

# NEONATOLOGY TODAY

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in Neonatal and Perinatal Medicine



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# Antibody Testing of Infants Born to Asymptomatic COVID-19 Positive Mothers

Tonya Robinson, MD, Nicole Pozzi, MT (ASCP),  
Saeed A. Jortani, PhD, DABCC

## Abstract

**Importance and Contribution of this Study:** Variability exists in the passage of SARS-CoV-2 IgG from asymptomatic COVID-19 mothers to their newly born infants.

Awareness of SARS-CoV-2 IgG may contribute to the management of asymptomatic RT PCR COVID-19 positive pregnant women, their newborns, and future vaccination practices.

**Objective:** Characterize COVID testing results of asymptomatic COVID-19 positive pregnant women and their infants. Our assumption/hypothesis maintained that all infants born to asymptomatic COVID-19 positive mothers would have detectable SARS-CoV-2 specific IgG.

**Study Design:** Retrospective chart review. Clinical demographics/COVID-19 testing of maternal/infant dyads were reviewed/collected for reporting purposes.

**Setting:** Center for Women and Infants (CWI), University of Louisville Hospital, Louisville, KY

**Participants:** Asymptomatic COVID-19 positive pregnant women/infant dyads admitted to the CWI between June 2020 to February 2021.

**Results:** 36 COVID-19 positive asymptomatic mother/37 infant dyads (one set of twins) reviewed. 38% of the mother/infant dyads were positive for SARS-CoV-2 IgG, while 27% of mother/infant dyads were negative for IgG. A COVID-19 positive mother of twins was IgG negative, but both twins were positive. Two mothers in this study group had developed significant COVID-19 disease at 28w4d gestation and 34w0d gestation. Both required intensive care but recovered, and their pregnancies were maintained until 37w4d and 39w3d gestation, respectively. By the time of delivery, both mothers had negative COVID-19 RT PCR testing, but both infants were positive for SARS-CoV-2 IgG antibodies. COVID-19 RT PCR testing on both of these infants at 24 and 48 hours of age was negative.

**Conclusion:** SARS-CoV-2 IgG is passively transferred to the infant during pregnancy of asymptomatic positive COVID-19 mothers however appears variable and/or possibly based on the ability of IgG detection with current testing. Further investigation of the immune system's response to the SARS-CoV-2 virus during pregnancy can direct future management/treatment during pregnancy, especially in the wake of vaccination for the virus during pregnancy and emerging variants.

**Key Words:** Pregnancy, Newborn, COVID-19, SARS-CoV-2 IgG, Immunity, Placenta

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**“SARS-CoV-2 IgG is passively transferred to the infant during pregnancy of asymptomatic positive COVID-19 mothers however appears variable and/or possibly based on the ability of IgG detection with current testing.”**

## Introduction:

Coronavirus is one of the largest members of the RNA viruses shown to cause diseases in humans and animals. The latest member of the coronaviruses is the COVID-19 which can result in severe acute respiratory syndrome. One area still developing is the antibody response to the virus during pregnancy and subsequently by the newborn infant. The current standard to diagnose COVID-19 involves identifying genetic material in specimens obtained via nasal swabs using reverse transcription-polymerase chain reaction (RT PCR). There has also been support to determine the production of SARS-Co-2 as a means to evaluate a previous or more recent infection.(1,2,3) We describe the detection of SARS-CoV-2 IgG of asymptomatic recent or previous COVID-19 positive pregnant women at the time of delivery. Our hypothesis or presumption was that all infants born to asymptomatic COVID-19 positive mothers would have SARS-CoV-2 specific IgG.

**“We describe the detection of SARS-CoV-2 IgG of asymptomatic recent or previous COVID-19 positive pregnant women at the time of delivery. Our hypothesis or presumption was that all infants born to asymptomatic COVID-19 positive mothers would have SARS-CoV-2 specific IgG.”**

## Methods:

All patients admitted, including pregnant women presenting for delivery to the University of Louisville Hospital, Louisville, KY, from April 2020, have been tested by RT-PCR for the SARS-CoV-2 virus using emergency authorized COVID-19 tests marketed by four manufacturers (Roche, Becton Dickinson, Cepheid, and DiaSorin). The specific test utilized was dependent on reagent availability based on government-mandated allocation. Starting in June 2020, several pregnant women admitted to Labor & Delivery who tested positive for COVID-19 also underwent COVID-19 antibody testing. All infants born to COVID-19 positive mothers underwent nasopharyngeal COVID-19 PCR testing at 24 and 48 hours of age. Starting in June 2020, the majority of infants born to mothers positive for COVID-19 also underwent COVID-19 antibody testing. Data were retrospectively reviewed of these mother/infant dyads who delivered between June 2020 to February 2021. IRB approval for the study was granted both by the University of Louisville and the University of Louisville Hospital.

## Collection and PCR testing for COVID-19:

CDC COVID-19 Guidelines were followed for RT PCR COVID-19 collection and testing using synthetic fiber swabs with plastic shafts. Specimens were placed immediately in sterile tubes with 2-3 ml of viral transport media (UTM, Universal Transport Media by Han-Chag medical).

## COVID-19 antibody testing:

For antibody testing, the SARS-CoV-2 IgG assay was utilized on

the Architect 2000 instrument (Abbott Laboratories, Abbott Park, IL) under Emergency Use Authorization by the FDA. Serum or plasma samples were submitted for the standard of care IgG testing. The process involves a chemiluminescent microparticle immunoassay whereby the amount of SARS-CoV-2 IgG antibodies in the sample is related to the RLU detected by the system optics. Samples with RLU amounts greater than the cut-off value are reported as positive for SARS-CoV-2 IgG.

**Results:**

From June 2020 to February 2021, charts of mothers and their newborn infants were reviewed whose admission or recent pre-admission screen was positive for SARS-CoV-2. There were 36 mother/37 infant dyads which included one set of twins. Delivery was by cesarian section in 14 (38%) of the cases. Eight infants (22%) required admission to the neonatal intensive care unit (NICU) unrelated to COVID-19.

One infant tested positive for SARS-CoV-2 by RT PCR at 24 and 48 hours. The infant was delivered by repeat cesarian section at 37w4d gestation with rupture of membranes at delivery. Pregnancy was complicated by oligohydramnios. The infant was allowed to bond with the mother in recovery using proper personal protective equipment and remained in an incubator in the mother's room until discharge. The mother and infant were both negative for SARS-CoV-2 IgG. Placenta pathology was reported as normal. The family was lost to follow-up, but our Pediatric Infectious Disease specialists, who are aware of all significant and/or hospitalized COVID-19 pediatric cases, have no record of this infant requiring subsequent hospitalization.

Table 1 is a summary of the SARS-CoV-2 IgG Maternal/Infant Dyads. Fourteen mother/infant dyads (38%) were positive for SARS-CoV-2 IgG, while ten dyads (27%) were negative for SARS-CoV-2 IgG. Five (14%) of the mothers tested positive for SARS-CoV-2 IgG while their infants were negative. The mother of the twins tested negative for SARS-CoV-2 IgG, while both twins were positive and confirmed on retesting. There were five mother/infant dyads (14%) with incomplete IgG testing.

Nasopharyngeal COVID-19 RT PCR testing of infants occurred at 24 and 48 hours of age. In the first 24 hours of life before IgG testing occurred, eight (50%) infants positive for IgG received their

mother's breastmilk, and eight (50%) received formula. Infants NPO on admission to the NICU all tested negative for IgG.

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***“Nasopharyngeal COVID-19 RT PCR testing of infants occurred at 24 and 48 hours of age. In the first 24 hours of life before IgG testing occurred, eight (50%) infants positive for IgG received their mother’s breastmilk, and eight (50%) received formula. Infants NPO on admission to the NICU all tested negative for IgG.”***

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**Discussion:**

Unique to our study is the focus to characterize detection of SARS-CoV-2 IgG in asymptomatic positive COVID-19 pregnant women upon admission for delivery and of their newborn infant.

