atrophy, hypo- or hyperpigmented macules, or contractures. These lesions often coexist with other congenital findings, such as ocular abnormalities and CNS malformations, which reflect antenatal injury.

Common benign skin lesions present at birth include erythema toxicum, milia, sebaceous gland hypertrophy, and pustular melanosis. Skin lesions at birth with infectious involvement requiring diagnosis and timely intervention include those secondary to bacteria (group B streptococcus, streptococcus, Staphylococcus aureus, syphilis, Listeria), viruses (HSV, CMV, varicella-zoster), fungi, or parasites. It is beyond the scope of this article to discuss in depth the appearance and manifestation of these infectious dermal lesions. However, the skin lesions that were assumed to be the problem in the above-described case (pustular melanosis) WERE NOT adequately evaluated. More probable than not, the skin lesions were secondary to HSV and would have revealed HSV on proper testing.

Transient neonatal pustular melanosis is characterized by the presence of superficial, fragile pustules or vesiculopustules on a non-erythematous base, which rupture easily and leave behind hyperpigmented macules with a collarette of scale. The pustules are typically present at birth or appear within the first day of life. The residual hyperpigmented macules can persist for weeks to months before fading. The lesions are most commonly found on the forehead, chin, neck, lower back, and shins but can occur anywhere on the body. There are no associated systemic symptoms, and the condition is benign and self-limiting.

In summary, pustular melanosis can be mistaken for herpes simplex virus, especially in neonates. Therefore, careful clinical evaluation, supported by laboratory testing as recommended by the Infectious Diseases Society of America and the American Society for Microbiology, is essential to avoid misdiagnosis and unnecessary treatment. The crucial point is to exclude the more threatening diagnosis of HSV.

"In summary, pustular melanosis can be mistaken for herpes simplex virus, especially in neonates. Therefore, careful clinical evaluation, supported by laboratory testing as recommended by the Infectious Diseases Society of America and the American Society for Microbiology, is essential to avoid misdiagnosis and unnecessary treatment. The crucial point is to exclude the more threatening diagnosis of HSV."

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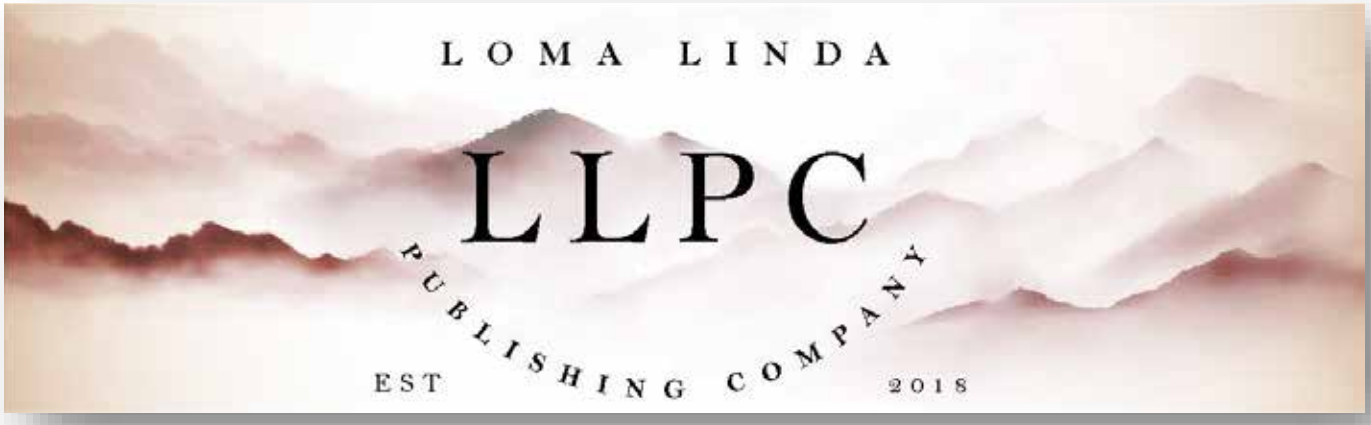
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Will your **PRETERM INFANT** *need* **EARLY INTERVENTION** *services?*

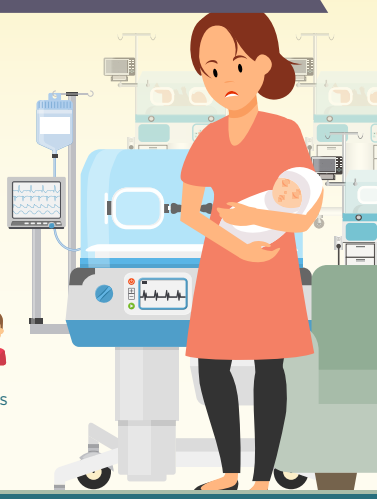
Preterm infants are:

2x more likely to have developmental delays

5x more likely to have learning challenges



1 in **3** preterm infants will require support services at school

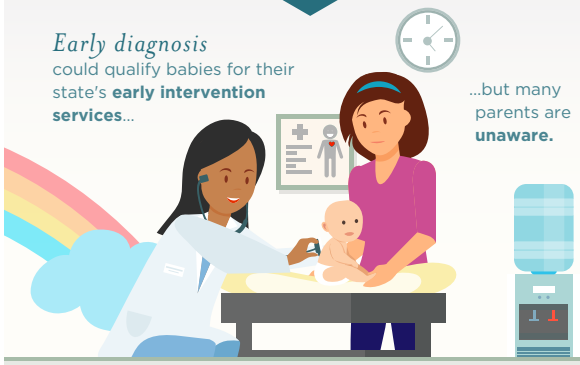


Early intervention can help preterm infants:

- Enhance language and communication skills
- Build more effective learning techniques
- Process social and emotional situations
- Address physical challenges
- Prevent mild difficulties from developing into major problems

Early diagnosis could qualify babies for their state's **early intervention services**...

...but many parents are **unaware.**





NICU staff, nurses, pediatricians and social workers **should talk** with NICU families about the challenges their baby may face.

Awareness, referral & timely enrollment in early intervention programs can help **infants thrive** and grow.



NCFIH National Coalition for Infant Health

Protecting Access for Premature Infants through Age Two

www.infanthealth.org

Visit **CDC.gov** to find contact information for your state's early intervention program.

Las nuevas mamás necesitan acceso a la detección y tratamiento para **LA DEPRESIÓN POSPARTO**

1 DE CADA **7** MADRES AFRONTA LA DEPRESIÓN POSPARTO, *experimentando*

- Llanto incontrolable
- Sueño interrumpido
- Ansiedad
- Desplazamientos en los patrones de alimentación
- Ideas de hacerse daño a sí mismas o al bebé
- Distanciamiento de amigos y familiares





Sin embargo, sólo el 15% recibe tratamiento[1]

LA DEPRESIÓN POSTPARTO **NO TRATADA** PUEDE AFECTAR:



- *La salud de la madre*
- *El sueño, la alimentación y el comportamiento del bebé a medida que crece*[2]
- *La capacidad para cuidar de un bebé y sus hermanos*

PARA AYUDAR **A LAS MADRES A ENFRENTAR LA DEPRESIÓN POSPARTO**

LOS ENCARGADOS DE FORMULAR POLÍTICAS PUEDEN:

- Financiar los esfuerzos de despistaje y diagnostico
- Proteger el acceso al tratamiento

LOS HOSPITALES PUEDEN:

- Capacitar a los profesionales de la salud para proporcionar apoyo psicosocial a las familias... **Especialmente aquellas con bebés prematuros, que son 40% más propensas a desarrollar depresión posparto**[3,4]
- Conectar a las mamás con una organización de apoyo



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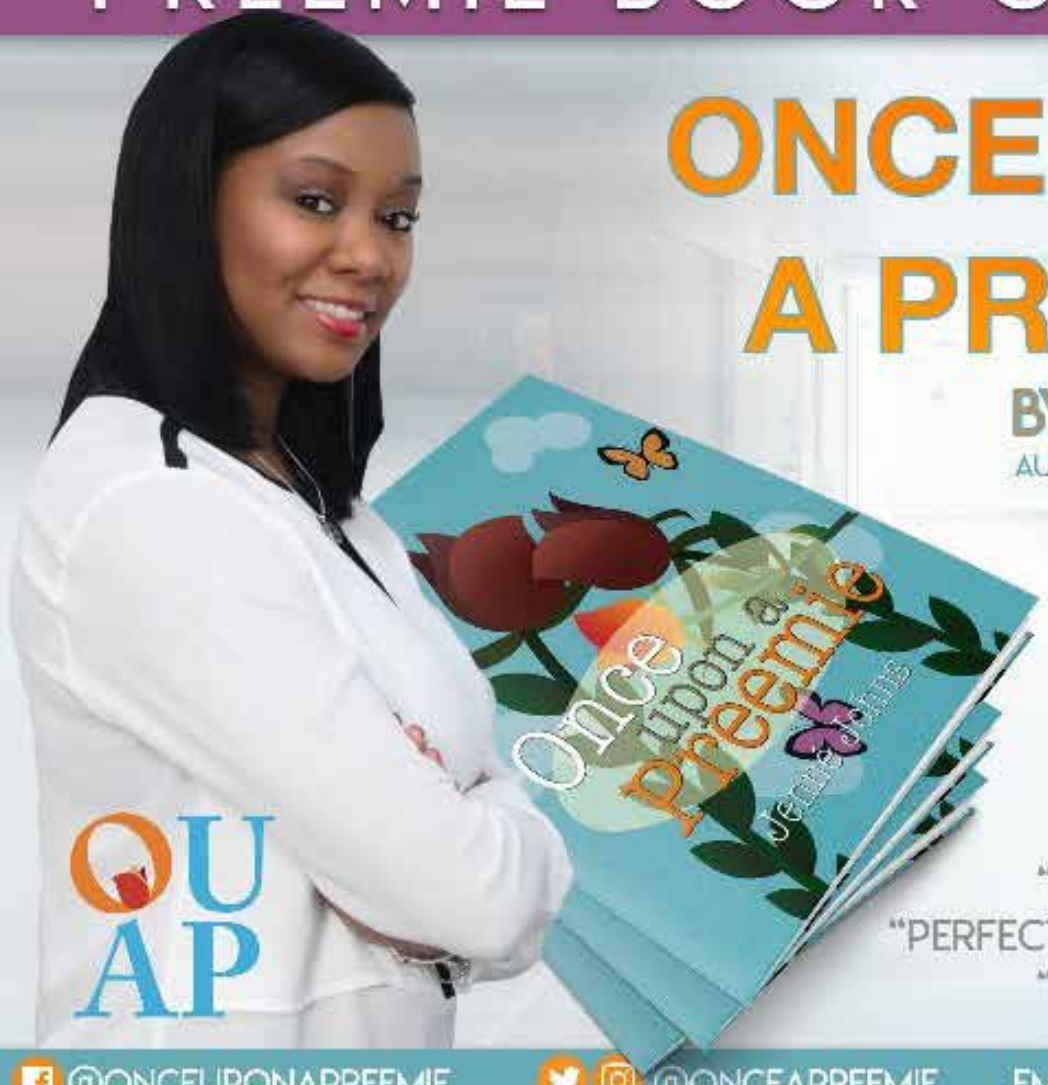
[1] American Psychological Association. Accesible en: http://www.apa.org/pi/women/resources/reports/postpartum-depression.aspx

[2] National Institute of Mental Health. Accesible en: https://www.nimh.nih.gov/health/publications/postpartum-depression-facts/index.shtml

[3] Journal of Perinatology (2015) 35, 529–536; doi:10.1038/jp.2015.147.

[4] Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: a systematic review. Vigod SN, Villegas L, Dennis CL, Ross LE BJOG. 2010 Apr; 117(5):540-50.

PREEMIE BOOK ON SALE



ONCE UPON A PREEMIE

BY JENNÉ JOHNS

AUTHOR | SPEAKER | ADVOCATE

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NIH *Eunice Kennedy Shriver* National Institute of Child Health and Human Development

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Compiled and Reviewed by Benjamin Hopkins, DO

Sobi discontinues RSV injection Synagis

NEWS PROVIDED BY

American Academy of Pediatrics

By Melissa Jenco

Study: **Sobi discontinues RSV injection Synagis**

Current as of August 12, 2025

Respiratory syncytial virus (RSV) injection Synagis (palivizumab) will be discontinued at the end of the year.

Sobi's decision to remove the product from the market follows the approval of two new immunizations in recent years that are recommended for a wider range of children and provide longer protection against RSV.

Synagis, which received Food and Drug Administration approval in 1998, is given in monthly doses to protect high-risk infants and toddlers.

Beyfortus (nirsevimab from Sanofi and AstraZeneca) and Enflonsia (clesrovimab from Merck) were approved in 2023 and 2025, respectively, and are given as a single dose for most children. Both can be used for infants under 8 months of age born during or entering their first RSV season, according to guidance from federal health officials. Beyfortus also can be used for children 8-19 months at high risk for severe RSV disease entering their second RSV season.

Last month, the AAP updated its recommendations to clarify that it no longer routinely recommends using Synagis. Updated guidance incorporating the use of Enflonsia is being finalized and is expected to be published this month.

AAP updates RSV immunization guidance

NEWS PROVIDED BY

American Academy of Pediatrics

By Melissa Jenco

Study: **AAP updates RSV immunization guidance**

Current as of August 19, 2025

The AAP has updated its respiratory syncytial virus (RSV) policy to add a new immunization to protect infants under 8 months.

The AAP published its RSV immunization recommendations Tuesday along with a revised child and adolescent immunization schedule that also includes updated guidance on COVID-19 and flu vaccines.

The AAP policy Recommendations for the Prevention of RSV Disease in Infants and Children adds Merck's clesrovimab (Enflonsia) as one of two monoclonal antibody products available to protect infants under 8 months born during or entering their first RSV season. The other product is nirsevimab (Beyfortus) developed by Sanofi and AstraZeneca.

"Having multiple products available is a good thing. If there are shortages of one, for example, the other may be able to fill in the gap," said Sean T. O'Leary, M.D., M.P.H., FAAP, chair of the AAP Committee on Infectious Diseases. "And in this case, we're talking about the leading cause of hospitalization in young children, so … this is great news."