All of our mothers at the time of presentation were asymptomatic for COVID-19. Nineteen (53%) of the 36 mothers displayed SARS-CoV-2 IgG, thirteen (36%) were negative for IgG, and four (11%) were not tested for IgG. Of the 37 infants born to SARS-CoV-2 positive mothers, 14 (39%) were positive for SARS-CoV-2 IgG antibodies. Five (14%) infants whose mothers tested positive for IgG were negative for the SARS-CoV-2 specific IgG. Ten of the dyads (27%) revealed that both mother and infant were negative for SARS-CoV-2 IgG. Our initial hypothesis/assumption was that all infants born to asymptomatic COVID-19 mothers would have SARS-CoV-2 IgG antibodies. However, our results indicate that not all mothers had IgG to be passively transferred to the infant; some infants were negative for SARS-CoV-2 IgG when their mothers displayed IgG, as noted in the case of twins, the infants displayed IgG while their mother was negative for SARS-CoV-2

Table 1. Results on SARS-CoV-2 IgG Maternal/Infant Dyads

DYADS	N=36*
Maternal IgG +/-Infant IgG +	14 (38%)
Maternal IgG -/Infant IgG -	10 (27%)
Maternal IgG +/-Infant IgG -	5 (14%)
Maternal IgG -/Infant IgG +	2 (5%)*
<b>INCOMPLETE TESTING</b>	
Maternal IgG testing but no infant IgG testing	1 (3%)
No maternal IgG testing but infant IgG testing completed	4 (11%)

\*Includes set of twins



IgG. P. Egerup et al. investigating the frequency of SARS-CoV-2 antibodies in their general population of parturient women, their infants, and partners, also found the variable presence of antibodies of infants born to mothers found to be COVID-19 positive. (15)

It has been reported that in adults, the median day from COVID-19 symptoms/infection until IgG seroconversion was approximately 13 days, while others similarly reported the median time for seroconversion of all isotypes (IgG, IgM, IgA) was at ~ 12 days. (2,4) Likewise, in the Cochrane Review by JJ Deeks *et al.*, there was a low sensitivity of IgG seroconversion in the first week of symptoms, while the highest IgG values occurred by the third week after the onset of symptoms. (5) F. Zullo *et al.* demonstrated peak production of SARS-CoV-2 IgG at ~ 18 days (range 10-20 days) after the onset of symptoms. (6) They also indicated that repeat nasopharyngeal COVID-19 RT PCR testing was unlikely to be positive after 28 days from the onset of symptoms. Unlike patients described in these studies, our subjects, including infants, were asymptomatic with variable detectable IgG. The significance of our results and antibiotic production timing in asymptomatic SARS-CoV-2 positive pregnant women and their infants remains unknown but may be of interest for further investigation. A better understanding of the immune system's response to the SARS-CoV-2 virus and timing of antibody production could serve as Zullo *et al.* referred to as an "immunity passport" to address better how patients are managed, especially in relation to isolation and quarantine recommendations. (6)

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***"A better understanding of the immune system's response to the SARS-CoV-2 virus and timing of antibody production could serve as Zullo et al. referred to as an "immunity passport" to address better how patients are managed, especially in relation to isolation and quarantine recommendations. (6)"***

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Specific to pregnancy and the newborn, Flannery *et al.* measured maternal and cord blood SARS-CoV-2 IgG/IgM antibodies of asymptomatic (60%/symptomatic (40%) positive COVID-19 RT PCR pregnant women at the time of delivery. Eight percent of their study population (N=83) had detectable COVID-19 antibodies, and of these patients, 87% of their infants had detectable COVID-19 IgG at the time of the delivery. In our study population, 59% of the COVID-19 RT PCR positive mothers had detectable COVID-19 IgG, but only 38% of their infants were positive for COVID-19 IgG. The discrepancy might be explained since 100% (versus 60%) of our mothers were asymptomatic at the time of delivery. Flannery *et al.* did note in their study that infants of mothers with low IgG levels were negative for IgG at birth. Possibly in our asymptomatic population, the maternal IgG levels were so low that placental transfer did not occur or could not be detectable by the qualitative assays we used for SARS-CoV-2 IgG. The other possible explanation could be that delivery occurred before the placental transfer of antibody could occur, which would support Flannery *et al.* findings that placental transfer ratios increased with the increased time between maternal infection and delivery.

Two of the mothers included in this descriptive study developed significant COVID-19 disease at 28w4d gestation and 34w0d gestation. Both required intensive care but recovered, and their pregnancies were maintained until 37w4d and 39w3d gestation,

respectively. Both mothers had negative COVID-19 RT PCR testing prior to delivery, but both infants were positive for SARS-CoV-2 IgG antibodies indicating potential passive immunity for ~3 months. COVID-19 RT PCR testing on both of these infants at 24 and 48 hours of age were negative.

This presence would suggest that transplacental passive immunity from symptomatic COVID-19 stricken mothers to their newborn infant is maintained for a similar time period of 3 months as reported in the general population with symptomatic COVID-19 infection. Isho B et al. found in their general/asymptomatic + COVID-19 /non-pregnant study population that serum and saliva SARS-CoV-2 IgG antibodies were maintained for at least three months. (8) Iyer et al. found decay of IgM and IgA at 49 and 71 days respectively after the development of COVID-19 symptoms and slower decay of SARS-CoV-2 IgG. (4)

We had one infant that tested positive by SARS-CoV-2 RT PCR. Neither mother nor infant had SARS-CoV-2 IgM testing, but both were negative for SARS-CoV-2 IgG. The placenta pathology was read as normal, but because the infant was exposed to the mother after delivery, it was felt that vertical infection of the virus did not occur.

Although we did not specifically evaluate breast milk, we did look at feeding practices prior to the infant's 24 hour nasopharyngeal COVID-19 RT PCR and SARS-CoV-2 IgG testing. There were no significant differences in RT PCR and IgG results between those receiving mother's breast milk or formula. Pace *et al.* analyzed breast milk of COVID-19 positive mothers and found all to contain SARS-CoV-2 specific IgA and IgG. (13) Likewise, Demers-Mathieu V *et al.* concluded from their evaluation that SARS-CoV-2 antibodies in breastmilk could serve to provide passive immunity and protect from COVID-19 disease. (16) Centeno-Tablante *et al.* reviewed transmission of SARS-CoV-2 through breast milk and concluded there was no evidence to support the virus is transmitted via breast milk. (14) Specific viral antibody testing would appear to support breastfeeding as a means to contribute protection to the infant. With the advent of COVID-19 vaccination during pregnancy, the determination of passive immunity using viral-specific antibody testing could serve to further substantiate breast milk as a way to prolong protection to the infant.

There are significant limitations to this study. This was a retrospective study with incomplete SARS-CoV-2 IgG antibody testing, numbers are limited, and SARS-CoV-2 antibody testing was qualitative and not quantitative. Qualitative testing does provide more timely results, which is important when there is a need to make rapid clinical treatment decisions. For the purpose of a study, however, qualitative testing and the absence of SARS-CoV-2 antibody levels fail to provide true antibody decay or timing of each individual immune response to the virus.

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***"SARS-CoV-2 IgG is passively transferred to the infant during pregnancy of asymptomatic positive COVID-19 mothers however is not an absolute."***

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#### **Conclusion:**

Our descriptive study contributes information regarding SARS-CoV-2 antibody detection during pregnancy of asymptomatic COVID-19 positive women presenting for delivery. SARS-CoV-2 IgG is passively transferred to the infant during pregnancy of asymptomatic positive COVID-19 mothers however is not an absolute. Further investigation of the immune system's response to

the SARS-CoV-2 virus during pregnancy can direct future management/treatment during pregnancy, especially in the wake of vaccination during pregnancy and emerging variants.

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Conflict of interest: The authors declare that they have no conflict of interest

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## TAKE THE NECESSARY STEPS TO ELIMINATE INEQUITIES

**Make health equity and implicit bias training mandatory.**

**Prioritize health + racial equity as a goal.**

**Communicate with parents using plain language.**

**Partner with Black parents to deliver bias free care.**

**Hire, retain, or partner with Black Premie family support groups + professionals to fill diversity gaps.**

**Make digital + virtual resources available**

**Encourage reading to Premie babies while bedside.**



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# Keeping Your Baby Safe

during the COVID-19 pandemic

## How to protect your little one from germs and viruses

Even though there are some things we don't know about COVID-19 yet, there are many more things that we do know. We know that 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. Protecting your baby from flu and pertussis lowers their risks for complications from coronavirus.