Clesrovimab was licensed by the Food and Drug Administration in June and approved by the Centers for Disease Control and Prevention director earlier this month. In clinical trials, the immunization reduced RSV-associated hospitalizations by 84% through five months compared to a placebo, according to Merck. It reduced medically attended lower respiratory infections by 61%. The most common adverse reactions were redness at the injection site, swelling at the injection site and rash, all of which occurred in less than 4% of infants receiving the immunization.

For infants under 8 months, both clesrovimab and nirsevimab are safe and effective. Infants and children 8 months through 19 months at high risk of severe RSV disease entering their second RSV season should receive nirsevimab as clesrovimab is not indicated for children in this age group.

Infants born during the RSV season should receive immunization within one week of birth, ideally during their birth hospitalization. However, administration can occur during any visit to a health care setting, including well-child visits. Infants under 8 months born outside RSV season should receive immunization shortly before or during the season (October through March in most of the continental U.S.).

Immunization is not needed for most infants under 8 months whose pregnant parent received RSVpreF vaccine at least 14 days before giving birth.

The AAP no longer routinely recommends palivizumab (Synagis from Sobi), a short-acting monoclonal antibody product. Sobi recently announced it will remove the product from the market at the end of the year. Nirsevimab and clesrovimab are recommended for a wider range of children and provide longer protection against RSV.

The AAP has a long history of providing evidence-based guidance on vaccines. It announced in June it would continue to publish its own vaccine recommendations and schedules after Health and Human Services Secretary Robert F. Kennedy Jr. made unilateral, unscientific changes to COVID-19 vaccines and replaced members of the CDC's Advisory Committee on Immunization Practices with new people who have espoused anti-vaccine viewpoints.

The AAP also is collaborating with professional societies, payers and partner organizations to share approaches for developing evidence-based clinical guidance on COVID, flu and RSV for the upcoming respiratory virus season. The societies also have been collaborating with the University of Minnesota's Center for Infectious Disease Research and Policy's Vaccine Integrity Project.

AAP releases evidence-based immunization schedule; calls on payers to cover recommendations

NEWS PROVIDED BY

American Academy of Pediatrics

By Melissa Jenco

Study: **AAP releases evidence-based immunization schedule; calls on payers to cover recommendations**

Current as of August 19, 2025

The AAP has published an independent evidence-based immunization schedule for children and adolescents in the wake of federal officials undermining the rigorous scientific process for making recommendations.

The schedule published in AAP Red Book Online includes guidance on COVID-19 vaccination that differs from federal policy. It also includes updates to recommendations on respiratory syncytial virus (RSV) and flu.

"The AAP will continue to provide recommendations for immunizations that are rooted in science and are in the best interest of the health of infants, children and adolescents," said AAP President Susan J. Kressly, M.D., FAAP. "Pediatricians know how important routine childhood immunizations are in keeping children, families and their communities healthy and thriving."

The AAP has a long history of providing evidence-based guidance on vaccines and worked with the Centers for Disease Control and Prevention (CDC) and others in recent decades to harmonize recommendations when possible. However, Health and Human Services Secretary Robert F. Kennedy Jr. unilaterally removed COVID-19 vaccines from the routine recommendations for healthy children and pregnant people, sparking a lawsuit from the AAP and other medical groups.

Kennedy also replaced CDC Advisory Committee on Immunization Practices members with people who have espoused anti-vaccine viewpoints. At its first meeting, the group announced it would review the vaccine schedules, which falsely suggested they are flawed. The schedules are monitored constantly for safety, AAP leaders said. They vowed to continue publishing their own science-based schedule.

The schedule released today incorporates these three respiratory viruses as well as new recommendations from the past year on a pentavalent meningococcal vaccine from GSK and AAP's recommendation to start HPV vaccination at 9-12 years. Hepatitis B vaccine PreHevbrio has been discontinued and was removed from the schedule.

The biggest difference between the AAP and CDC schedules is around COVID-19 vaccination. The CDC no longer recommends routine vaccination for healthy children, although children can get vaccinated after a conversation with their doctor. In contrast, the AAP recommends all young children ages 6-23 months get vaccinated as well as children ages 2-18 years in certain risk groups. It also calls for children whose parent or guardian desires their protection from COVID-19 to have access to the vaccine.

The AAP has been collaborating with professional societies, payers, and partner organizations to share approaches for developing evidence-based clinical guidance on COVID, flu and RSV for the upcoming respiratory virus season. The societies also have been collaborating with the University of Minnesota's Center for Infectious Disease Research and Policy's Vaccine Integrity Project. The AAP has been talking with payers to ensure its recommendations will be covered by insurance.

"The AAP urges every insurer to cover all the vaccines that are included in this immunization schedule," Dr. Kressly said. "AAP is committed to working with our partners at the local, state and federal levels to make sure every child, in every community has access to vaccines."

AAP recommends all young and high-risk children get vaccinated against COVID-19, diverging from CDC policy

NEWS PROVIDED BY

American Academy of Pediatrics

By Melissa Jenco

Study: **AAP recommends all young and high-risk children get vaccinated against COVID-19, diverging from CDC policy.**

Current as of August 19, 2025

The AAP recommends all young children ages 6-23 months get vaccinated against COVID-19 along with older children in certain risk groups, based on evidence on who can benefit the most from the vaccine.

The guidance differs from federal policy that removes routine recommendations for healthy children but allows vaccination after a conversation with a health care provider. AAP published its COVID-19 vaccine recommendations Tuesday along with a revised child and adolescent immunization schedule that also includes updated guidance on respiratory syncytial virus (RSV) immunizations and flu vaccines.

"It's clear that we're in a different place in the pandemic than we were four or five

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years ago in terms of risks to healthy older kids," said Sean T. O'Leary, M.D., M.P.H., FAAP, chair of the AAP Committee on Infectious Diseases (COID). However, "the risk of hospitalization for young children and those with high-risk conditions remains pretty high."

The rate of COVID-19 hospitalization for children under 2 years is the highest among pediatric age groups and for children ages 6-23 months, it is comparable to people ages 50-64 years, according to the Centers for Disease Control and Prevention (CDC). More than half of these young children hospitalized for COVID-19 did not have an underlying medical condition.

All children ages 6-23 months without a contraindication should get vaccinated with a 2025-'26 COVID vaccine formula regardless of whether they previously received any doses or have had a SARS-CoV-2 infection, according to the AAP policy Recommendations for COVID-19 Vaccines in Infants, Children, and Adolescents. The policy details the number of doses needed based on vaccination history.

For children ages 2-18 years, the AAP recommends a single dose of age-appropriate 2025-'26 COVID-19 vaccine regardless of vaccination status for those who

are at high risk of severe COVID-19,

are residents of long-term care facilities or other congregate settings,

have never been vaccinated or

have household contacts at high risk for severe COVID-19.

Children not in one of these groups whose parent or guardian desires their protection from COVID-19 also should be offered a single dose of the updated vaccine.

The guidance differs from that of the CDC, which no longer recommends routine COVID vaccination for healthy children. Under CDC guidance, children can be vaccinated after a discussion with a health care provider. However, shared clinical decision-making can be difficult to implement because it lacks clear guidance and does not emphasize the importance of vaccinating people at high risk of severe disease.

In early July, the AAP and other major medical groups sued Health and Human Services Secretary Robert F. Kennedy Jr. for unilaterally removing routine vaccination recommendations, without scientific evidence. The AAP also has been critical of Kennedy replacing members of the CDC's Advisory Committee on Immunization Practices with new people who have espoused anti-vaccine viewpoints. The AAP announced in June it would continue to publish its own vaccine recommendations and schedule. It has a long history of providing evidence-based guidance on vaccines.

COID crafted the AAP's COVID-19 vaccine guidance after consultation with a variety of experts and a thorough review of recent scientific data. The AAP has been collaborating with professional societies, payers and partner organizations to share approaches for developing evidence-based clinical guidance on COVID, flu and RSV for the upcoming respiratory virus season. The societies also have been collaborating with the University of Minnesota's Center for Infectious Disease Research and Policy's Vaccine Integrity Project.

"We were able to review the most recently available data on COVID-19 vaccine safety and effectiveness, as well as the recent data on risk of hospitalization across different age groups and risk conditions," Dr. O'Leary said. "We worked with a diverse group of experts, including COID members, outside consultants and many partner societies, to craft our guidance. We strongly considered keeping a universal recommendation, but because it was clear that there are some children definitely at higher risk, we felt that emphasizing those risk groups was important, while still leaving room for vaccination for anyone who desires it."

Under the AAP guidance, any available COVID-19 vaccine appropriate by age and health status can be used. The Food and Drug Administration (FDA) recently updated licensing for Moderna's Spikevax vaccine to cover people ages 6 months through 64 years with at least one underlying condition that puts them at high risk for severe disease and for everyone 65 years and older.

Novavax's Nuvaxovid vaccine is licensed for people ages 12-64 years with an underlying condition that puts them at high risk for severe disease and everyone 65 years and older.

The AAP is monitoring reports the FDA may not renew emergency use authorization for Pfizer's COVID-19 vaccine for young children.

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Study to test if mothers' diet prevents early sign of food allergy in babies

NEWS PROVIDED BY

National Institute of Health

By NIH Communications

Study: **Study to test if mothers' diet prevents early sign of food allergy in babies**

Current as of August 5, 2025

NIH trial to assess if eating peanuts, eggs during pregnancy, breastfeeding protects infants.

A National Institutes of Health (NIH)-sponsored clinical trial testing whether maternal consumption of peanuts and eggs during pregnancy and breastfeeding prevents babies from developing an early sign of allergies to these foods began today. Food allergy affects about 8% of children in the United States and sometimes causes severe or life-threatening reactions. Peanut and egg are two of the most common early-childhood food allergens. The study will enroll pregnant mothers who are not allergic to peanut or egg but whose babies are at high risk for food allergy because the mother has a parent, sibling or child with allergic disease. NIH's National Institute of Allergy and Infectious Diseases (NIAID) is funding the trial.

"Introducing food allergens such as peanut and egg into infants' diets around four to six months of age has proven to be an important element of food allergy prevention, but this intervention comes too late for some children," said Alkis Togias, chief of NIAID's Allergy, Asthma, and Airway Biology Branch. "We need additional, earlier strategies to help prevent the development of food allergies in children at high risk for them."

Studies have found that before some infants

ever eat peanut or egg products, their immune systems have already produced an antibody called immunoglobulin E (IgE) against these foods, and this antibody is a precursor of food allergy. These findings indicate a need to develop early childhood food allergy prevention strategies that precede the introduction of solid foods.

So far, research on the relationship between consumption or avoidance of allergenic foods by mothers during pregnancy and breastfeeding and the development of food allergy in their babies has yielded contradictory results. The new clinical trial aims to clearly determine the efficacy of including peanuts and eggs in expecting mothers' diets before and after birth to prevent their babies from developing IgE against those foods before they eat them.

The study team will enroll 504 mother-infant pairs, one quarter at University of Rochester Medicine in Rochester, New York, and three quarters elsewhere nationwide. The mothers will be assigned at random to either eat or avoid peanut and egg, beginning in their third trimester and continuing through breastfeeding. Investigators will provide guidance on the amounts of peanut and egg to eat weekly or guidance on how to avoid eating peanut and egg, as appropriate. Mothers will be encouraged to feed their infants breast milk exclusively for at least three months. The main goal of the study is to learn the proportion of infants in each group whose blood has IgE against peanut, egg or both at age 4 to 6 months, before they ever eat those foods.

Study investigators and others involved in assessing and analyzing the data will not know which mother-infant pairs are in the peanut and egg avoidance group and which are in the consumption group. Mother-infant pairs will be followed until the children turn 1 year old.

The study, called Expecting Mother's Study of Consumption or Avoidance of Peanut and Egg (ESCAPE), will be led by Kirsi Järvinen-Seppo, M.D., Ph.D., chief of Pediatric Allergy and Immunology and Founders' Distinguished Professor in Pediatric Allergy at University of Rochester Medicine. Results are expected in 2029.

On World Breastfeeding Week, UNICEF and WHO underscore importance of sustained investment

NEWS PROVIDED BY

World Health Organization

By Indonesian Communication Team

Study: **On World Breastfeeding Week, UNICEF and WHO underscore importance of sustained investment**

Current as of August 1, 2025

As Indonesia commemorates World Breastfeeding Week 2025, UNICEF and the World Health Organization (WHO) are highlighting the importance of strengthening support systems for breastfeeding mothers across the country.

World Breastfeeding Week is observed around the world from 1–7 August. In Indonesia, this important occasion is observed throughout the month of August, under the theme: "Prioritize Breastfeeding: Create Sustainable Support Systems".

UNICEF and WHO commend the Government of Indonesia's continued commitment to protect, promote and support breastfeeding. The rate of exclusive breastfeeding among infants under six months has steadily increased, rising from 52% in 2017 to 66.4% in 2024. However, many infants are not exclusively breastfed for the full six months – the duration required to achieve the full health benefits.

With reliable and long-lasting support, mothers can better access help when they need it, wherever they are – at work, home or in their community. This includes skilled counselling from trained health workers, workplace policies and physical arrangements that enable breastfeeding, and ongoing support from community networks.

"By investing in support systems for breastfeeding mothers, we create a vital a safety net that ensures no mother has to navigate breastfeeding challenges alone," said UNICEF Indonesia Representative, Maniza Zaman. "When women and their babies are supported to breastfeed successfully, it sets off a chain of positive outcomes – not only for the child's development, but also for stronger families, healthier communities and ultimately a better future for the nation."

"Indonesia's steady rise in exclusive breastfeeding is a remarkable achievement and reflects the commitment of families, communities and the health system," said Dr N. Paranietharan, WHO Representative to Indonesia. "With stronger support systems, every mother in Indonesia can have the resources needed to exclusively breastfeed for the full recommended six months, giving every child the healthiest start to life."

Breastfeeding is a baby's first source of protection and nutrition. UNICEF and WHO recommend that infants are breastfed within one hour of birth and exclusively breastfed in their first six months of life, with no other foods and liquids provided.

Evidence shows that breastfeeding boosts children's cognitive development by 3–4 IQ points, reduces overweight and obesity risk and provides lifelong protection against non-communicable diseases. Babies who are not breastfed are up to 14 times more likely to die before their first birthday than those who are exclusively breastfed during their first six months.

Unlike formula production, breastfeeding is also environmentally sustainable, lowering carbon emissions and reducing packaging waste.

UNICEF and WHO call on all stakeholders – the government, workplaces, healthcare institutions, the private sector and communities – to accelerate efforts to support breastfeeding mothers. Key actions include:

- Expand access to skilled breastfeeding counselling through health facilities, community services, and remote options such as tele-counselling established by the Ministry of Health.
- Ensure all maternity facilities implement the Ten Steps to Successful Breastfeeding under the Baby-Friendly Hospital Initiative.
- Enforce the International Code of Marketing of Breast-milk Substitutes (BMS) to protect families from unethical marketing.
- Integrate breastfeeding education into healthcare training curricula.
- Adopt family-friendly policies—

including paid maternity leave, lactation rooms and flexible workplace arrangements.

On World Breastfeeding Week, countries urged to invest in health systems and support breastfeeding mothers

NEWS PROVIDED BY

World Health Organization

By Laura Keenan & Nadia Samie-Jacobs

Study: **On World Breastfeeding Week, countries urged to invest in health systems and support breastfeeding mothers**

Current as of August 4, 2025

Joint statement by WHO Director-General Dr Tedros Adhanom Ghebreyesus and UNICEF Executive Director Catherine Russell

Breastfeeding is one of the most effective ways to ensure a baby's health, development, and survival in the earliest stages of life. It acts as their first vaccine, providing protection against diseases including diarrhoea and pneumonia.

Investing in breastfeeding is an investment in the future, yet only 48 per cent of infants under six months are exclusively breastfed – well below the World Health Assembly target of 60 per cent by 2030. This is due to the overlapping challenges for new mothers, health workers, and health systems.

Millions of mothers around the world do not receive timely and skilled support in a healthcare setting when they need it most.

Only a fifth of countries include infant and young child feeding training for the doctors and nurses who care for new mothers. This means the majority of the world's mothers leave hospitals without proper guidance on how to breastfeed their babies and when to introduce complementary feeding.

In many countries, health systems are too often under-resourced, fragmented, or poorly equipped to deliver quality, consistent, evidence-based breastfeeding support.

Investment in breastfeeding support remains critically low even though every dollar invested generates US$35 in economic returns.

As we mark World Breastfeeding Week under the theme, "Prioritize breastfeeding: Create sustainable support systems", WHO and UNICEF are calling on governments, health administrators, and partners to invest in high-quality breastfeeding support, by:

- ensuring adequate investment in equitable, quality maternal and newborn care, including breastfeeding support services;
- increasing national budget allocations for breastfeeding programmes;
- integrating breastfeeding counselling and support into routine maternal and child health services, including antenatal, delivery, and postnatal care;
- ensuring all health service providers are equipped with the skills and knowledge required to support breastfeeding, including in emergency and humanitarian settings;
- strengthening community health systems to provide every new mother with ongoing, accessible breastfeeding support to for up to two years and beyond; and
- protecting breastfeeding by ensuring that the International Code of Marketing of Breast-milk Substitutes is applied in all health facilities and systems.
- Strengthening health systems to support breastfeeding is not just a health imperative, it is a moral and economic imperative. WHO and UNICEF remain committed to supporting countries to build resilient health systems that leave no mother or child behind.

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WHO releases new target product profile for diagnostic tests to detect serious bacterial infections in young infants

NEWS PROVIDED BY

World Health Organization

By WHO Media Team

Study: **WHO releases new target product profile for diagnostic tests to detect serious bacterial infections in young infants**

Current as of August 6, 2025

The World Health Organization (WHO) has released a new target product profile to guide the development of in vitro diagnostic tests for serious bacterial infections in newborns and young infants, including neonatal sepsis – a leading cause of infant deaths globally.

Each year, an estimated 2.3 million newborns die, with low- and middle-income countries bearing the greatest burden. Roughly 15% of these deaths are due to sepsis. Evidence suggests that 84% of newborn deaths due to infection could be prevented through early diagnosis and appropriate clinical management.

Current diagnostic methods for serious bacterial infection, including bacterial sepsis, are often inadequate, inaccessible, or unaffordable in both hospital and non-hospital health facilities. Diagnostic methods, such as blood cultures and molecular diagnostics, face significant limitations, including low sensitivity and long turnaround times, high costs and infrastructure requirements, and inadequate performance.

"Timely and accurate diagnosis tests for serious bacterial infection is critical to reducing newborn mortality," said Dr Yvan J-F. Hutin, Director of the Department of Antimicrobial Resistance at WHO.

"This new target product profile outlines the essential features needed in diagnostic tools to improve clinical decision-making,

reduce unnecessary antibiotic use and prevent antimicrobial resistance, especially in low-resource settings where the burden of neonatal sepsis remains critical," said Dr Silvia Bertagnolio, Head of the Antimicrobial Resistance Surveillance, Evidence and Laboratory Strengthening Unit at WHO.

The target product profile defines the essential and desirable characteristics of in vitro diagnostic tests to support early, accurate diagnosis among infants aged 0–59 days. The tests are designed to address two priority use cases: diagnosis occurring in primary health care settings and in higher level health-care facilities.

In many settings, health-care workers rely solely on clinical assessment to decide whether to initiate antibiotics or refer a newborn to a hospital – often without the support of reliable diagnostic tools. This test would help health-care professionals identify newborns and young infants who require referral to hospital for further management and/or treatment with antibiotics.

In hospitals, in vitro diagnostic tests would help health-care professionals determine whether to initiate bacterial sepsis management and antibiotics in infants with serious bacterial infections and sepsis.

The target product profile is intended for diagnostic manufacturers, regulatory bodies, health ministries, and other stakeholders involved in the development and implementation of diagnostic technologies.

The target product profile was developed by the WHO Department of Antimicrobial Resistance through a strong collaboration with the Department of Maternal, Child Health and Ageing, and with the contribution of WHO Research for Health Department. WHO acknowledges the substantial contribution of many partners, especially FIND, and the essential role of the target product development group members.

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WHO and partners launch global guide to advance respectful maternal and newborn care

NEWS PROVIDED BY

World Health Organization

By WHO Media Team

Study: **WHO and partners launch global guide to advance respectful maternal and newborn care**

Current as of August 7, 2025

Leading global health and development agencies today released a new first-of-its-kind implementation guide to help countries provide respectful, dignified care and eliminate mistreatment across maternal and newborn health services: Compendium on respectful maternal and newborn care.

This mistreatment takes different forms, ranging from neglect and abuse to non-consensual medical procedures – and evidence suggests it remains alarmingly widespread in many countries around the world.

A 2019 study by the UN's Special Programme in Human Reproduction (HRP), supported by World Health Organization (WHO), in four countries found that over 40% of women experienced abuse or discrimination during labour or childbirth – with some being slapped, shouted at, or forcibly restrained. Communication gaps are also prevalent in many contexts. Across this same study, women reported that more than 75% of episiotomies and 60% of vaginal examinations were performed without their consent.

"Respectful care is not a luxury – it is a fundamental human right that shapes health outcomes and people's experiences of care," said Dr Hedieh Mehrtash, Technical Officer and co-lead of the compendium. "Yet too often, women are not part of decision-making and are treated with contempt or even abuse. This new publication is a call to action for health systems to proactively embed dignity, equity, and respect into every aspect of maternity and newborn care."

A decade of focus

Representing the first global effort to translate principles of respectful care into tangible implementation strategies, WHO's new Compendium on respectful maternal and newborn care marks a major milestone in this area.

It builds on the Organization's 2014 statement on preventing disrespect and abuse during childbirth, and reflects growing global recognition that mistreatment in health care not only harms individuals but also undermines trust in health systems and jeopardizes people's health.

"Ending mistreatment and achieving respectful care doesn't happen by chance – it needs the commitment of health authorities and all stakeholders so that these principles are purposefully integrated within the health system," said Anayda Portela, Scientist at WHO, also a co-lead of the compendium. "This means creating environments where women, parents and health workers feel safe, heard and valued, while ensuring services are equipped to provide the quality care every woman, baby and family needs and deserves."

A global resource for local action

Targeted primarily at health programme managers, the publication gathers recent evidence, provides links to practical tools, and outlines actions to help countries strengthen respectful care across a full range of maternal and newborn services. Cited interventions include enacting supportive laws and policies; training and supporting health workers by improving their work environments and ensuring they have up to date knowledge and skills, and involving women and families in planning and monitoring of care.

The publication also highlights critical areas where mistreatment is often overlooked, such as perinatal mental health and support for bereaved families, or for parents caring for small and sick newborns.

The guide urges decision-makers to identify and address root causes of mistreatment. These may include harmful policies, for example, around forced detention for non-payment of medical bills or mother–baby separation; stigma and discrimination, for instance, against younger or unmarried women or those from disadvantaged

backgrounds; as well as heavy workloads of health workers or under-resourcing in health systems.

Making respectful care a reality

Over the past decade, research and advocacy in this area have significantly expanded. WHO has developed different tools and standards to support quality improvements – from advancing midwifery models of care to WHO's rights-based clinical recommendations for maternal and newborn health. The new compendium complements these various products, providing a useful 'one-stop' reference for available resources and evidence on respectful care.

The Compendium is published by WHO together with UNFPA, UNICEF and the United Nations' Special Programme on Human Reproduction (HRP), with support from Jhpiego and the MOMENTUM Country and Global Leadership programme.

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Keeping Your Baby Safe
from respiratory infections

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How to protect your little ones from germs and viruses

Cold and flu season can be dangerous - especially for vulnerable infants and children. Fortunately, there are proven protective measures that we can take to stay healthy.

Here's what you can do...

Wash Your Hands

- This is the single, most important thing you can do to stop the spread of viruses.
- Use soap.
- Wash for more than 20 seconds.
- Use alcohol-based hand sanitizers.



Limit Contact with Others



- Stay home when you can.
- Avoid sick people.
- Wear a face mask when out.
- Change your clothes when you get home.
- Tell others what you're doing to stay safe.

Provide Protective Immunity

- Hold your baby skin-to-skin.
- Give them your breast milk.
- Stay current with your family's immunizations.



Take Care of Yourself

- Stay connected with your family and friends.
- Drink more water and eat healthy foods.
- Seek mental health support.
- Sleep when you can.



Get Immunized

Vaccinations save lives. Protecting your baby from RSV, COVID-19, flu, and pertussis lowers their risks for complications from respiratory infections.



WARNING

Never Put a Mask on Your Baby

- Because babies have smaller airways, a mask can make it harder for them to breathe.
- Face masks and their straps pose a risk of suffocation and strangulation.
- Remember, a baby can't remove their mask if they're having trouble breathing.



If you feel sick or are positive for COVID-19

- Wash with soap and water and put on fresh clothes before holding or feeding your baby.
- Wear a mask to help stop viruses from spreading.
- Watch out for symptoms like fever, confusion, or trouble breathing.
- Ask for help caring for your baby and yourself while you recover.



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How to Care for a Baby with Signs of Withdrawal

Use the Right Words

I was exposed to substances in utero. I am not an addict. And my parent may or may not have a Substance Use Disorder (SUD).

Treat Us as a Dyad

Parents and babies need each other. Help us bond. Whenever possible, provide my care alongside my parents and teach them how to meet my needs.



Support Rooming-In

Babies like me do best in a calm, quiet, dimly-lit room where we can be close to our caregivers.



Promote Kangaroo Care

Skin-to-skin care helps me stabilize and self-regulate. It helps relieve the autonomic symptoms associated with withdrawal, promotes bonding, and helps me sleep.



Try Non-Pharmacological Care

Help me self-soothe. Swaddle me snugly in a flexed position that reminds me of the womb. Offer me a pacifier to suck on. Protect my sleep by "clustering" my care.



Provide Lactation Support

Human milk is important to my gastrointestinal health and breastfeeding is recommended when my parent is HIV-negative and receiving medically-supervised care. Help my family reach our pumping and feeding goals.



Treat My Symptoms

If I am experiencing signs of withdrawal that make it hard for me to eat, sleep, and be soothed, create a care plan to help me wean comfortably.

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Peer Reviewed

Physicians at Teaching Hospitals: Guidelines for Attending Physicians, APPs, and Trainees

Scott D. Duncan, MD, MHA

A similar article on supervision of trainees was published in August 2023. Given that new trainees have begun within the last month, the concepts in that article are worth repeating.

Guidelines for Teaching Physicians, Interns & Residents, commonly referred to as PATH (Physicians at Teaching Hospitals), are established by CMS and form the basis for billing and payment policies for services provided in teaching settings. These guidelines ensure accurate reimbursement under the Medicare Physician Fee Schedule for services delivered by teaching physicians, interns, and residents, and are typically followed by state Medicaid programs. Commercial insurers are not mandated to follow these guidelines; however, many payors adopt elements of the guidelines to establish payment policies.

"These guidelines ensure accurate reimbursement under the Medicare Physician Fee Schedule for services delivered by teaching physicians, interns, and residents, and are typically followed by state Medicaid programs. Commercial insurers are not mandated to follow these guidelines; however, many payors adopt elements of the guidelines to establish payment policies."

Question

A neonatologist in a teaching hospital attends a delivery with a pediatric resident. The infant is apneic at birth and requires PPV via face mask. The neonatologist instructs the resident to intubate the infant, which the resident accomplished under direct, bedside supervision. The infant required additional PPV via endotracheal tube, with subsequent recovery. The infant was subsequently transferred to the NICU. Given the following codes, correct coding for the neonatologist includes:

99465: Delivery/birthing room resuscitation, provision of positive pressure ventilation and/or chest compressions in the presence of acute inadequate ventilation and/or cardiac output

31500: Intubation, endotracheal, emergency

A. **99465, 31500**

B. **99465**

C. **31500**

D. **There was no billable service**



Answer

A. **99465, 31500**

The focus of this question is on the supervision of trainees and collaboration among care providers. In this scenario, the neonatologist is supervising a trainee.