#### 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.

Learn more

[www.nationalperinatal.org/COVID-19](http://www.nationalperinatal.org/COVID-19)





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*“With the results we and others see after making the change to targeted fortification, it must become standard of care.”* Dr Jiří Dušek

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# Disaster Series: Disaster Planning for Perinatal/Neonatal Medicine: Rethinking the Process and Caring for Mothers. Infants and Technology Dependent Infants - The Time is NOW

Daved van Stralen, M.D., Elba Fayard, M.D., Julia Paz, D.O.,  
Louisa Shelby RN, BSN, IBCLC, Mitchell Goldstein, M.D.,  
MBA, T. Allen Merritt, M.D., MHA

## Introduction:

Disasters that affect health care delivery seem to be happening with increased frequency and can be found all around us. Within the last month, the Caldor Fire in Northeast California resulted in the evacuation of Barton Memorial Hospital in South Lake Tahoe (Sacramento Bee, August 30, 2021). Hurricane Ida caused the loss of electrical power and loss of water to New Orleans Children's Hospital, making an evacuation of their NICU and other patients to other hospitals necessary, according to the Chief Medical Officer, Dr. Mark Kline on CBS Good Morning America (August 30/2021). We aim to review how disasters, both natural and man-made, threaten the well-being, indeed the very lives of pregnant women, newborns, and especially the lives of technology-dependent infants and children. We offer novel approaches for critical decisions and actions that accomplish our life-saving goals.

*“We aim to review how disasters, both natural and man-made, threaten the well-being, indeed the very lives of pregnant women, newborns, and especially the lives of technology-dependent infants and children. We offer novel approaches for critical decisions and actions that accomplish our life-saving goals.”*

Disasters may be very sudden and unexpected. Planning care delivery by highly skilled specialized caregivers, compromised in their routine functions by unanticipated damage to physical facilities, loss of electrical power, or inability of scheduled caregivers to work as designated due to environmental disruption and travel hazards is of utmost importance. Health care workers may also suffer unexpected injury or trauma or even widespread and progressive illnesses. We offer an action plan for emergency management officials and administrators, obstetric and pediatric

providers, and ancillary health care professionals, responding to emergent and disruptive challenges requiring flexible actions to protect patients and healthcare workers.

**Emergency Management Services** in many States are defined by statute. For example, in Oregon, “Emergency” means a human-created or natural event or circumstance that causes or threatens the widespread loss of life, injury to person or property, human suffering, or financial loss, including but not limited to:

a) Fire, explosion, flood, severe weather, landslides or mudslides, drought, earthquake, volcanic activity, tsunamis, or other oceanic phenomena, spills or releases of oil or hazardous material as defined, contamination, utility or transportation emergencies, disease, blight, infestation, civil disturbance, riot, sabotage, acts of terrorism and war

b) A rapid influx of individuals from outside the states, rapid migration of individuals from one part to another, or a rapid displacement of individuals in the influx, migration or displacement results from the type of event or circumstance described in paragraph (a) of this subsection (Oregon Revised Statutes 401.025 Chapter 401, June 2018). State Emergency Management and Services do not fully cover maternal, perinatal care, and maternal/infant aftercare, including intensive care services, either continuation or initiation, or essential services required by technology-dependent children. The response from the Office of Emergency Management Services, often including a proclamation by the Governor, takes time. This time is best described as a “fallacy of concreteness” when those on the ground, at or near the scene, and receiving casualties and evacuees will act on their own to make critical decisions described as “learn by doing” with reciprocal feedback (1). A disaster often constrains available information from outside for the immediate access location of support personnel. Though they always act in a way that makes sense to them, available information and guidance may be limited, imperfect, and changing, thus leading to gaps between system plans and operator practice. There will also be gaps between discrete concepts and their continuous perceptions of rapidly changing situations. Rasmussen described the purpose of operators and responders in complex technological systems. they are flexible, can learn to adapt to the system's peculiarities, and thus are expected to plug the holes in the designer's imagination. (2).

In Oregon, the Oregon Health Authority, among other collaborating state agencies, has primary responsibility for emergency medical responses. Emergency Support Functions (ESFs) for pregnant women, infants, and children fall under two major categories. ESF-6 Mass Care and ESF-8 for Health and Medical Services. Pregnant women, lactation support, women with newborns, infants on CPAP, feeding tubes, or gastrostomy would be triaged to a Mass Care unit. High-risk pregnancies, women in labor, women with newborns with medical complications such as those on high flow nasal cannula would be triaged to Health and Medical Units (Tables I and II). The California Hospital Association has created the “Hospital Activation of the Emergency Operations Plan Checklist” among other checklists for unique situations such as “active

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shooter,” Emergency food supplies for hospitals, and hospital water disruption. (3) (CHA Hospital Preparedness Program (<https://www.calhospitalprepare.org/cha-tools>, accessed 8/4/21).

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The California Emergency Services Act (8551) states that “the state has long recognized its responsibility to mitigate the effects of natural, man-made, or war-caused emergencies which result in conditions of disaster or extreme peril to life and property; and the resources of the state to protect the health and safety and preserve the lives and property of the people of the state.” It outlines how the Governor and various chief executives and governing bodies of political subdivisions of California have emergency powers to provide for state-based assistance and provides for a state agency “Office of Emergency Services” to prescribe the powers and duties of the director of that office. However, the California Emergency Services Act is short on how this duty applies to pregnant women, newborn infants, or technology-dependent infants and children.

Kaiser Permanente in California has adopted a Hazard and Vulnerability Assessment tool for Human Related events. It allows risk calculation over an array of hospital resources and functions, of which preparedness, internal response, and external response are critical factors for these calculations. The human impact, property, and business impact are also calculated for risk. This system augmented their response to wildfires affecting Kaiser beneficiaries and facilities, some of which were severely affected in Santa Rosa, California, in 2017 (4) by developing a turnkey command center that opens a command center before the threat becomes acute, identifies interdependencies, and activate resources, considering incremental action as needed. They emphasize “the reality is that the risk our facilities face today are different than what we imagined and faced a decade ago—and that a rapidly changing climate poses yet unforeseeable hazards for the future.” (5).

Applicable definitions in disaster preparation, response, and recovery include (6)

1. **All-Hazards:** An approach for prevention, protection, preparedness, response, and recovery that addresses a full range of threats and hazards, including domestic terrorist attacks, natural and manufactured disasters, accidental disruptions, and other emergencies.
2. **Assisting Agency:** An agency or organization providing personnel, services, or other resources to the agency with direct responsibility for incident management.
3. **Cache:** A pre-determined complement of tools, equipment, and/or supplies stored in a designated location, available for incident use.
4. **Emergency Operations Plan:** An ongoing plan for responding to a wide variety of potential hazards.

5. **Evacuation:** The organized, phased, and supervised withdrawal, dispersal, or removal of patients/personnel from dangerous or potentially dangerous areas and their reception and care in safe areas.
6. **Incident:** An occurrence, natural or man-made, for which an emergency response protects life or property. Some examples of incidents include, but are not limited to, earthquakes, hurricanes, tornadoes, tsunamis, wildfires or urban fires, floods, nuclear accidents, hazardous materials spills, aircraft accidents, war-related disasters, terrorist attacks, civil unrests, and public health emergencies.
7. **Mitigation:** Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. Mitigation is taking actions ahead of time to prevent or minimize human safety and property losses. These actions reduce or eliminate the need for emergency response and significantly reduce the recovery period.
8. **National Incident Management System:** The National incident management System (NIMS) identifies concepts and principles that guide emergencies from preparedness to recovery. The NIMS provides a consistent, nationwide approach and vocabulary for multiple governmental, private, and jurisdictions to work together in response efforts, regardless of cause. This guidance ensures effective and integrated preparedness, planning, and response and reduces loss of life or property and harm to ecosystems.
9. **Preparedness:** A continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action to ensure effective coordination during incident response.
10. **Prevention:** Actions to avoid an incident or to intervene to stop an incident from occurring. Prevention involves actions to protect lives and property. It consists in applying intelligence and other information to a range of or quarantine and, as appropriate, specific law enforcement operations aimed at deterring, preempting, interdicting, or disrupting illegal activity and apprehending potential perpetrators.
11. **Resources:** Personnel and significant items of equipment, supplies, and facilities available for potentially available for assignment to incident operations and for which status is maintained. Various types of equipment for maternal, perinatal, neonatal, and technology-dependent children has also been endorsed by the California Department of Public Health and the Disaster Preparedness Task Force of the Naval Medical Center, San Diego. (7)

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In 2015 the California Perinatal Quality Care Collaborative and Loma Linda University Children's Hospital prepared a toolkit for NICU disaster preparedness and described steps to prepared needed equipment and personnel from multiple disciplines and execute plans if a disaster occurred. (8) However, Eskandar-Afshari et al. reported a survey of 84 NICUs in California in 2018 (8). They found that 10% did not participate in annual drills, 44% did once a year, 36% did twice per year, and 10% did more than twice per year. They concluded that NICU had systems in place and plans for various disasters. Still, there was inconsistent participation in hospital training for NICU disaster preparedness and a lack of sufficient exercises for unit readiness if a disaster were to occur (9,10). Barfield et al. (11) prepared a detailed clinical report for "Disaster Preparedness in Neonatal Intensive Care Units" in 2017. Still, in the subsequent four years, national emergencies such as the COVID-19 pandemic, regional wildfires burning entire communities such as Santa Rosa, California, and its hospital, or tornados devastating a St John's Medical Center in Joplin, Missouri, airborne toxins from burning chemical fires at refineries, and unprecedented heat attributed to climate change with temperatures up to 130 degrees F, have disrupted health-care services to pregnant women, their newborn infants, neonatal intensive care units, and transport systems. These function well in the absence of these disasters. Obstetricians, neonatologists, pediatricians and supporting perinatal nurses, lactation support, respiratory care practitioners, pharmacists, social workers, and others working within regionalized perinatal care delivery systems must collaborate and plan a collective response when a disaster strikes. The perinatal team shares an obligation to create policies to optimize care provision to mothers, infants, and especially technology-dependent infants, such as those in an NICU, focusing on these vulnerable patients by providing trauma-informed care. Furthermore, triage and delegation of resources may be limited over extended periods, and the lack of resources creates ethical issues that are best anticipated and presented for their advanced approval.