Question

True or False: PATH Guidelines apply to advanced practice providers (e.g., APRNs, NNPs, etc.)

Answer

False. APPs are not considered trainees; therefore, the PATH Guidelines do not apply. A future article will address the collaboration between physicians and APPs.

Question

True or False: A co-signature or attestation of a resident's note that states *"Patient seen and evaluated"* is considered adequate documentation per PATH Guidelines.

Answer

False. Co-signature alone of a resident, fellow, or student note, or phrases like the above, are insufficient to support billing for teaching physician services. For services involving trainees, the teaching physician must personally document at least the

following:

- The supervising physician personally performed the service or was physically present during the key or critical portions of the service when performed by the resident, and
- Participation of the supervising physician in the management of the patient.

"When a teaching physician supervises a resident trainee, the physician must ensure that proper documentation is maintained, demonstrating their involvement in the patient's care. In the preceding case involving attendance at delivery, documentation should detail the request for attendance at delivery, services provided, and disposition of the infant."

Documentation Pearls

When a teaching physician supervises a resident trainee, the physician must ensure that proper documentation is maintained, demonstrating their involvement in the patient's care. In the preceding case involving attendance at delivery, documentation should detail the request for attendance at delivery, services provided, and disposition of the infant. The medical record must be signed and dated with a legible signature or a valid form of identification. Documentation may be:

- Dictated and transcribed
- Typed
- Handwritten and/or
- Computer-generated

The physician may place a 'macro' on the medical record; however, they must be placed anew each day. It is not sufficient for a physician to solely use a macro for documentation purposes without noting the physician's presence during the provision of services and a description of the patient-specific services provided on that date, thereby justifying the level of billing for that encounter. Examples might include:

Global Critical and Intensive Care Service example:

I was present for key or critical portions of this patient's care, and I reviewed the patient's findings and note with the resident. I provided face-to-face coordination of the health care team, inclusive of the resident, and directed the patient's assessment and management as reflected in the documentation above.

Newborn Nursery example:

I was present in the nursery where I examined the patient and directed the patient's care. I reviewed the above note with the resident and agree with the documented findings, assessment, and plan of care.

Minor Procedure example:

As the teaching physician supervising the resident, I was physically present during the entire procedure.

Attendance at Delivery example:

I was present and participated in the initial stabilization of the patient in the delivery room, as reflected in the resident's documentation.

Question

A 5-day-old patient is re-admitted for phototherapy due to hyperbilirubinemia. The resident documents their H&P after seeing the patient at 23:15 on September 1st. On the morning of September 2nd, the neonatologist rounds on the patient, documents an attestation on the H&P note verifying the history, plan, and assessment recorded by the resident. Additionally, the neonatologist updates the current exam and records any interim changes in the patient's condition and plan.

Which is the correct date of service for the teaching physician to report their initial hospital care code?

A. September 1st

B. September 2nd

C. No billable service



Answer

B. **September 2nd**

In this scenario, the teaching physician did not provide a billable service until the following day. When a medical resident admits a patient to a hospital late at night and the teaching physician does not see the patient until the next calendar day, the teaching physician must document that they personally saw and examined the patient and participated in the management of the patient. The

teaching physician may reference the resident's note in lieu of re-documenting the pertinent history, examination, and medical decision-making, given that the patient's condition has not changed, and the teaching physician agrees with the resident's note. The teaching physician's note should reflect any changes in the patient's condition and clinical course at the time the patient is seen personally by the teaching physician. The teaching physician's charges must reflect the actual date of service when the teaching physician saw the patient and the patient's current status.

Question

Mrs. Smith has requested a circumcision for her son prior to discharge. After ensuring informed consent has been obtained and the patient has a normal examination, the upper-level resident performs the circumcision in the adjoining nursery, while the teaching physician is available in the NICU. Correct coding for this encounter would be:

A. **54150**: Circumcision performed using a clamp or other device, with or without regional dorsal penile or ring block

B. **No billable service**

Answer

B: No billable service

Minor procedures are those that take only a few minutes to complete and involve relatively little decision-making once the need for the procedure is determined. With these types of procedures, the teaching physician must be present for the entire procedure. The teaching physician or trainee may document the supervising physician's presence. For other surgical, high-risk, or complex procedures, the supervising physician must be present during all critical and key portions of the procedure and immediately available to furnish services throughout the entire procedure.

Question

True or False: An APP can charge a procedure or evaluation and management code if supervising a resident.

Answer

False. While some programs may allow an APP to supervise a resident under certain conditions, an APP is not considered a supervising physician according to PATH guidelines.

Hopefully, this overview is helpful. "There are plenty of difficult obstacles in your *PATH Guidelines*. Don't allow yourself to become one of them." – Borrowed from Ralph Marston.

References:

1. Coding for Pediatrics 2025, 30th Edition. American Academy of Pediatrics
2. Current Procedural Terminology 2025, Professional Edition. American Medical Association

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2024

Protecting your baby and family from

Respiratory Viruses:

What parents need to know this RSV and flu season

Like COVID-19, RSV (Respiratory Syncytial Virus) and flu affect the lungs and can cause serious breathing problems for children and babies. Talk to your family about the risks.

Certain diagnoses can make children and babies more vulnerable for serious complications from respiratory viruses - including prematurity, chronic lung disease, and heart conditions.

You can limit the spread of viruses by wearing a mask, washing your hands with soap & water, using an alcohol-based hand sanitizer, and getting vaccinated.

The fewer germs your baby is exposed to, the less likely they are to get sick. Let people know you need their help to stay well. Limit visitors. Avoid crowds. Stay away from sick people.

Immunizations save lives. Stay up-to-date with your family's flu vaccinations and COVID-19 boosters. This helps our community stay safe by stopping the spread of deadly viruses.

Babies older than 6 months can get a flu shot and COVID-19 vaccinations. Now there are new vaccines for RSV for adults and antibody shots for babies that can help protect them.

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2q34 Microdeletion Involving *ERBB4* and Congenital Heart Disease: A Case Report

Hua Wang, M.D., Ph.D., FACMG

Abstract:

Background*: Microdeletions involving 2q34 and* ERBB4 *have been associated with neurodevelopmental disorders, epilepsy, and variable penetrance, but their relationship to congenital heart disease (CHD) remains unclear. Deletions at 3q12.1 are rare and often classified as variants of uncertain significance (VUS) without a definitive phenotype association.* ***Case Presentation****: We report a male infant with tetralogy of Fallot (TOF) with pulmonary atresia and major aortopulmonary collaterals (MAPCAs), found to have a 299-kb deletion at 2q34 encompassing exon 2 of* ERBB4 *and a 250-kb deletion at 3q12.1 involving* CMSS1, FILIP1L, MIR3921, *and* TMEM30CP*. Both deletions were paternally inherited. A comprehensive CHD gene panel was negative. Development has been normal to date, and no seizure activity has been confirmed.* ***Conclusion****: This case highlights a paternally inherited* ERBB4 *exon 2 deletion without neurodevelopmental symptoms in early infancy, adding to evidence of reduced penetrance and variable expressivity. The absence of an established association between these CNVs and TOF suggests the cardiac phenotype may be unrelated or multifactorial. Long-term developmental surveillance remains warranted.*

Introduction:

Microdeletions at 2q34 involving *ERBB4* (OMIM 600543) are rare, with fewer than 15 reported patients. *ERBB4* encodes a receptor tyrosine kinase essential for neural and cardiac development; haploinsufficiency shows autosomal-dominant inheritance with variable expressivity. Reported phenotypes include developmental delay, intellectual disability (ID), epilepsy, and behavioral abnormalities, whereas CHD has not been consistently observed (1–3).

"Microdeletions at 2q34 involving ERBB4 *(OMIM 600543) are rare, with fewer than 15 reported patients. ERBB4 encodes a receptor tyrosine kinase essential for neural and cardiac development; haploinsufficiency shows autosomal-dominant inheritance with variable expressivity. Reported phenotypes include developmental delay, intellectual disability (ID), epilepsy, and behavioral abnormalities, whereas CHD has not been consistently observed. "*

Kasnauskienė et al. described a de novo *ERBB4* disruption in a patient with ID and language impairment (2). Hyder et al. reported nine patients from five families with *ERBB4* exonic deletions, spanning asymptomatic carriers to individuals with ID or epilepsy, supporting reduced penetrance (1). Westphal et al. further corroborated associations between 2q34 microdeletions and epilepsy, developmental delay, and behavioral issues, nominating *ERBB4* as a candidate neurodevelopmental gene (3).

The present case describes a paternally inherited *ERBB4* exon 2 deletion in a patient with complex CHD and no neurodevelopmental symptoms at 8 months, reinforcing the concept of phenotypic nonpenetrance. Ongoing developmental surveillance is recommended for children with pathogenic Copy Number Variations (CNV), given evolving phenotypes and possible future reclassification (4). In summary, *ERBB4* exon 2 deletions at 2q34 are rare and variably expressive; careful developmental monitoring and genetic follow-up are warranted in affected individuals and asymptomatic carriers (1–4).

"The present case describes a paternally inherited ERBB4 *exon 2 deletion in a patient with complex CHD and no neurodevelopmental symptoms at 8 months, reinforcing the concept of phenotypic nonpenetrance."*

Case Description:

The patient is an 8-month-old male born at 37 weeks 4 days to healthy, non-consanguineous parents of mixed Caucasian/Ashkenazi Jewish (paternal) and German/Mexican (maternal) ancestry. Pregnancy was notable for maternal anemia, anxiety, and depression; noninvasive prenatal testing was low risk (male fetus).

Second-trimester ultrasound identified TOF with pulmonary atresia and MAPCAs; prenatal genetic counseling was provided. Birth was uneventful aside from the known cardiac lesion (Apgars 7 and 8; weight 3340 g, length 51 cm, head circumference 35 cm). In the newborn period, he received prostaglandin E1 for ductal patency and underwent central shunt placement at one month to augment pulmonary blood flow. Cardiac imaging revealed hypoplastic branch pulmonary arteries, a right-sided aortic arch with mirror-image branching, and a large malalignment ventricular septal defect (VSD).

At two months, he was hospitalized for hypoxia. A brief episode of possible seizure activity was reported, but no event was confirmed, and an EEG was not completed; no antiseizure therapy was initiated. Transient nocturnal oxygen desaturation led to PRN

"Second-trimester ultrasound identified TOF with pulmonary atresia and MAPCAs...Cardiac imaging revealed hypoplastic branch pulmonary arteries, a right-sided aortic arch with mirror-image branching, and a large malalignment ventricular septal defect (VSD)."

home oxygen. Development at 8 months was age-appropriate (social engagement, babbling, rolling both ways, sitting with some assistance, and weight-bearing when supported). He receives weekly developmental monitoring via the Inland Regional Center and was evaluated by a high-risk infant clinic with normal results.

Physical examination revealed a well-appearing infant with mild dysmorphisms (relatively large ears with thin helices, long/flat philtrum). Cardiac exam post-repair revealed no murmurs; neurologic exam was normal.

Other tests: Head ultrasound is normal; abdominal ultrasound is negative for intussusception. Post-repair echocardiography showed an RV-to-PA conduit, VSD closure, improved pulmonary artery caliber with mild residual right PA hypoplasia, and preserved biventricular function.

Genetic Testing and Interpretation:

Genetic testing: Chromosomal microarray (cord blood) identified:

- **2q34 deletion (299 kb)** involving *ERBB4* exon 2 (NM_005235) → **likely pathogenic**; confirmed by metaphase Fluorescence In Situ Hybridization (FISH) (CTD-2016K1). Intragenic *ERBB4* loss-of-function variants are linked to ID, developmental delay, epilepsy, and behavioral abnormalities, with reduced penetrance reported in inherited cases (1–3).
- **3q12.1 deletion (250 kb)** including *CMSS1, FILIP1L, MIR3921, TMEM30CP* → **VUS**; confirmed by FISH (RP11-138H6). None of these genes has established haploinsufficiency phenotypes, and similar deletions are present in population controls (23).

Parental studies showed the mother to be negative and the father to be carrying both deletions. The father is clinically asymptomatic, though multiple paternal relatives have autism spectrum disorder. A comprehensive CHD gene panel (comprising 398 genes, Next-Generation Sequencing) was negative, indicating a reduced likelihood of a monogenic etiology for the cardiac phenotype.

Management and Outcome:

Following diagnosis of TOF with pulmonary atresia/MAPCAs, the patient received a central aortopulmonary shunt at one month, then complete repair with RV-to-PA conduit and VSD closure. Postoperative imaging showed improved pulmonary arteries and preserved ventricular function.

Genetics follow-up included counseling on the paternally inherited *ERBB4* and 3q12.1 deletions, reduced penetrance, and a 50% recurrence risk. Options for future pregnancies (chorionic villus sampling/amniocentesis; preimplantation testing) were discussed. Early-intervention developmental monitoring continues; no confirmed seizures have been reported to date. At the last follow-up, growth and neurodevelopment were normal, and cardiac status was stable.

"Genetics follow-up included counseling on the paternally inherited ERBB4 and 3q12.1 deletions, reduced penetrance, and a 50% recurrence risk. Options for future pregnancies (chorionic villus sampling/amniocentesis; preimplantation testing) were discussed. Early-intervention developmental monitoring continues; no confirmed seizures have been reported to date. At the last follow-up, growth and neurodevelopment were normal, and cardiac status was stable."

Discussion:

***ERBB4* haploinsufficiency: neurodevelopmental impact and penetrance:**

ERBB4 (HER4) encodes a receptor tyrosine kinase in the EGFR/ERBB family mediating neuregulin-1 (NRG1) signaling critical for neural crest migration, neuronal differentiation, synaptic plasticity, and interneuron development (1, 2). Human series and single-gene reports link *ERBB4* haploinsufficiency with ID, developmental delay, epilepsy, and behavioral abnormalities, while animal work shows cognitive and motor effects in *Erbb4*-deficient models (1, 2). Penetrance is incomplete, as asymptomatic carriers are observed in multiplex families (1–3). The paternally inherited deletion in our patient, whose father is unaffected, fits this pattern and supports longitudinal developmental surveillance (4).