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In 2013 the American Academy of Pediatrics, with support from the Centers for Disease Control and Prevention (Pediatric Preparedness Resource Kit) (12), focused on the H1NI pandemic, provided a pediatric toolkit regarding policies concerning pediatricians and children in disasters. Still, in the decade since, there has been a paucity of a creative and thoughtful redesign of systems of care or function during the multitude of tragedies that have affected mothers, infants, and technological dependent infants in NICU settings. Pregnant women, women in labor, newborns, and infants in NICUs are particularly vulnerable. Because of the dynamic changes in a pregnant woman's physiology, emotional distress may precipitate premature labor. Infants, because of their small size, physiologic immaturity, and baseline requirement for technology or supplemental oxygen, specialized nutritional needs, medication administration, and monitoring of cardiorespiratory function, as well as diagnostic information gathering and life-sustaining support, can be imperiled. Disasters may disrupt a mother's or infant's protective surroundings (warmth, light, humidity, oxygen, and air mixtures, or filtered air, as well as diagnostic and therapeutic resources. Different types of disasters may mandate immediate evacuation to a safe place and disrupt the expected medical care by a previously established professional relationship. Disasters may lead to uncontrolled physiologic changes when supplies to supplemental oxygen are suddenly disrupted. Indeed, "ideal" physiology, such as maintaining an "ideal" SaO<sub>2</sub> of 92-95%, may need to be substituted for lower saturations in room air that are still survivable.

Disasters have many different origins. Natural and man-made disasters (and even hybrids) exist, such as the reactor meltdown in Fukushima, Japan, following the damage from a tsunami at the Dai-ichi Nuclear Power Station (a nuclear reactor closer to the epicenter was undamaged from the same tsunami). Chemical releases caused by natural hazard events and disasters. Recent fires at Baytown and Harris County Texas Exxon Mobil refinery in 2019 injured 37 and required a "shelter in place" order for residents as ammonia, benzene, and propylene were released into the atmosphere, endangering thousands. The Galveston Bay Marathon Oil refinery fire resulted in the release of hydrogen fluoride- a highly toxic chemical. More recently, biological disasters such as anthrax, Zika, HiN1 influenza, and the ongoing COVID-19 (and variants) pandemic or whether from terrorist activities or animal to human and human to human page 4contact have resulted in national or worldwide calamities. Responding to each type of disaster has unique elements depending on the risks and threats imposed on pregnant women, those in labor, post-partum women, and their infants, especially infants and children dependent on medical technologies.

#### **Increased risk for Mothers During Disasters:**

One in five women of childbearing age is pregnant in a disaster setting. The obstetric care needs of these women are constant during the various stages of disaster response and recovery (13); multiple studies have documented an association between disasters and their impact on pregnancies. Early pregnancy loss, increased birth defects (possibly related to toxic exposures, smoke exposure, pandemic infections such as Zika or COVID-19) or lack of preventive measures with inadequate nutrition, folic acid, and iron supplements contribute to placental abruption, preterm birth, and low birth weight infants (14). Pregnant women are at increased risk of maternal death because of limited or reduced access to prenatal care, assisted delivery, emergency obstetric care, and anesthesia. Increased rates of peripartum infections have



also been reported (15). In a systematic review of health outcomes after floods, mortality rates in general increased up to 50 percent in the first year after the event. Many of the deaths were associated with increased exposure to infectious agents (16) in this study. Rates of spontaneous abortion and birth defects have been documented following disasters, contributing to decreased fecundity, presumably secondary to traumatic or toxic exposures. In a prospective study of 301 pregnant women who experienced Hurricane Katrina, preterm birth increased threefold with preterm birth rates of 14 percent versus 5 percent in those not experiencing such a disaster. (17) There was no significant difference in preterm birth for women without post-traumatic stress disorder or depression. While the etiologies of poorer pregnancy outcomes are unclear, the intensity of the disaster experience appears to be a risk factor (18). In a study that compared the outcomes of women and infants before and after the 1997 Red River flood in North Dakota, there was an increase in underlying maternal medical morbidities (anemia, lung disease, uterine bleeding), low birth weight, and preterm delivery following the event. (19).

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#### **Action Planning: Caring for Mothers During Disasters:**

Both basic and comprehensive emergency obstetric and newborn care services need to be considered in disaster planning and established as soon as possible, both during and following a disaster. The creation of a minimum initial service package (MISP) for managing reproductive health services helps disaster planners and field workers anticipate the reproductive health needs of women within a population. Operational systems for both treating and triaging, working simultaneously with each guiding the other, and using joint decision-making are critical. Knowledge of site-specific data on crude birthrates, contraceptive prevalence rate, sexually transmitted infection prevalence rates, and maternal mortality ratio can be computer to estimate:

- Number of currently pregnant women
- Number of anticipated births
- Complications

#### **Cesarean deliveries and Neonatal Resuscitation:**

This information can be used to estimate needs when preparing for obstetric care and for stockpiling supplies for use during a disaster. The use of the MISP calculator helps determine the estimated number of pregnant women, the anticipated number of women who will deliver or miscarry, and the permit ordering of obstetric and newborn supplies. An Obstetrics and Gynecology

specialist should take a leadership role in assessing the availability and creation of a robust supply chain and proper replacement of equipment, medications, and supplies for potential deliveries and neonatal care. As transportation to existing obstetric facilities may be significantly hampered, having onsite medications and delivery kits, and neonatal care provisions are necessary. Medications deemed essential for deliveries include oxytocin, misoprostol, and tranexamic acid. Also, neonatal care warmers, epinephrine, normal saline, air, and oxygen with pressure regulators for bag and mask ventilation or T piece resuscitation devices are essential. Because clean water and soap may be less available, using alcohol-based cleanser solutions for handwashing and site preparation is invaluable. Ideally, a portable ultrasound device will be available for fetal and neonatal imaging.

#### **Impact of Disaster Setting on Pregnancy and Delivery Care**

Disaster causes an acute resource scarcity; thus, healthcare workers must consider the availability of resources to safely facilitate procedural and postprocedural care before evacuation to a higher level of care. For instance, the indications for cesarean delivery in an evacuation center or even a field hospital have increased risk for infection, blood loss, and a more limited capacity to address complications. Clinicians must prioritize procedures for women requiring immediate life-saving interventions, followed by fetal intervention and immediate newborn care. For example, performing routine cesarean delivery for a breech presentation may be deferred in favor of cesarean deliveries only for women with abdominal trauma. The procedure will aid maternal resuscitation. Potential contingencies and decision rules such be discussed in the planning stage and among the assembled team of healthcare providers. In a qualitative interview of 11 women who were pregnant during Hurricane Katrina in New Orleans, the hurricane disrupted pregnancy plans and led to great anxiety and uncertainty. Although none received direct injuries, three underwent cesarean delivery as indicated by usual obstetric criteria in a resource-limited environment.