Cardiac biology and human genetics of *ERBB4:*

Although neurodevelopmental phenotypes are most consistent, converging evidence supports a role for ERBB4 in cardiac morphogenesis and postnatal myocardial health. *Erbb4* knockout mice die in mid-gestation due to failed ventricular trabeculation (13); conditional ventricular knockout leads to dilated cardiomyopathy and contractile dysfunction (15). Isoform-specific models suggest that canonical ERBB4 signaling is necessary for normal morphogenesis (16). In human pluripotent stem cells, ERBB4 activation via p38γ MAPK regulates early cardiogenesis through NKX2.5 and GATA4 (17), and all ERBB4 isoforms can mediate NRG1-induced hypertrophy, with expression declining postnatally and during hypertrophic remodeling (18). ERBB4 expression persists in both neonatal and adult ventricular myocytes, supporting its roles in maintenance and stress responses (14,

20–22). Human data parallel these mechanisms: CNVs and rare damaging *ERBB4* variants have been reported in CHD, including hypoplastic right heart and conotruncal defects (5, 6). Large cohort analyses implicate *ERBB4* as a dominant CHD gene and show enrichment of genes expressed in both the heart and brain in syndromic CHD with neurodevelopmental delay (7–11). This biological plausibility suggests a potential contribution of *ERBB4* haploinsufficiency to broader CHD phenotypes—even though a direct, consistent association with TOF has not been established.

"Although neurodevelopmental phenotypes are most consistent, converging evidence supports a role for ERBB4 in cardiac morphogenesis and postnatal myocardial health.* Erbb4 *knockout mice die in mid-gestation due to failed ventricular trabeculation; conditional ventricular knockout leads to dilated cardiomyopathy and contractile dysfunction. Isoform-specific models suggest that canonical ERBB4 signaling is necessary for normal morphogenesis."

Clinical Implications:

The American Heart Association estimates that 20–30% of CHD is attributable to identifiable genetic variants, including CNVs and single-gene disorders, and recommends genetic evaluation—particularly when extracardiac features or family history are present (12). For *ERBB4* CNVs, best practice includes anticipatory guidance and longitudinal developmental monitoring, given variable expressivity and potential later-onset neurocognitive or cardiac manifestations (8, 10, 12).

Conclusions:

This case illustrates the potential contribution of ERBB4 haploinsufficiency to the pathogenesis of congenital heart disease, specifically tetralogy of Fallot with major aortopulmonary collateral arteries. While *ERBB4* deletions have primarily been reported in association with neurodevelopmental disorders, emerging evidence suggests a broader spectrum that includes conotruncal heart malformations. Our patient expands this phenotypic range and highlights the importance of careful clinical, genetic, and familial evaluation in children with rare CNVs.

The coexistence of a second 3q12.1 CNV, though of uncertain significance, also underscores the complexity of interpreting multiple copy number variants and the potential for genetic modifiers. Given the variable expressivity and incomplete penetrance of *ERBB4*-related disorders, longitudinal follow-up of affected individuals and at-risk family members is warranted. Future research combining functional modeling and large-scale genomic data will be crucial in clarifying the pathogenicity of *ERBB4* haploinsufficiency in congenital heart disease.

"This case illustrates the potential contribution of ERBB4 haploinsufficiency to the pathogenesis of congenital heart disease, specifically tetralogy of Fallot with major aortopulmonary collateral arteries. While* ERBB4 *deletions have primarily been reported in association with neurodevelopmental disorders, emerging evidence suggests a broader spectrum that includes conotruncal heart malformations. Our patient expands this phenotypic range and highlights the importance of careful clinical, genetic, and familial evaluation in children with rare CNVs."

Take-Home Messages:

- **ERBB4 is essential for cardiac morphogenesis**; haploinsufficiency may underlie select conotruncal malformations.
- **Variable expressivity and incomplete penetrance** mean some carriers remain asymptomatic.
- **Additional CNVs may act as modifiers**, complicating interpretation and counseling.
- **Genetic testing adds diagnostic and prognostic value** in congenital heart disease with extracardiac features.
- **Long-term surveillance is crucial for patients and at-risk family members, even when they are** currently asymptomatic.

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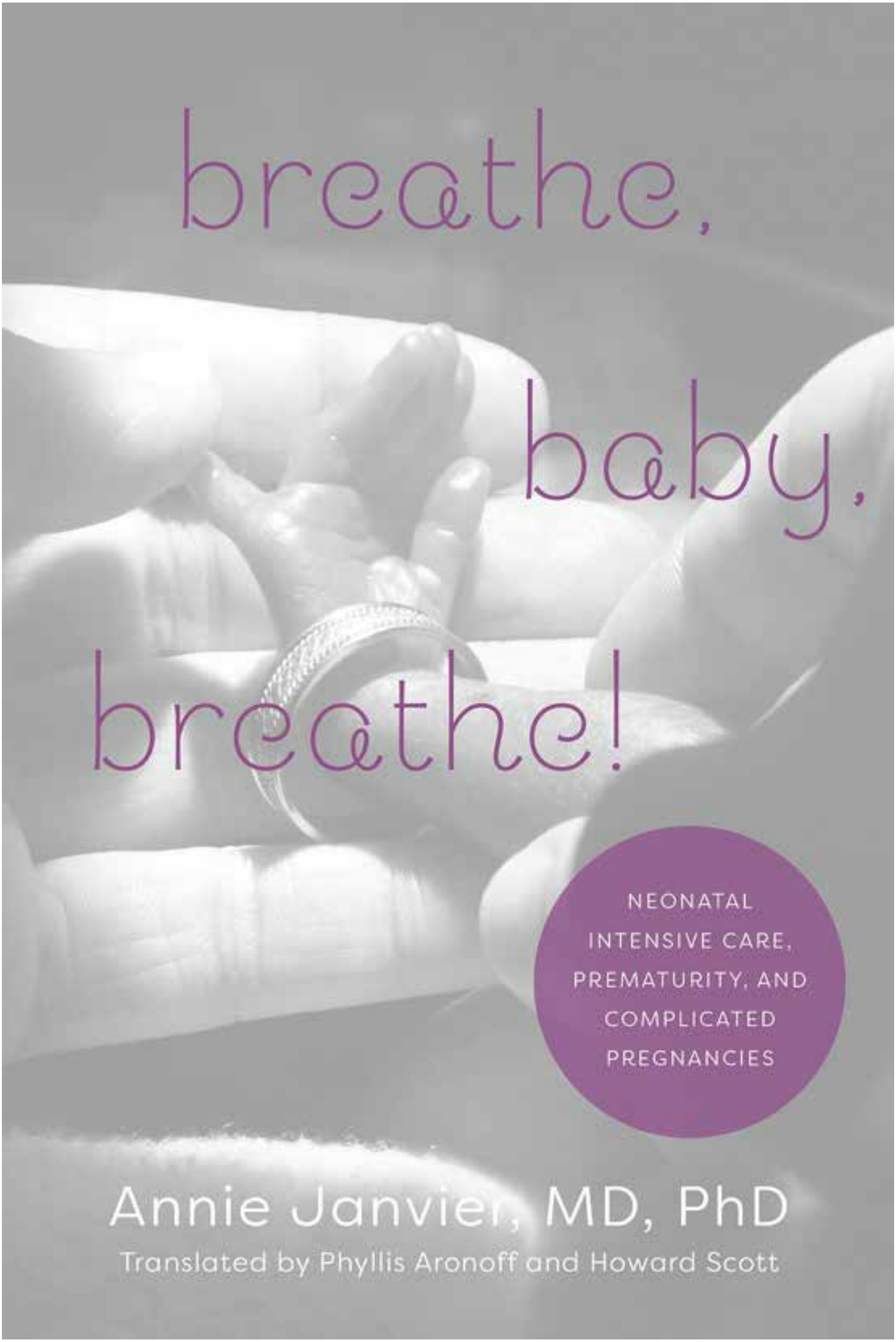
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*Source: Respirator Syncytial Virus and African Americans

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58.1%	Breastfeeding	50.2%
7.3%	Low Birth Weight	11.8%
60.1%	Siblings	71.6%
1%	Crowded Living Conditions	3%

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Family Centered Care July Webinar Summary

Morgan Kowalski



"By the end of the session, attendees were able to identify at least two concrete approaches to enhance relational safety in daily clinical interactions and consider how caring with intention shapes clinical practice, their sense of purpose, and the well-being of babies and families."

The Family-Centered Care Taskforce held its 21st free educational webinar on July 10, 2025, featuring Mary Coughlin, MS, NNP-NCC-E, and Jessi Barnes, MSN, RN, RNC-NIC, NPD-BD, C-ELBW. Mary and Jessi opted for an interactive session, *"Leveraging Human Connection: Caring with Intention," to help participants evaluate current practices and identify opportunities to strengthen family-clinician partnerships and promote self-*care. By the end of the session, attendees were able to identify at least two concrete approaches to enhance relational safety in daily clinical interactions and consider how caring with intention shapes clinical practice, their sense of purpose, and the well-being of babies and families.

"Jessi, a neonatal outreach coordinator for the Atlanta Perinatal Region and NICU Clinical Nurse Educator at Grady Memorial Hospital, became a NICU parent a little over three years ago when her daughter, Aurelia, was born at 27 weeks gestation following a home placental abruption. Her 75-day NICU stay was marked by emotional stress, fear, and uncertainty, but also by moments of advocacy and transformation."

Jessi, a neonatal outreach coordinator for the Atlanta Perinatal Region and NICU Clinical Nurse Educator at Grady Memorial Hospital, became a NICU parent a little over three years ago when her daughter, Aurelia, was born at 27 weeks gestation following a home placental abruption. Her 75-day NICU stay was marked by emotional stress, fear, and uncertainty but also by moments of advocacy and transformation. She shared the importance of parental voice in care decisions, how trauma-informed developmental care (TIDC) acknowledges the emotional journey of families–not just the clinical one, and how NICU trauma leaves a long-term emotional imprint on the lives of families.

"Mary is a pioneer in trauma-informed developmental care and President and Founder of Caring Essentials Collaborative, which is best known for its Trauma-Informed Professional (TIP) Certificate Program."

Mary is a pioneer in trauma-informed developmental care and President and Founder of Caring Essentials Collaborative, which is best known for its Trauma-Informed Professional (TIP) Certificate Program. Mary became a NICU grandparent a little over two years ago, cementing her calling to this work. She expanded on the foundations of trauma-informed developmental care, which are safety, trust, connection, and equity, and emphasized that both babies and families experience trauma in the NICU.

Together, Mary and Jessi challenged the traditional definition of 'value' in NICU care. Instead of equating value solely with efficiency, cost-savings, and medical metrics, they invited webinar participants to expand their understanding of value to include family experiences, the psychological safety of parents, and the well-being of clinicians. Examples of providing this kind of value to families specifically include: 1) listening to and lifting family voices, 2) ensuring parents are present for procedures, firsts, and milestones when they want to be, and 3) acknowledging a family's NICU trauma rather than minimizing it. The following prompt was offered to guide reflection: *"What would it mean to define value in the NICU based on what families and bedside staff need to feel safe, heard, and supported?"*

"Examples of providing this kind of value to families specifically include: 1) listening to and lifting family voices, 2) ensuring parents are present for procedures, firsts, and milestones when they want to be, and 3) acknowledging a family's NICU trauma rather than minimizing it. The following prompt was offered to guide reflection: 'What would it mean to define value in the NICU based on what families and bedside staff need to feel safe, heard, and supported?'"

Trauma-informed developmental care benefits NICU staff as well. Burnout and moral distress are often linked to systems that prevent connection with families and require staff to operate in 'survival mode". TIDC encourages an organizational culture that supports clinician well-being, not just productivity. This might look like respect for boundaries, safe spaces for debriefing, clear communication from leadership, and consistency in practice.

"TIDC encourages an organizational culture that supports clinician well-being, not just productivity. This might look like respect for boundaries, safe spaces for debriefing, clear communication from leadership, and consistency in practice."

The session ended with a call to action, urging attendees to reflect on their personal definitions of value in the NICU, explore how policies, workflow, and language can be changed to center trauma-informed principles, involve parents as partners in–not just recipients of–care, and advocate for spaces like Family Partnership Councils.

Concrete Approaches to Enhance Relational Safety in Daily Clinical Interactions:

1. Consistent, Transparent Communication
   - Introduce yourself every time you enter the room, even if you have met the family before.
   - Explain what you are doing *before* you touch the baby or equipment.
   - Offer transparent updates (including uncertainties) while reassuring families that they are not alone.
2. Intentional Presence at the Bedside
   - Slow down during interactions; make eye contact, use calm body language, and pause to ask, "*What questions do you have right now?"*
   - Prioritize parent participation in care, such as diaper changes and skin-to-skin, even if it takes longer.
   - Sit when possible instead of standing over your parents; this signals collaboration rather than power.
3. Collaborative Decision-Making
   - Involve parents in the planning and care of their infant whenever possible.
   - Ask, *"What are your priorities for your baby today?"*
   - Honor family values and cultural practices when creating care plans.
4. Repairing Relationships After Missteps
   - If conflict or miscommunication arises, acknowledge it and seek a resolution. This might look like, *"I realize what I said may have come across as dismissive. That wasn't my intention, and I want to better support you."*
5. Trauma-Informed Language
   - Use phrases like, *"Your baby is working on…"* rather than *"Your baby can't..."*
   - Say, *"We will try again"* instead of *"your baby couldn't do it."*

Caring with Intention–Impact on Practice and Well-Being:

- **For Clinical Practice:** Intentional caring shifts focus from tasks and efficiency to relationships. This human-centered approach strengthens teamwork and reduces errors by fostering open communication.
- **For NICU Staff:** Acting with intention reminds staff of the reasons they do this work. Achieving trust with parents or witnessing a baby's serene calmness during

skin-to-skin care reinforces meaning and resilience.