#### **Perinatal Triage and Response Considerations:**

Disaster triage is the most important and psychologically the most challenging part of the medical response in significant disasters. Disaster triage aims to do the greatest good for the greatest number of patients with the determinants based on the severity of injury/disease, the likelihood of survival, and available resources. Disaster medical triage may be conducted at three (or more) different levels. Field triage in acute (non-ambulatory) versus non-acute (ambulatory) settings such as an evacuation center or by Emergency Medical services must occur. Medical triage involves a rapid assessment of women to identify life-threatening injuries, determine those with the best chance of survival, and allocate care in settings of insufficient resources. If possible, laboring women should be referred to an appropriate health care facility for delivery. Before the transfer, the clinician should assess, as best as possible, the gestation age of the patient, available levels of neonatal intensive care, and the limits of fetal viability in a specific disaster setting. The types of facilities are typically divided into Basic Emergency Obstetric and Newborn Care (**BEmONC**) and Comprehensive Emergency Obstetric and Newborn Care units (**CEmONC**) (16). **BEmONC** provided 24-hour access to skilled birth attendants and possible access to intramuscular and/or intravenous antibiotics, uterotonics, and anticonvulsants. Professional services may include manual extraction of the placenta, uterine



evacuation in cases of a retained placenta following delivery or miscarriage, assisted vacuum delivery, and neonatal resuscitation using NRP. Women candidates for BEmONC delivery include primiparous, have a history of intrauterine fetal death, hemorrhage, or assisted vaginal delivery (vacuum or forceps, or grand multiparity).

**CEmONC** facilities typically serve as regional referral medical centers that provide all services described above but have facilities to perform cesarean delivery and hysterectomy, offer blood transfusions, and provide neonatal intensive care for premature and low birth weight infants. Women who benefit from delivering at the **CEmONC** facility include those who require cesarean delivery or those in whom cesarean delivery is likely.

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#### **Postpartum Woman:**

Post-partum care is provided within the first 76 hours that follow the delivery. Disasters are often accompanied by injuries and illnesses that should be treated within the context of post-partum care in affected women. Knowledge of normal post-partum physiology, the basics of post-partum care, and the potential risks during this time can assist in determining when there is a need for intervention. Both mothers and their newborns are vulnerable during the post-partum days. An estimated 65% of all maternal deaths occur after the delivery, and almost half of these post-partum deaths occur within 24 hours of delivery (21). Maternal bleeding and hypertensive disorders can occur after birth and up until six weeks post-partum. The first 24 hours of a newborn infant's life are critical. The maternal-infant dyad must be carefully monitored for breastfeeding, maintaining infant temperature, and urination and stooling patterns. Two-thirds of infant death occurs within the first week after birth, and 50% occur within the first 24 hours after birth (22).

#### **Maintaining the Readiness of the Obstetric Team**

Physicians and other birth attendants interested in providing obstetric care during a disaster should obtain training for obstetric management during disasters so that they will continue to carry out their professional responsibilities in austere environments. The following attributes and traits of staff are helpful.

#### **Attributes that Facilitate Birthing Center staff coordination**

#### **and functioning during a disaster**

1. Able to work in hardship positions
2. Are multifunctional
3. Integrate well into a camp or military-like environment
4. Able to make complex and difficult decisions
5. Able to work cooperatively within a hierarchical structure of the organizational response.
6. Able to coordinate between Obstetric and Pediatric providers and local public health authorities and disaster or incident commands.

Leeb and coworkers report a framework for coordination between obstetric and pediatric providers in their combined response to the Zika outbreak in the U.S from 2015 to 2017 (23). They provide a framework to help coordinate the care of pregnant women and their infants exposed to congenital threats. Their framework identifies critical information to inform care, establish health care touchpoints and communication/infants transfer pathways. They created the “children's Interdisciplinary Care page Coordination Framework based on a frame that (1) identifies and collects critical information to inform care. These are primary pathways of communication and modes of transfer, essential health care touchpoints for the maternal-infant dyad, and health care providers to transmit critical information to other health care providers, the patient, and family. They provide strategies to facilitate implementation during a public health crisis. In their case, it was applied to the Zika epidemic.

1. Strategy 1 Identifying critical information during an emergency response to a novel biologic agent. Information is evolving. Clinical teams need frequent interaction to assimilate the latest reliable information.
2. Strategy 2 Adapt existing tools to enable more efficient collection of critical information compared with developing new tools. Clinical tools help to organize, align, and structure critical information. They guide discussions with patients and providers about testing and treatment and allow the documentation of these communications.
3. Strategy 3 Joint training, using a shared language. Joint training for maternal and pediatric providers fosters shared language around critical information. Such communication is best based on physiology as the basis of communication (the SaO<sub>2</sub> is now 88%, Blood Pressures on dopamine have a mean value of 45 mm Hg). Communication needs to be objective, articulate, and succinct, with ongoing collaboration that identifies, interprets and translates words into actions. The CDC, AAP, ACOG, and other maternal and pediatric partners have developed and promoted clinical education packages that increase opportunities for clinicians to build a shared framework to promote communication across specialization areas. Healthcare professions seem to have a perverse joy in their use of specialty jargon as a method to show camaraderie but also to show others' lack of understanding.
4. Strategy 4. Use plain language. Plain-language explanations of laboratory or other results coupled with actionable and defined next steps for provider to provider and provider to patient communications facilitate the collection of information

and improve interdisciplinary understanding of critical data.

Leeb et al. also address creating information transfer pathways, standardized protocols and procedures, and clear handoffs that include verbal and written components that capture the quantity and detail of shared information (23). Triage and transfer lists are helpful for caregivers, unit managers, and administrators in sending and receiving facilities. In disaster situations, there are challenges to linking medical records across systems of care and patients. An incident command unit may be unfamiliar with the requirements for medical documentation that patients may need to carry with them and to align incentives to support care coordination, especially for pregnant and delivered woman and their babies. Lactation support is essential and metabolic screening, upper and lower extremity blood pressure, and saturation monitoring may be deferred. Hearing screenings all need to be completed, but a patient flow may require that these are done later with more resources. Intentional redundancy reduces communication gaps.

The American College of Obstetrics and Gynecology codified their recommendations in Committee Opinion 726 in 2017 for disaster-preparedness-for-obstetricians-and-facilities-providing-maternity-care (24)

Their specific recommendations include:

- Appoint an obstetrician to direct disaster planning for maternity services, including a pediatrician and maternity and pediatric nursing involvement
- Consider regional patterns of obstetric care provision and disaster scenarios
- Consider obstetric and neonatal needs with high obstetric patient surge
- Establish policies for visitation and lactation that balance infection control concerns with patient and family desires for involvement in the birthing process
- Foster functional working relationships with local and regional critical care clinicians.
- Have a working algorithm for ethical resource allocation that considers obstetric and pediatric-specific needs when demands exceed supply.
- Develop a surge capacity plan realizing the challenges that pregnancy poses to control patient volume
- Consider temporary alterations to usual standards of obstetric care and mechanisms to optimize services with limited resources such as early hospital discharge after delivery, enhanced telephone and telemedicine triage, attention to documentation requirements, and rapid credentialing of health care providers to enable the delivery of obstetric care in the event of workforce limitations.

Disaster action plans are more than an administrative task and testing the feasibility of these plans through mock drills incorporating local and statewide emergency management agencies. It is also essential to find pitfalls or unanticipated difficulties in the execution of disaster responsiveness plans.

#### Evaluating the Pregnant Patient:

At the onset of a disaster, the initiation of plans for obstetric and newborn evacuation or “shelter in place” response, and the as-

essment of the available medical personnel, licensed midwives, anesthesia, interpreters, and lactation support, as well as operational resources like delivery kits, medications, and the capacity to maintain a clean environment are essential. Access to existing medical records for obstetric patients, including information of comorbidities, prior laboratory results, and birth plans, may not be fully accessible for pregnant women, those in labor, or who have recently delivered or their newborn. To the degree possible in evacuation centers, a safe and physically protected location should be used to conduct the obstetric interview and physical examination. Either a separate tent or a partitioned-off space will protect women’s modesty and potentially improve trust and reduce anxieties. Some cultures eschew the presence of male healthcare providers, and males may not be able to examine women; thus, having a female health worker from the community may help acceptance of male providers to female patients. A complete history for the pregnant woman is not dissimilar to that of the non-pregnant female, but getting information of the woman is crucial for initiation of care:

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1. **Current complaint**
2. **Last Menstrual history** or when was pregnancy confirmed by a pregnancy test
3. **Pregnancy-related symptoms** including amenorrhea, breast enlargement and tenderness, nausea and vomiting, increased urination, and fatigue.
4. **General medical history** for baseline medical conditions, particularly those that could be life-threatening if untreated to the pregnant women (hypertension, diabetes, kidney disease, anemia, maternal infections, seizure disorders, and psychiatric or behavioral disorders)
5. **Surgical history**
6. **Current Medications and Allergies**
7. **Vaccination history** (including Tetanus, COVID-19, DTaP, Influenza)
8. **Obstetric history** including gravidity, parity, routes of delivery, premature deliveries, miscarriages, ectopic pregnancies, and prior labor complications (e.g., Uterine rupture, placental abruption, and hemorrhage).
9. **Social History** including significant other, living conditions, employment, food, and water security, domestic violence, and safety of her surroundings.

A focused physical examination is performed, including vital signs and disaster-related trauma-bruising, lacerations, smoke inha-

lation, fever, tachycardia, tachypnea, hypo or hypertension, or diminished oxygen saturation must take priority. Uterine size estimation and assessment of fetal heart tones ideally with a Doppler that should be audible by 10-12 weeks (doppler) or 20 weeks using a Pinard stethoscope. Ideally, at an evacuation site or first level of triage, continuous fetal monitoring via cardiotocography is performed on pregnant trauma patients to determine fetal viability. The purpose is overall to assess maternal and fetal well-being or distress and uterine contractions over time. Laboratory testing capabilities may be limited, but most EMS responders can perform point of care testing using an iSTAT device or similar device to determine glucose, Hemoglobin, electrolytes, creatine, blood urea nitrogen, rapid HIV, and COVID-19 testing. At evaluation centers, fetal ultrasound may not be available, and priority evacuation to a BEmONC or if experiencing premature labor with rupture of membranes to a CEmONC should be a high priority.

Trauma care for the pregnant patient is beyond this review; however, women with trauma require medical stabilization with a simultaneous focus on fetal well being can often be initiated while the mother is being treated, including placement in the left lat-

eral uterine displacement, volume replacement, and supplemental oxygen if available (21). Management of the first and second stages of labor should proceed. However, adaptations to limited resources in less than ordinary environments with cultural sensitivity should acknowledge limited resources with a focus to maintain the mother's safety (21). Post-partum hemorrhage can be immediate or delayed. Immediate post-partum hemorrhage can be caused by an incomplete contracted uterus, vaginal or cervical lacerations, retained placental fragments, or less commonly, uterine rupture, or a combination of these. A non-contracted uterus is treated with fundal massage, and cervical and vaginal lacerations can be repaired with sutures but require adequate lighting for visualization. The placenta is examined to confirm its intactness, and in cases of uterine atony, uterotonic medications and aggressive bimanual massage are initiated, followed by medications to encourage uterine contraction (25,26)). Efforts must be focused on skin-to-skin maternal-infant dyad care both for the well-being of both mother and baby to provide for breast milk, warmth, and maternal bonding with her newborn.

Equipment and Supplies:

Table I Supply Kits for Use in Perinatal Disaster:

<i>NICU Specific</i>	<i>PICU Specific</i>	<i>OB Specific</i>
<ul style="list-style-type: none"> <li>• <b>Infant Med Sled</b></li> <li>• <b>EPOC (Electronic Point of Care Testing)</b></li> <li>• <b>T-Piece Resuscitator Vent</b></li> <li>• <b>Chemical warming mattress</b></li> <li>• <b>Neowrap</b></li> <li>• Specialized evacuation equipment for preemies</li> <li>• <b>NICU transport bags</b> *includes supplies needed for short term use</li> <li>• <b>Unit code carts</b> (removable drawers)</li> <li>• <b>Bedside patient disaster kits</b>(see NICU equipment Section)</li> <li>• Transport Ventilator, Monitors,Suction, Bed</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Stryker Chair</b></li> <li>• <b>EPOC (Electronic Point of Care Testing)</b></li> <li>• <b>Portable Pulse Oximetry</b></li> <li>• <b>PICU transport bags</b> *includes supplies and medications needed for short term use</li> <li>• <b>Unit code carts</b> (removable drawers)</li> <li>• <b>Patient Disaster supply Backpack</b> (see PICU Supply section)</li> <li>• Transport Ventilator, Monitors,Suction</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Birthing kits</b></li> <li>• <b>Dopplers</b></li> <li>• <b>Emergency bags</b> *off unit delivery supplies</li> <li>• <b>Postpartum Transport bags</b>(See OB Equipment Section) *includes general supplies for mother and baby</li> <li>• <b>Unit code carts</b> (removable drawers)</li> </ul>



A large influx of patients can quickly deplete a hospital's resources. In the same manner, an evacuation of patients to another facility can also consume resources. Thus, hospitals and individual units must prepare before a disaster strikes. The availability of appropriate and adequate supplies is vital for timely emergency response efforts, so the unit's disaster team should compile a list of essential supplies required to provide routine assessments, respiratory care, nutritional support, and thermoregulation for 12-24 hours in the event of an emergency. However, regulatory agencies require hospitals to have a 96-hour cache of food and supplies or a documented contingency plan on how the hospital will receive these if they do not — keeping equipment powered fully and using emergency power outlets when available and fully charged batteries for backup. Recent disasters such as Hurricane Ida caused power outages, and generators were flooded by hurricane Ida. Thus even redundant power systems may fail and result in hospital evacuation.

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***“Recent disasters such as Hurricane Ida caused power outages, and generators were flooded by hurricane Ida. Thus even redundant power systems may fail and result in hospital evacuation.”***

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- Units should consider the purchase of backup batteries for equipment and a method to assure charging capabilities and testing based on recommendations of the manufacturer or hospital-based Biomedical/Clinical Engineering and recent advancements in solar power generators that may be ideal in many emergencies.
- Essential equipment for NICU evacuation includes, but are not limited to, the following:
  - Portable cardio-respiratory monitors
  - Pulse oximetry monitors
  - Point of Care Testing (i.e., EPOC, AccuCheck)
  - Syringe pumps/IV
  - Drug box/Transport bag/Organized supply kit, i.e., Kangaroo Board
  - Airway kit and supplies
  - O<sub>2</sub> source and supplies
  - Portable Suction Equipment
  - Transport Ventilators, if available
- Consider taking a Crash Cart/Transport Bags if going to a non-clinical Staging Area on a horizontal move
- Consider additional hospital locations of Crash Carts that could easily be moved to the designated Staging Area (i.e., extra NICU Crash Cart maintained in an Outpatient O.B. setting or Emergency Code carts).

## Evacuation Equipment

Recognize that there are multiple types of evacuation equipment explicitly made for specialty populations (i.e., Stryker Chair, Med Sled, neonatal pocket vest). Neonatal evacuation “packages” with sleds to rapidly move multiple infants and supplies are described by Ma et al. (27).

Mobile disaster kits have been developed, from individualized backpacks to unit-specific portable dollies on wheels with equipment, drugs, and other supplies. Patient and supply sleds have been designed that facilitate both vertical and horizontal movement of patients and supplies.

Purchase and direct drills with evacuation supplies and equipment so that staff become familiar with their use.

## Maternal-Infant Dyad and support for Infant feeding during disasters

Infants are particularly vulnerable to illness and death during disasters. Establishing and implementing an infant emergency feeding plan is vital in providing care to families during a disaster. The WHO recommends that infants be exclusively breastfed for the first six months of life; this is also recommended by the American Academy of Pediatrics and the Women Infants and Children (WIC) programs (27). During disasters, breastfed infants are at a **decreased risk** for dehydration, diarrheal illnesses, and other infections, including respiratory illness, compared to formula-fed infants. In 2018, the World Health Assembly resolution 71.9 urged members to “take all necessary measures to ensure evidence-based and appropriate infant and young child feeding during emergencies, including through preparedness plans, capacity-building of personnel working in emergency situations, and coordination of intersectional operations.” One recent study evaluating the feeding practices during the mass evacuation during the Fort McMurry wildfire showed a significantly decreased rate in exclusive breastfeeding following the disaster with an odds ratio of 1.96 x higher breastfeeding prevalence before the evacuation (28). Some of the barriers to maintaining breastfeeding during disasters include concerns about adequate space and privacy for breastfeeding mothers and decreased access to support services such as lactation specialists and people knowledgeable in the benefits of breastfeeding.

Additional challenges are posed when the non-targeted distribution of formula occurs during disaster relief efforts. In a publication reviewing the recent literature on barriers and challenges in infant feeding in disasters in middle and high-income countries, they found that the WHO International Code of Marketing and Breastmilk substitutes was violated in all cases. When the formula is distributed without adequate education about proper mixing, access to clean water, and proper space for preparation and cleaning of bottles, there is a risk of creating worse health outcomes in infants. During disasters, mothers may express concerns about decreased milk supply or concern for inadequate nutrition in their milk, leading to mothers incorrectly thinking that formula will be a superior source of nutrition over breastfeeding. Ideally, the formula should only be distributed to mothers who are not breastfeeding. In addition to adequate space and privacy for breastfeeding, consideration for milk storage and an area for pumping should be offered at evacuation centers, with privacy, if possible.