- **For Babies and Families:** Relational safety reduces parental stress, enhances bonding with their infant, and promotes positive neurodevelopmental outcomes. Families who feel safe and respected are more confident in caring for their infant, both in the NICU and after discharge.

To view a recording of our July Webinar, click here.

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FCC Taskforce Webinar

September 11, 2025
11-12:30pm PT

Screening Now: Standardizing Mental Health Assessments for NICU Parents



Megan Paulsen
MD (she/her)
Neonatologist &
NICU Parent,
Children's Hospital
Minnesota



Sarah Swenson
MD, DPhil, FAAP (she/her)
Assistant Professor,
Division of Neonatology
University of Nebraska
Medical Center
Children's Nebraska

Long-Term Outcomes: Preparing Families for Future Health



Lauren Ingledow
(she/her)
Co-Founder and
Director,
Adult Preemie
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Michelle M. Kelly
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From Battlefield to Bedside: A Father's NICU Journey

Carolyn TenEyck, RN

"Adam Wood is no stranger to battlefields. As an Army veteran who served more than two decades—including the first deployment to Afghanistan after 9/11—he has seen more tragedy and chaos than most of us can imagine. However, nothing prepared him for the battlefield he never saw coming: the neonatal intensive care unit (NICU)."

Adam Wood is no stranger to battlefields. As an Army veteran who served more than two decades—including the first deployment to Afghanistan after 9/11—he has seen more tragedy and chaos than most of us can imagine. However, nothing prepared him for the battlefield he never saw coming: the neonatal intensive care unit (NICU).

"Seven years ago in Connecticut, Adam and his wife welcomed their son, Brady, into the world at just 25 weeks gestation. Weighing only one pound, four ounces, Brady was a 'micro-preemie,' born an entire trimester early. His arrival followed multiple rounds of IVF, a pregnancy complicated by his mother's polycystic kidney disease, and weeks of uncertainty."

Brady's Early Fight:

Seven years ago in Connecticut, Adam and his wife welcomed their son, Brady, into the world at just 25 weeks gestation. Weighing only one pound, four ounces, Brady was a "micro-preemie," born an entire trimester early. His arrival followed multiple rounds of IVF, a pregnancy complicated by his mother's polycystic kidney disease, and weeks of uncertainty.

At exactly 25 weeks, Brady was delivered in silence—without the reassuring cry that parents wait to hear. Adam recalls, *"It was the quietest delivery I'd ever heard. I didn't hear my son's voice for three months."*

Brady spent 135 days in the NICU, cycling through every possible machine and intervention. One day, Adam was told it was time to say goodbye. Standing over his son's isolette, he begged the universe for a chance. Miraculously, Brady fought back—and began to recover.

The Power of Connection:

From that moment, Adam and his wife committed to celebrating every milestone and staying as connected as possible. Skin-to-skin care, reading aloud, and diaper changes became their lifeline.

"When they could not be physically present, technology bridged the gap. Through a bedside camera system, capable of providing real-time viewing on any secure internet device, Adam and his wife were able to see their son at any hour of the day."

When they could not be physically present, technology bridged the gap. Through a bedside camera system, capable of providing real-time viewing on any secure internet device, Adam and his wife were able to see their son at any hour of the day. *"Not everyone can live in the NICU 24/7,"* Adam shares. *"Being able to check in at 2 a.m. gave us peace of mind. Seeing Brady's image—even for a moment—brought us calm."*

A Different Kind of PTSD:

Adam draws a striking parallel between war zones and NICUs: *"People think PTSD only happens in combat. But NICU parents live it every day. The alarms, the flashing monitors—they're our battlefield."*

Even today, Adam feels the echo of those moments. He believes NICU parents deserve more support—and that tools like AngelEye play a crucial role in helping them feel like parents, not just bystanders.

From Experience to Advocacy:

Adam now serves on AngelEye Health's Parent & Family Collaborative, offering insights grounded in lived experience.

He emphasizes the importance of empathy-driven innovation: *"Imagine it's your child in that isolette. What would you need to feel connected, informed, empowered? That's how we need to think."*

"Brady's journey did not end when he left the NICU. Though he faced challenges early on, he has continued to defy the odds. Today, he is a bright and curious 7-year-old about to begin second grade."

Brady Today:

Brady's journey did not end when he left the NICU. Though he faced challenges early on, he has continued to defy the odds. Today, he is a bright and curious 7-year-old about to begin second grade. He loves math, science, and engineering, has a sharp sense of humor, and can spend hours reading or building with Legos. His resilience is a daily reminder of the fighting spirit that defines so many preemies.

Preemie Adventures:

Inspired by Brady, Adam created **Preemie Adventures**, an organization and book series that celebrates milestones, supports NICU families, and provides resources worldwide. Since 2021, he has authored four children's books—including two co-written with neonatologist Dr. Prem Fort—that help parents and kids alike navigate the NICU journey with hope.

Adam also serves as a parent advisor on the Neonatal Research Network and continues to share his family's story to inspire others.

Adam's story is more than a testimony—it is a rallying cry for empathy, innovation, and never forgetting the parents behind every isolette.

Follow Adam and Preemie Adventures:
Website: preemieadventures.com
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Disclosure: *The authors are employees of AngelEye Health.*

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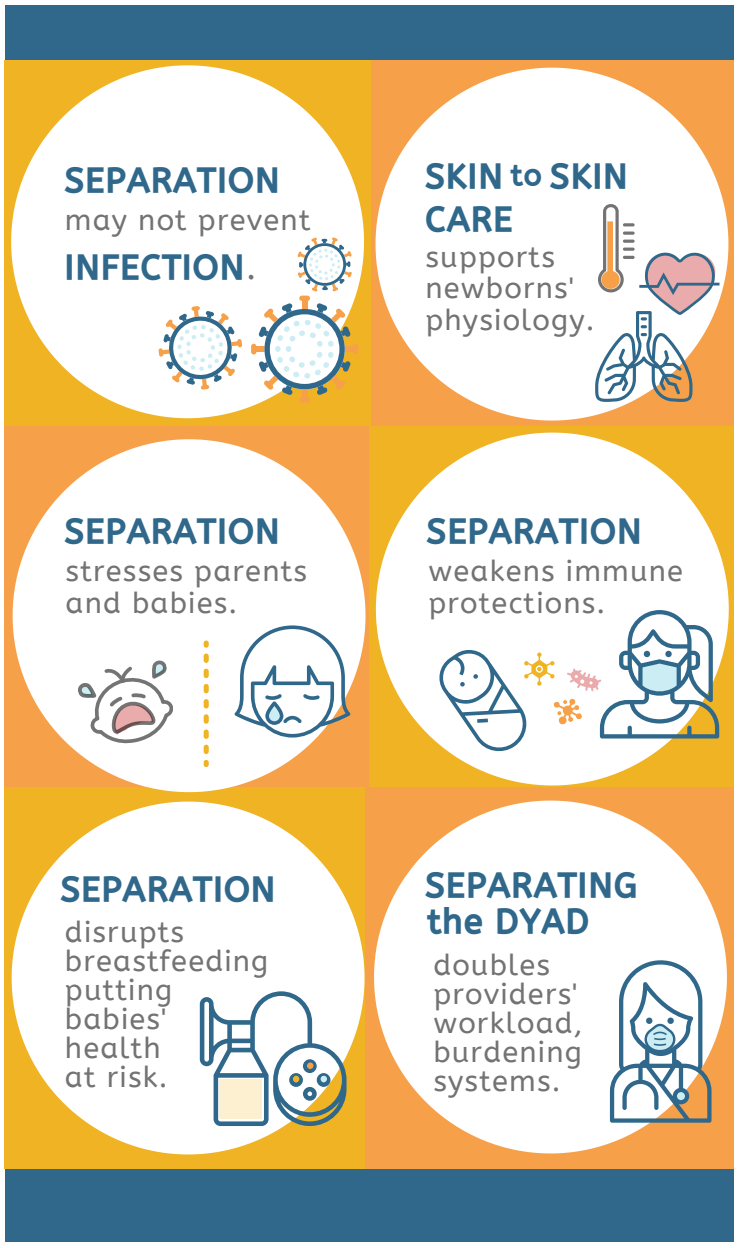
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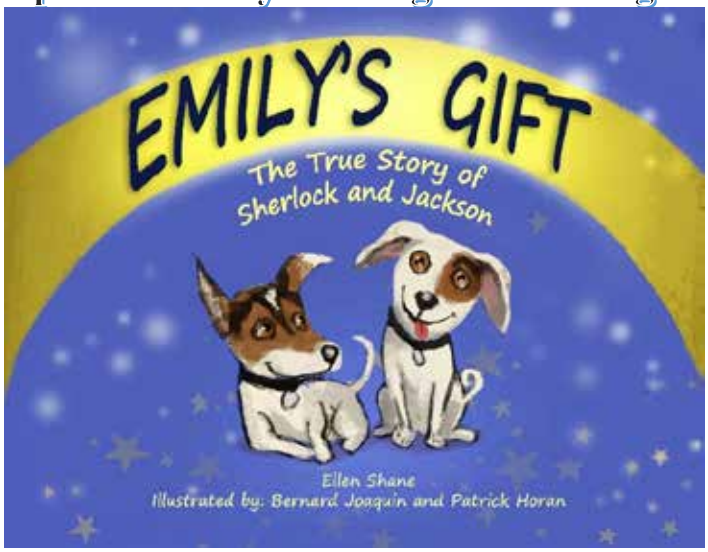
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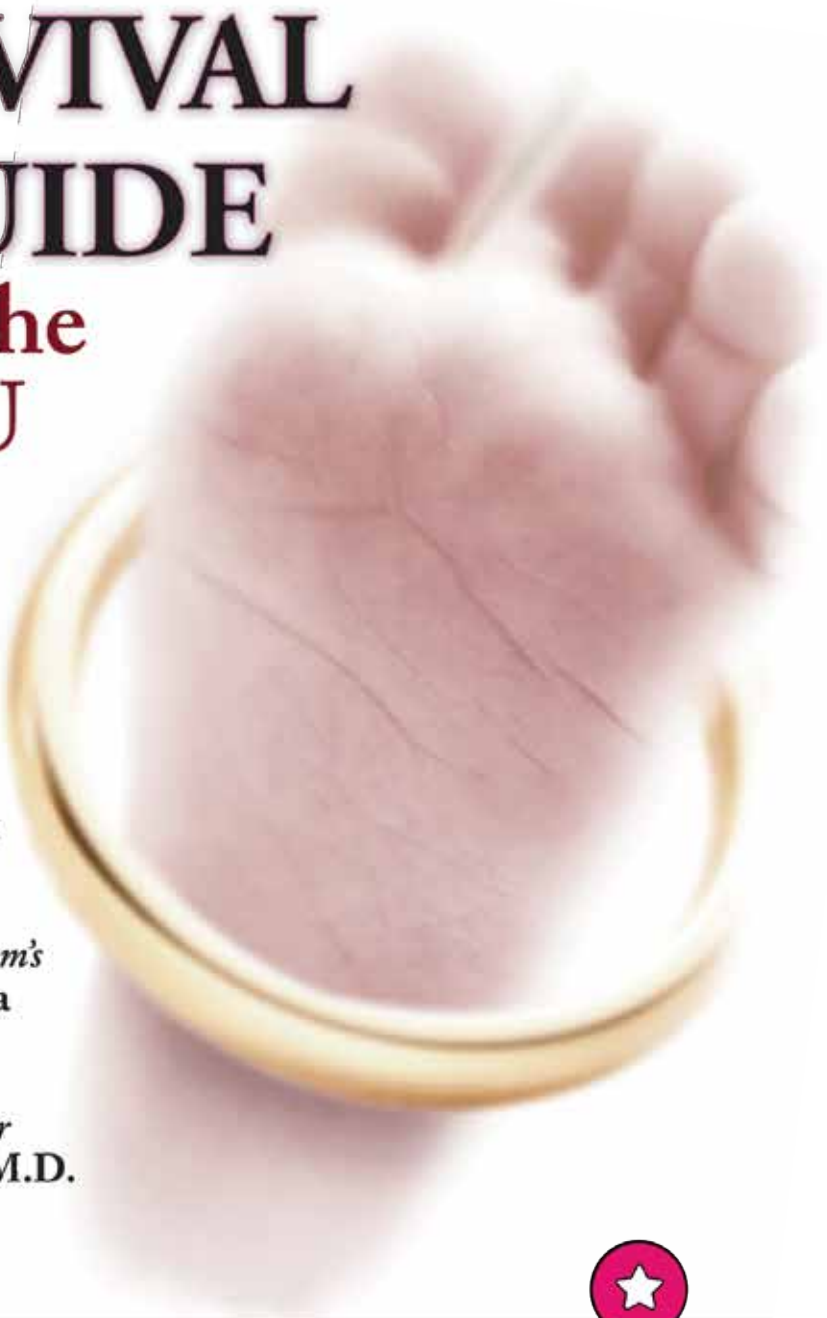




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The Preemie Parent's SURVIVAL GUIDE to the NICU



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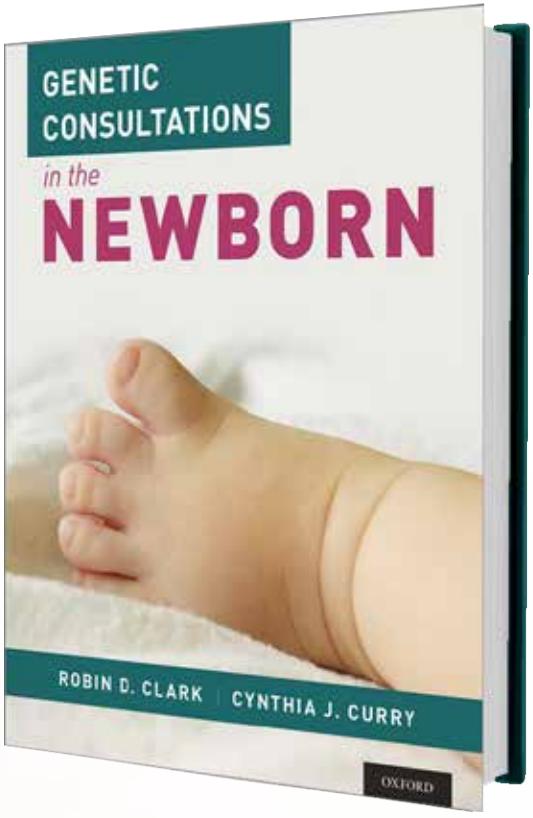
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Clinical Pearl: Situational Awareness: Perceive, Comprehend and Predict

Gustave H. Falciglia, MD, MSCI, MSHQPS, Joseph R. Hageman, MD, Mitchell Goldstein, MD, MBA

"Managing critically ill preterm and term infants is challenging. It requires clinicians to gather and review multiple pieces of data. These data are typically disparate and located in different areas (e.g., physical exam at the bedside, current vitals on the bedside monitor, historical events with the bedside nurse or electronic health record [EHR] documentation, labs and images in various sections of the EHR)."