Some mothers may not have access to their breast pump during an evacuation. Having electric pumps, hand pumps, pumping kits, and an area for milk storage can help support mothers who



Triage for Resource Allocation for inpatients from TRAIN tool (adapted from Lin et al.)					
Transport	Car	BLS	ALS	CCS	Specialty
Life-support	Stable	Stable	Minimal	Moderate	Maximal
Mobility	Car/Car	Wheelchair/ Seat	Wheelchair/ stretcher	Transport rig/ stretcher	Incubator/ Immobile
Nutrition	All P.O./ Enteral	Intermittent/ Enteral/Partial P.N	Continuous	TPN dependent	
Pharmacy	P.O. meds	Intermittent IV	IV fluids	IV Drips x1	IV drips X2
<b>P.O.: taken orally, TPN: total parenteral nutrition, IV: intravenous medications.</b>					

are exclusively pumping, experiencing a temporary decrease in milk supply, or trying to maintain their milk supply due to separation from their infant. Re-lactation can be considered for recently breastfed infants if there is inadequate access to safe water and formula.

Supplies to consider for Infants and breastfeeding mothers:

- Clean source of water for mixing formula and for drinking
- Disposable breast pads
- Disposable wipes for cleaning pump parts and bottles

- Bottles and bottle nipples
- Nipple shields and nipple cream
- Nursing covers for privacy
- Milk storage containers
- Pump supplies including USB adapter/batteries

While in the U.S., bottled water is usually available for mixing with infant formulas, in the developing world, access to clean water may be less certain. Thus, formula mixed with contaminated water poses a significant health hazard to infants.

Parent Evacuation Preparedness Checklist for Parents: (Table II)	
Emergency Phones Numbers	Parents should have a written list of emergency contacts, not just an electronic list on a smartphone: Child's doctor, pharmacy, medical supply Vendor, utility services, and I EMS numbers all on a wallet-sized card.
Emergency Health Information form	Parent completes form documenting the child's list of diagnoses and medications and doses, local pharmacy, dosage, allergies, and equipment settings.
Three or more days of Supplies /Nutrition	Parent has a separate 3-day supply of all medications, materials needed for medical equipment (including extra tracheostomy of gastrostomy tubes) and special nutrition) as needed.
Design a "Go Bag"	Parent has a prepacked bag or another container with necessary supplies, including medications that require refrigeration.
Knowledge and equipment available to use Backup batteries generators and power sources	Parent has secured power back up for durable medical equipment such as ventilators, nebulizers, infusion pumps, oxygen concentrators Parents are advised to purchase power or solar generators with sufficient voltage and amperage to provide power for equipment
Evacuation plans	Parents have an established evacuation plan with family, friends, or a designated evacuation site.
Awareness of Recharging sites	Parents are aware of public buildings that allow emergency recharging Sites: police stations, evacuation centers, fire stations, or public library
Register with Utility Companies	Parents should register their household and specific equipment with the Utility company providing electricity, water, and natural gas or propane.
<i>(adapted from Gillen, J, Morris M, Preparing Families of Technology -Dependent Children for Emergencies. Hosp Pediatr 2019) (32).</i>	

## NICU Evacuation and the Neonatologist

Whether a disaster is predictable, imminent, or has just occurred. Neonatologists, together with essential nurses, respiratory therapists, pharmacists, and clerical support, activate a hopefully predetermined plan of evacuation to safely move infants from the NICU environment to a safer environment while maintaining care duties. When possible, delegating one Neonatologist to communicate with “incident command” while letting others attend to the needs of critically ill infants offers a more seamless response than each Neonatologist communicating through the institutional “chain of command.” Getting assistance from associate Neonatologists, pediatricians, and others allows for rapid triage and determination of severity. As reported by others, this workflow supports the care of infants who may be safely and rapidly transported to an evacuation site or for those that require transport with ongoing ventilatory support, vasopressors, and fluid drips using infusion pumps, along with other scheduled medications. A tool kit was developed that guides NICU leadership in developing a comprehensive disaster response plan that complies with the Joint Commission Standards and is based on community best practice models (29). This tool kit discusses “command center” functions and critical elements for an NICU response to disasters(30). Ma and coworkers (31) have described the TRAIN tool (developed by Lin and associates) as a practical way for NICU leaders to categorize the infants under their care daily, should evacuation be necessary (32). Their TRAIN tool assigns ambulance asset needs but not NICU level. According to the need for life support, the transport assignments are categorized as stable (amenable to be done by private vehicle), basic life support, advanced life support, critical care, and specialized transport. Transport support includes mobility issues such as stretchers, incubators, or equipment for highly complex immobile infants and intravenous nutritional and pharmacy support.

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***“Their TRAIN tool assigns ambulance asset needs but not NICU level.***

***According to the need for life support, the transport assignments are categorized as stable (amenable to be done by private vehicle), basic life support, advanced life support, critical care, and specialized transport. Transport support includes mobility issues such as stretchers, incubators, or equipment for highly complex immobile infants and intravenous nutritional and pharmacy support.”***

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Depending on resource limitations such as emergency power, access to water, and the availability of needed supplies within the medical center, as many as 80% of infants can be horizontally transferred to an accepting facility unaffected by the disaster. In disasters, the Neonatologist treats the incident, members of the

NICU staff, the babies under her/his care, and potentially parents at the bedside. Emphasis must focus on maintaining a thermo-neutral zone for infants, avoiding smoke, dust, other contaminants, and potential vibrations that may affect gas supply and vacuum lines. As emphasized previously, the primary focus is keeping all babies alive for the moment and determining with staff who can be immediately moved or if a “shelter in place” position is necessary. An infant on ECMO may be very difficult to transport. An infant returning from gastroschisis repair with a silo in place may be challenging, especially with various vasoactive drugs infusing. Coordination requires collaborative action by Neonatologists and Pediatric Surgeons. Staff may need to gather needed supplies, medications, and respiratory therapists may place infants on high-flow nasal cannula rather than CPAP to facilitate a move. Ventilated infants may need backup batteries to move infants, providing radiant warmer and ventilator support simultaneously. Infants on TPN may tolerate an interval when IV fluids can be changed to D10W or D12.5W to sustain glucose delivery and calories until the pharmacy supplies a new TPN preparation. Having evacuation medication and procedure kits already prepared and available within minutes is essential for time-sensitive evacuation, whether vertical or horizontal, because power outages are frequent (as in Hurricane Ida). Multiple infants may be moved using sleds designed to move four infants at a time down a stairwell; staff may also wear “Infant aprons” designed to transport late preterm infants or term infants, usually four at a time. The staff can wear these to move infants to a safe evacuation site rapidly.

More critically ill infants such as those on the ventilator often require infant transport units as customarily used for infant transports between centers. Transport ventilator, E cylinders for air and oxygen, and batteries usually provide a safe environment to move most infants requiring assisted ventilation. It is helpful and essential to have transport agreements among NICUs within a region or state to transport seamlessly. When entire regions are affected, statewide affiliations or interstate transport agreements may be required; however, it is already occurring when critically ill infants are moved across stateliness to facilitate their care.

For all infant care levels, redundant systems for electrical power, medical gases, wall suction, information technology, and drinkable water are advised. Although hospital-wide generators constitute a significant source of electrical power, NICU-specific power generators may be needed, as recently demonstrated at New Orleans Children’s Hospital, where Hurricane Ida flooded hospital generators. Recent wildland fires resulted in several days of poor air quality with air quality indices >150 resulting in staff and probably infant discomfort breathing ambient smoke-filled air. Adequate ventilation systems with air filters and cycled air exchange will maintain ambient conditions potentially less injurious to the airways of infants who are breathing ambient air or an air/oxygen mixture.

### **Technology Dependent infants and Children, family preparedness:**

Care for technology-dependent, often fragile infants and children is a challenge for hospital evacuations and parents at home if a disaster occurs. Children who have ongoing medical needs and mobility challenges, those who require continuous power sources, oxygen at variable flow rates, and specialized nutrition, whether through continuous feeding tubes or gastrostomies, place additional responsibilities on their parents and potential rescuers in

a disaster. Families and other caregivers must understand their infant or child's ongoing needs and the unique risks under those circumstances.