Introduction:

Managing critically ill preterm and term infants is challenging. It requires clinicians to gather and review multiple pieces of data. These data are typically disparate and located in different areas (e.g., physical exam at the bedside, current vitals on the bedside monitor, historical events with the bedside nurse or electronic health record [EHR] documentation, labs and images in various sections of the EHR). After gathering data, clinicians must ascertain the meaning, describe the patient's state, and then formulate a plan. Ultimately, this knowledge must be disseminated to clinicians across various disciplines.

What describes this ubiquitous and important process? This process is known as situational awareness, and this article aims to define it, describe how breakdowns lead to medical errors, and provide ways to avoid them.

Situational Awareness:

An excellent review article on situational awareness by Green et al defines situational awareness by clinicians as:

> "*the **perception** of elements of the environment within a volume of time and space, the **comprehension** of their meaning and the **projection** of their status in the near future* (1) "

In other words, do clinicians have an accurate internal sense of what is going on and what is likely to happen? The first step, perception, requires clinicians to recognize data in their environment (e.g., NICU). (1) These data include infant vitals, labs, imaging results, nursing observations, etc. (e.g., respiratory distress, tachycardia, poor urine output, normal blood pressure in a febrile term infant at 1 week). The second step, comprehension, requires clinicians to understand the meaning and significance of these data (e.g., the term infant with bacterial sepsis in compensated shock). (1) Finally, projection requires clinicians to predict what will happen based on their comprehension of the data, and then act accordingly (e.g., obtain intravenous [IV] access, then start antibiotics, and intravenous fluids to manage impending uncompensated septic shock). (1)

"Critical care medicine requires collaboration and coordination of multiple clinicians from various specialties. Situational awareness can be extended to the dynamics of the care team. It includes clear roles and responsibilities for each clinician involved, as well as guidance on how to handle unexpected events, including whom to approach and when to approach this individual with an issue. (2)"

Critical care medicine requires collaboration and coordination of multiple clinicians from various specialties. Situational awareness can be extended to the dynamics of the care team. It includes clear roles and responsibilities for each clinician involved, as well as guidance on how to handle unexpected events, including whom to approach and when to approach this individual with an issue. (2)

"There is a fracture, I need to fix it" – Breakdowns in Situational Awareness:

Breakdown in situational awareness can occur for several reasons, leading to medical errors. Reasons include distraction, interruption, tunnel vision, primacy effect, and confirmation bias. (1) When clinicians are distracted or bedside rounds are interrupted, they may fail to detect cues from the environment. Approximately three-

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quarters of situational awareness in airplane pilots was attributed to a lack of recognition of changing environmental conditions. (1) Stress can help clinicians focus on a task. While some focus is beneficial, there is such a thing as too much focus, which can result in tunnel vision. (2) Tunnel vision occurs when clinicians become overly focused on a task or aspect of care at the expense of the big picture. (1) A comical example of tunnel vision is the infamous "*Orthopedics vs. Anesthesia*" cartoon video on YouTube of an orthopedic surgeon and an anesthesiologist played by two bears. (3) The surgeon repeatedly states, "*There is a fracture, I need to fix it*", while an exasperated anesthesiologist tries to alert the surgeon to the more pressing concern of asystole.

"Even when data or environmental signals are detected, there is a risk that clinicians may ignore or fail to integrate new information into their assessment. The primacy effect refers to the phenomenon where clinicians tend to adhere closely to an initial assessment despite new evidence to the contrary. (1)"

Even when data or environmental signals are detected, there is a risk that clinicians may ignore or fail to integrate new information into their assessment. The primacy effect refers to the phenomenon where clinicians tend to adhere closely to an initial assessment despite new evidence to the contrary. (1) A related concept is confirmation bias, where clinicians ignore or reject new data contrary to the initial evidence and only recognize data that confirms the initial assessment. (1) In our previous examples of a full-term infant with respiratory distress and low urine output, the clinicians may have surmised that the infant had sepsis. Additional findings, such as persistently low sodium and high potassium, might be dismissed as lab errors or related to IV fluids or antibiotics; however, they may also be signs that the infant's findings are secondary to early-onset congenital adrenal hyperplasia, rather than sepsis.

"Additional findings, such as persistently low sodium and high potassium, might be dismissed as lab errors or related to IV fluids or antibiotics; however, they may also be signs that the infant's findings are secondary to early-onset congenital adrenal hyperplasia, rather than sepsis."

Avoiding Breakdowns in Situational Awareness:

Maintaining situational awareness is challenging in a NICU environment that is full of distractions and complex patients. Two books that touch upon aspects are "*Thinking, Fast and Slow*" by Daniel Kahneman and "*Managing the Unexpected*" by Karl Weick and Kathleen Sutcliffe. (4, 5) Kahneman was a Nobel prize-winning behavioral Economist. In his book, he described the two modes of human thought. Type 1 thought is fast and based on gut instinct and pattern recognition. (4) It makes good decisions most of the time and is efficient; however, it is susceptible to human biases such as confirmation bias. Type 2 is a slow and methodical analysis of data. It requires careful reflection and can help avoid susceptibility to bias; however, it is energy-intensive. (4) During times of hunger or fatigue (e.g., post-call), clinicians are more likely to engage in Type 1 thought with increased risk for susceptibility to bias.

Weick and Sutcliffe identify five common characteristics of high-reliability organizations. These are organizations that perform inherently risky operations with lower-than-expected error rates (e.g., nuclear power, naval aviation, commercial aviation). (5) One of the five salient findings was the concept, "reluctance to simplify". In these organizations, workers must comprehend the meaning of the data (step two in situational awareness) by simplifying disparate pieces of information into a concise one-liner. This is necessary to act and predict the future. In our original example, it is correct that the clinician surmised the data indicated bacterial sepsis. However, rather than embracing this simplification, they recommend that workers do it reluctantly and not be wedded to conclusions.

"In these organizations, workers must comprehend the meaning of the data (step two in situational awareness) by simplifying disparate pieces of information into a concise one-liner. This is necessary to act and predict the future. In our original example, it is correct that the clinician surmised the data indicated bacterial sepsis. However, rather than embracing this simplification, they recommend that workers do it reluctantly and not be wedded to conclusions."

There have been a few studies of situational awareness in critical care settings outside of the NICU. *Soberano et al* conducted a prospective observational study to assess situational awareness across a team of providers in the pediatric intensive care unit. (6) They surveyed a trio of clinicians, including the bedside nurse, respiratory therapist, and pediatric resident, several hours after the twice-daily unit huddles to discuss high-risk patients. Residents were less likely than nurses or therapists to correctly identify high-risk patients, suggesting that experience affects the ability to maintain situational awareness. This can be mitigated by increased involvement of trainees during bedside rounds. *Reader et al.* conducted another prospective observational study of clinicians in the adult intensive care unit. They surveyed a

variety of clinicians about the likelihood of a patient extubating, decompensating, surviving, or being discharged within the next 48 hours. (7) Again, resident predictions were not as strong as those of more experienced clinicians; however, correct trainee prediction was associated with resident involvement during rounds.

Therefore, the limited evidence suggests that maintaining situational awareness in a busy NICU requires fresh clinicians who are neither sleep-deprived nor hungry and who are willing to hold assessments on their patients. Routine timeouts before procedures or decisions may help clinicians to anticipate future events. (1) "Single visual display systems," where all data are displayed on one dashboard rather than distributed across various screens, may facilitate comprehension in academic settings, involving residents during rounds by actively encouraging questions and participation. (1)

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2024

Keeping Your Baby Safe

from respiratory infections

RSV
COVID-19
colds
flu

How to protect your little one from germs and viruses

This year's cold and flu season may be a dangerous one - especially for vulnerable infants and children. Fortunately, there are proven protective measures that we can take to stay healthy.

Here's what you can do...

Wash Your Hands

- This is the single, most important thing you can do to stop the spread of viruses.
- Use soap.
- Wash for more than 20 seconds.
- Use alcohol-based sanitizers.

Limit Contact with Others

- Stay home when you can.
- Stay 6 feet apart when out.
- Wear a face mask when out.
- Change your clothes when you get home.
- Tell others what you're doing to stay safe.

Provide Protective Immunity

- Hold baby skin-to-skin.
- Give them your breast milk.
- Stay current with your family's immunizations.

Take Care of Yourself

- Stay connected with your family and friends.
- Sleep when you can.
- Drink more water and eat healthy foods.
- Seek mental health support.

Immunizations Vaccinations save lives. Protect your baby from flu, pertussis, RSV, and COVID-19 by getting your immunizations.

WARNING

Never Put a Mask on Your Baby

- Because babies have smaller airways, a mask makes it hard for them to breathe.
- Masks pose a risk of strangulation and suffocation.
- A baby can't remove their mask if they're suffocating.

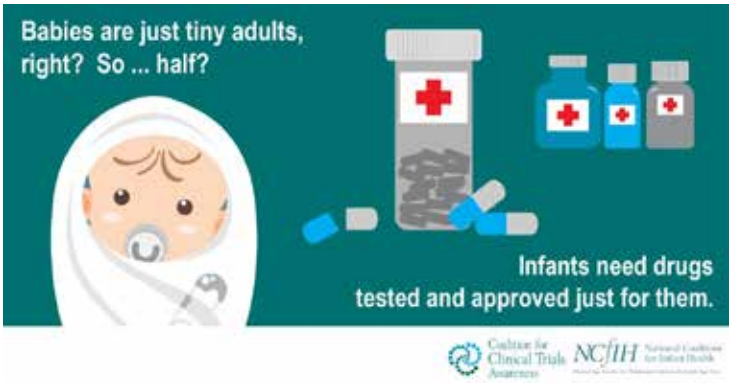
If you are positive for COVID-19

- Wash with soap and water and put on fresh clothes before holding or feeding your baby.
- Wear a mask to help stop the virus from spreading.
- Watch out for symptoms like fever, confusion, or trouble breathing.
- Ask for help caring for your baby and yourself while you recover.

We can help protect each other.

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Which Infants are More Vulnerable *to Respiratory Syncytial Virus?*

RSV is a respiratory virus with cold-like symptoms that causes 90,000 hospitalizations and 4,500 deaths per year in children 5 and younger. It's 10 times more deadly than the flu. For premature babies with fragile immune systems and underdeveloped lungs, RSV proves especially dangerous.

But risk factors associated with RSV don't touch all infants equally.*

*Source: Respirator Syncytial Virus and African Americans

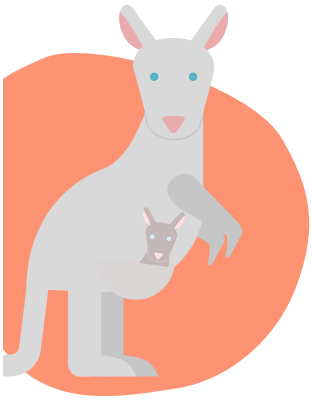
Caucasian Babies	Risk Factor	African American Babies
11.6%	Prematurity	18.3%
58.1%	Breastfeeding	50.2%
7.3%	Low Birth Weight	11.8%
60.1%	Siblings	71.6%
1%	Crowded Living Conditions	3%

AFRICAN AMERICAN BABIES bear the brunt of RSV. Yet the American Academy of Pediatrics' restrictive new guidlines limit their access to RSV preventative treatment, increasing these babies' risk.

AfPA Alliance for Patient Access

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SKIN-TO-SKIN CARE DURING COVID-19



GET INFORMED ABOUT THE RISKS + BENEFITS

work with your medical team to create a plan

GET CLEAN

WASH YOUR HANDS, ARMS, and CHEST

with soap and water for 20+ seconds. Dry well.





PUT ON FRESH CLOTHES

change into a clean gown or shirt.

IF COVID-19 + WEAR A MASK

and ask others to hold your baby when you can't be there



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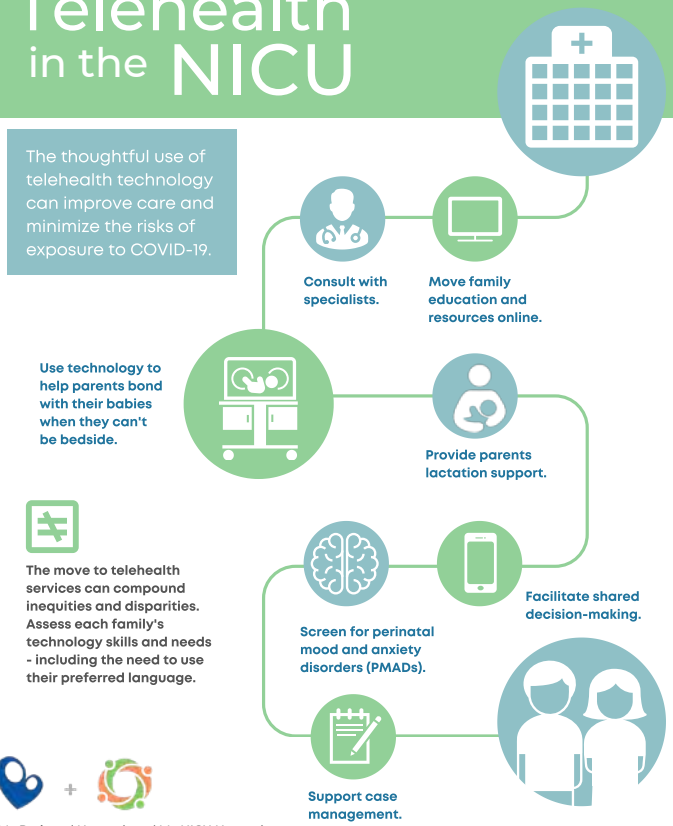
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NPN NICU PARENT NETWORK

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Telehealth in the NICU

The thoughtful use of telehealth technology can improve care and minimize the risks of exposure to COVID-19.



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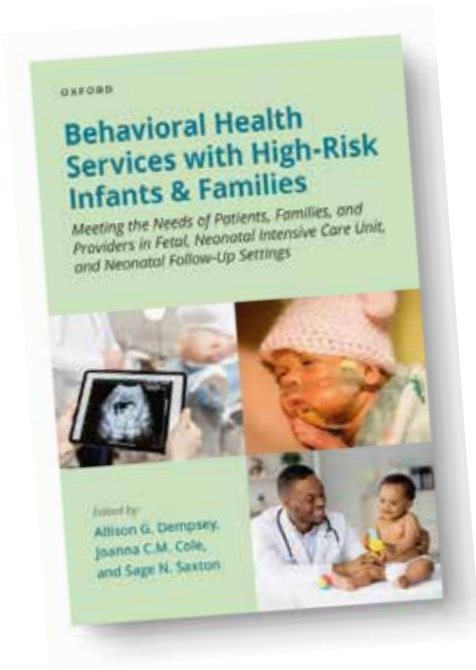
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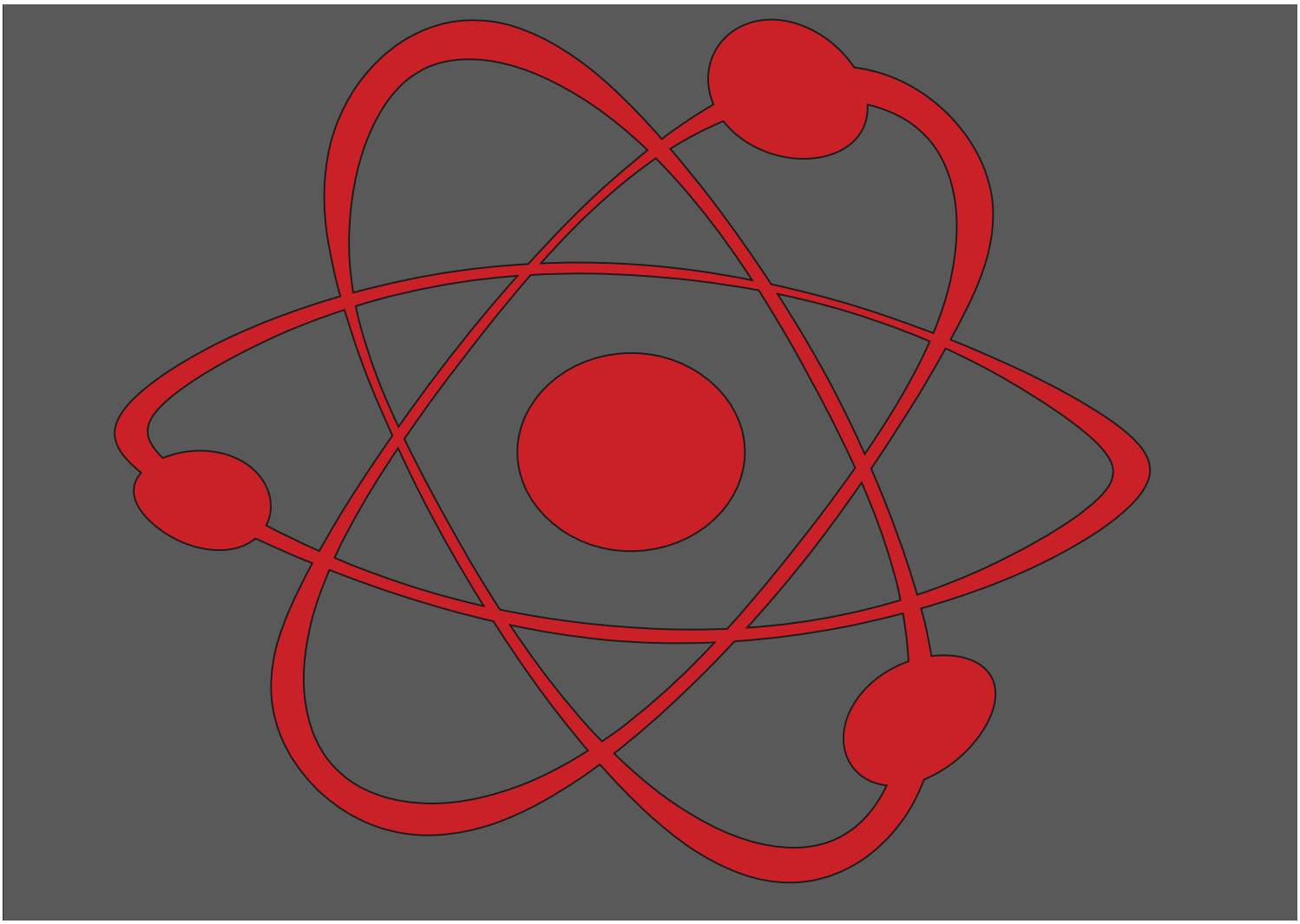
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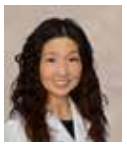
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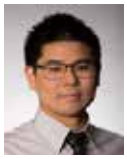
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Neonatology and the Arts

This section focuses on artistic work which is by those with an interest in Neonatology and Perinatology. The topics may be varied, but preference will be given to those works that focus on topics that are related to the fields of Neonatology, Pediatrics, and Perinatology. Contributions may include drawings, paintings, sketches, and other digital renderings. Photographs and video shorts may also be submitted. In order for the work to be considered, you must have the consent of any person whose photograph appears in the submission.

Works that have been published in another format are eligible for consideration as long as the contributor either owns the copyright or has secured copyright release prior to submission.

Logos and trademarks will usually not qualify for publication.

This month we continue to landscapes, feature artistic works created by our readers on the next to last page as well as photographs of birds on rear cover. Lorraine Dillon provides "My View Today at Lunchtime." For this edition, our art was graciously provided by Colleen Kraft, MD. It is a work called "Serpent and Harp" done by her son Tim. Our birds are from Dr. Shah, "Two Children."



Lily Martorell, MD

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Manuscript Submission: Instructions to Authors

1. Manuscripts are solicited by members of the Editorial Board or may be submitted by readers or other interested parties. Neonatology Today welcomes the submission of all academic manuscripts including randomized control trials, case reports, guidelines, best practice analysis, QI/QA, conference abstracts, and other important works. All content is subject to peer review.

2. All material should be emailed to: LomaLindaPublishingCompany@gmail.com in a Microsoft Word, Open Office, or XML format for the textual material and separate files (tif, eps, jpg, gif, ai, psd, SVG, or pdf) for each figure. Preferred formats are ai, SVG, psd, or pdf. tif and jpg images with sufficient resolution so as not to have visible pixilation for the intended dimension. In general, if acceptable for publication, submissions will be published within 3 months.

3. There is no charge for submission, publication (regardless of number of graphics and charts), use of color, or length. Published content will be freely available after publication. There is no charge for your manuscript to be published. NT does maintain a copyright of your published manuscript.

4. The title page should contain a brief title and full names of all authors, their professional degrees, their institutional affiliations, and any conflict of interest relevant to the manuscript. The principal author should be identified as the first author. Contact information for the principal author including phone number, fax number, e-mail address, and mailing address should be included.

5. A brief biographical sketch (very short paragraph) of the principal author including current position and academic titles as well as fellowship status in professional societies should be included. A picture of the principal (corresponding) author and supporting authors should be submitted if available.

6. An abstract may be submitted.

7. The main text of the article should be written in formal style using correct English. The length may be up to 10,000 words or longer with prior approval. Abbreviations which are commonplace in neonatology or in the lay literature may be used.

8. References should be included in standard "NLM" format (APA 7th is no longer acceptable). Bibliography Software should be used to facilitate formatting and to ensure that the correct formatting and abbreviations are used for references. EndNote X9 is suggested.

X9 9. Figures should be submitted separately as individual separate electronic files. Numbered figure captions should be included in the main file after the references. Captions should be brief.

10. Only manuscripts that have not been published previously will be considered for publication except under special circumstances. Prior publication must be disclosed on submission. Published articles become the property of the Neonatology Today and may not be published, copied or reproduced elsewhere without permission from Neonatology Today.

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Seeking content development experts for an AAP Project Advisory Committee (PAC)

The White Zone – Developing A Perinatal Loss Toolkit for LMICs

The Need: Over 2.4 million neonatal deaths and 2.6 million stillbirths occur each year; 98% occur in Low- and Middle-Income Countries (LMICs). While programs such as Helping Babies Breathe (HBB) and Essential Newborn Care (ENC 1 and 2) have revolutionized how providers in LMICs train in and provide neonatal resuscitation and post-delivery care for small and sick newborns, gaps remain in how to best offer end-of-life care and post-loss psychosocial care in these settings.

The Babies: HBB and ENC 1 begin with assessing if a baby is crying and conclude with the "Red Zone" where a baby who is unable to sustain an appropriate heart rate and/or respirations is provided with PPV support as someone attempts to get help. Within the HBB/ENC framework, we could imagine several babies for whom an extension of this framework to include palliative/perinatal loss guidelines could be helpful:

1. A stillbirth for whom no resuscitation is attempted. (Stillbirth)
2. A baby who proceeds through the red zone but never has a heartbeat or breathing despite the best resuscitative efforts of the team. (Stillbirth)
3. A baby who proceeds through the red zone who, after 20 or so minutes still has a very low heartbeat and/or gasping breathing. (Anticipated neonatal death)
4. A preterm baby who is too small for ongoing support, based on local resource constraints or resuscitation guidelines, despite a sustained heart rate and breathing. (Anticipated neonatal death)

The Approach: Create a suite of resources that could accompany ENC 1 and 2, focused on end-of-life care and perinatal loss. These resources would be less algorithmic than ENC, as local practices around death vary significantly – meaning there is not one "right" way to approach this care. Rather, the "White Zone Toolkit" would combine structured guidance about symptom management as well as reflective tools for implementing contextually and culturally appropriate post-loss care. This could consist of, but is not limited to, the following:

1. Structured guidance on what physiologic changes may happen at the end of life (ex: gasping) as well as pharmacologic and non-pharmacologic options for symptom management.
2. Reflective questions about if/when to offer seeing or holding of the baby.
    - Data shows that many women want to see and/or hold their infant following stillbirth or neonatal death but are often not offered that opportunity based on historic cultural norms.
3. Reflective questions about cultural traditions around loss and if/how these practices can be supported by those attending the delivery.
4. Anticipatory guidance guides on how mothers may still produce milk and how to manage those symptoms.
5. Anticipatory guidance on potential maternal mental health needs. Reflective questions on how to approach mental health and psychosocial support after loss.
6. Access to a set of adaptable practice scenarios that could help providers gain experience in handling perinatal loss and communicating with families surrounding perinatal loss.

NICU BABY'S *Bill of Rights*

1 The Right to *Advocacy*

My parents are **my voice** and **my family** are **my best advocates**.

My parents know me well. They are my voice and my best advocates. They need to be knowledgeable about my progress, medical needs, and prognosis, so they celebrate my achievements and support me when things get challenging.

2 The Right to *My Parents' Care*

Welcome my family and **include them** in everything we do.

My parents are my essential caregivers. In order to care for me, they need lots of opportunities to learn. Ensure that hospital policies and protocols, including hours & rounding, are as inclusive and expansive as possible. Then be patient with them.

3 The Right to *Bond With My Family*

Create opportunities for my family and me **to be together and bond**.

Bonding is crucial for my healthy growth and development. Support my parents so that we can practice skin-to-skin care as soon and as often as possible. Encourage them to read, sing, and talk to me.

4 The Right to *Neuroprotective Care*

Protect my **developing mind** and **senses**.

Protect me from things that startle, stress, or overwhelm me. Support things that calm me. Ensure I get as much sleep as possible. My brain is developing for the first time - and faster than it ever will again. The way I'm cared for today will affect me as I continue to grow & develop.

5 The Right to *Be Nourished*

Support our feeding decisions and **help us develop our skills**.

Encourage my parents to feed me at the breast or by bottle, whichever way works for us both. Support our feeding goals and make sure my parents know all the nutrition options available to meet my needs.

6 The Right to *Personhood*

Respect me as the **amazing, unique individual** that I am.

Use my name. Talk to me before touching me. If one of my siblings passes away, ask my family how we want to talk about and acknowledge them.

7 The Right to *Confident and Competent Care Giving*

Support my parents and caregivers.

The NICU may be a traumatic place for my parents. Ensure that they receive tender loving care, information, education, and as many resources as possible to help inform them about my unique needs, development, diagnoses, and more.

8 The Right to *Family-Centered Care*

Teach my family **how to care for me**.

Help me feel that I am a part of my own family. Teach my parents, grandparents, and siblings how to read my cues, how to care for me, and how to meet my needs. Encourage them to participate in or perform my daily care activities, such as bathing and diaper changes.

9 The Right to *Healthy and Supported Parents*

Care for our **mental health** and **wellbeing**.

My parents may be experiencing a range of new and challenging emotions. Be patient, listen to them, and lend your support. Share information with my family about resources such as counseling, support groups, & peer-to-peer programs, which can help reduce the impact of perinatal mood and anxiety disorders (PMADs).

10 The Right to *Inclusion and Belonging*

Celebrate what makes us special and unique.

Celebrate our diversity. Honor what makes us unique. Ensure that my parents, grandparents, siblings, and friends feel accepted and welcomed in the NICU, and respected and valued in all forms of engagement and communication.

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