The disaster planning information needs of such families and the parent's communication preferences have been understudied, as have the forms of education and material support for an effective disaster-prepared family plan. Gillen and Morris (32) have stressed the importance of creating a disaster plan for parents as a part of discharge planning from pediatric intensive care units or neonatal intensive care units with follow-up over six months to determine information retention and actual preparedness by parents (33). Others have measured the impact of having a disaster preparedness supply starter kit for parents and report that inexpensive educational disaster supply starter kits may increase parental preparedness, as noted in the table. (34)

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***“Depending on the locale of residence, it is critical for parents of technology-dependent to notify local Emergency Management offices (usually at the county level) regarding their infant’s or children’s particular needs and requirements for technology assistance.”***

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Depending on the locale of residence, it is critical for parents of technology-dependent to notify local Emergency Management offices (usually at the county level) regarding their infant's or children's particular needs and requirements for technology assistance. Addresses, telephone numbers, cross streets, or other identifiers should be given to local police and Emergency Medical Services offices. In areas where power outages occur, whether because of weather, fire, or flooding having a home generator is ideal as an alternative electric source or battery backup, and having at least a 3-day supply of oxygen, medications for aerosolization, and nutrition is a minimum need. When evacuation must occur rapidly, having these items in a central location ready to move at a moment's notice is critical. Experiences during Hurricane Katrina, Superstorm Sandy, and recent wildfires illustrate that a parent's preparation for their child's ongoing special health care needs is obligatory. Evacuation centers often lack the supplies unique to each child's special needs or individual technological requirements. Neonatologists and Pediatricians share duties with discharge planners, nursing and respiratory care practitioners. They all have critical roles in carefully listing anticipated needs for a child with special needs and reinforcing the need for parents to be prepared in the event of a disaster. Follow-up by home-health support workers to ensure that parents have adhered to these recommendations is also critical. Redundant communication to support adherence is vital to ensure compliance.

In California, there is a county registration for individuals with special needs. For example, San Luis Obispo County, Ca, provides a registration form (as illustrated) for a countywide registry for individuals with disabilities and special needs. While these registries are voluntary, they allow county emergency services managers to prioritize their response within the county to those with the high-

est needs in case a disaster occurs. A similar county registration has been proposed for Oregon and is under consideration by the Oregon Health Authority.

### **Demobilization, Unit Recovery, and After-Action Debriefing and Support:**

Demobilization refers to activities that focus on disengaging resources and personnel after the objectives of the disaster response have been met and operations return to normal functioning. In contrast, recovery efforts include long-term activities such as rehabilitating personnel, repairing or replacing equipment, and restocking resources.

Several steps should be followed in the emergency operations plan and considered a priority in the recovery after a disaster to facilitate unit recovery and systems improvement. These steps should include:

1. Uniting families with patients
2. Inventories of equipment and supplies
3. Evaluating of equipment function or failure to do so
4. Reordering and replacement of supplies
5. Assessing the usefulness of communication during the disaster (written, electronic medical records, radio/telephone contacts)
6. Returning to normal staffing patterns as soon as possible
7. Conducting debriefing for all staff involved in the incident
8. Completion of “After-Action reports” to be sent to the Emergency Management Program Director
9. Monitoring of mental health of staff, patients, and visitors and providing emotional support for all.

### **Discussion:**

Disaster preparedness and response requires both individual and team training and readiness. Situational awareness, analysis, and response by those “on the ground” are essential elements of effective disaster response. Successful disaster medical personnel share many of the following attributes (25):

1. Capability to work as a team in hardship positions
2. Ability to multitask and be multifunctional
3. Ability to integrate well into a resource-limited and regimented environment
4. Capability of making complex and difficult decisions
5. Ability to work cooperatively within the hierarchical structure of the disaster response team

Health care facilities should identify workers with these characteristics and organize a disaster-prepared team. They should develop plans and buy the needed equipment. Institutional responsibility and support are paramount in disaster preparedness and delivering health care to mothers, infants, and children during and following an unexpected crisis.

This responsibility also falls on the government to support and ensure the survival and protection of the community it serves.

The Western Regional Alliance for Pediatric Emergency Manage-



ment (WRAP-EM) has recently received a \$3 million grant to develop one of two Pediatric Disaster Care Centers of Excellence in the U.S. They are developing a model for improving emergency pediatric disaster response capabilities throughout the Western U.S. and to address weaknesses in emergency communications or access and uncover unknown challenges that could be detrimental during crises. Multiple institutions in Washington, Oregon, California, Nevada, and Arizona representing some 13 million children will gather 60 regional experts and subject matter experts to develop a more highly focused plan to inform the capacity and capabilities on the West Coast in response to disasters affecting pediatric patients. The WARP-EM consortium of some 60 institutions and medical centers will execute a year-long project in phases. They will be conducting a comprehensive review of available resources, developing a pediatric resource library, and conducting a gap analysis to assess the group's existing ability to respond to emergencies. A second phase will focus on delivering products with a measurable impact, such as creating a published guide containing regional pediatric disaster response expertise, developing telemedicine interconnectedness across the Western U.S., establishing a comprehensive pediatric training and educational platforms, and implementing patient tracking, reunifications, and information sharing practices to address interstate operational challenges (30). While this laudable effort may develop a network NICU with a more coordinated response to disasters, it is unclear how the NICUs are chosen to participate and whether they represent NICUs in the most disaster-prone regions in the Western U.S.

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**“ While this laudable effort may develop a network NICU with a more coordinated response to disasters, it is unclear how the NICUs are chosen to participate and whether they represent NICUs in the most disaster-prone regions in the Western U.S.”**

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Manuscripts in this forthcoming series will study disasters affecting NICUs and Neonatologists' responses to various disaster types.

General and President Dwight D. Eisenhower said, “The plan is useless; it's the planning that's important.”

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# Fellows Column: Unexpected Pneumomediastinum with Spontaneous Resolution in a Newborn

Rebekah Frazier, MSIV, Shabih Manzar, MD

## Abstract

Spontaneous pneumomediastinum is uncommon in neonates. We report a case of unexpected pneumomediastinum with spontaneous resolution in a newborn supported by a literature review.

## Keywords:

Pneumomediastinum, Respiratory distress, Spontaneous Resolution, Newborn, cesarean

**“Pneumomediastinum, also known as mediastinal emphysema, can be a complication of respiratory distress. While most cases of neonatal pneumomediastinum result in spontaneous resolution, there is a risk of pneumothorax, subcutaneous, and interstitial emphysema with deterioration of the clinical status (3,4,5). Therefore, treatment and close observation are warranted.”**

## Introduction:

Respiratory distress is defined as any sign of breathing difficulty in a newborn. This could present as tachycardia, grunting, cyanosis, or subcostal/intercostal retractions (1,2). Common causes of neonatal respiratory distress include transient tachypnea of the newborn, respiratory distress syndrome, pneumonia, sepsis, meconium aspiration syndrome, pneumothorax, pulmonary hypertension, cardiac failure, and hypoxic-ischemic encephalopathy.

Pneumomediastinum, also known as mediastinal emphysema, can be a complication of respiratory distress. While most cases of neonatal pneumomediastinum result in spontaneous resolution, there is a risk of pneumothorax, subcutaneous, and interstitial emphysema with deterioration of the clinical status (3,4,5). Therefore, treatment and close observation are warranted.

## Case Presentation:

A male infant was delivered via cesarian section at 39 weeks 5 days gestation (39<sup>5/7</sup>) to a Gravida 1, Para 0, Term 0, Preterm 0, Abortion 0, Living 0 (G1P0000) female. Pregnancy was complicated by fetal cardiac echogenic focus (Quad screen, NIPT neg, confirmed Level II) and group B streptococcus infection. Mother was admitted for induction of labor and progressed to complete dilation. The infant was unable to be delivered despite vacuum assistance. Delivery progressed to a low-transverse c section with epidural anesthesia. At birth, the infant weighed 3485 grams and presented with Apgar scores of 8 and 9 at one and five minutes. The infant required continuous positive airway pressure (CPAP) in the delivery room. On arrival to the Neonatal intensive care unit (NICU), the infant was placed on the bubble CPAP. The infant remained critically ill on bubble CPAP with FiO<sub>2</sub> 21-40%. Chest X-ray was concerning for pneumomediastinum/pneumopericardium and questionable right anterior pneumothorax (Figures 1A and 1B). Pneumopericardium was ruled out due to hemodynamic stability and the absence of halo around the cardiac silhouette. Transillumination was performed at bedside negative for pneumothorax. The echocardiogram was within normal limits. Oral nutrition was started on day 1 of life with 20 cc Similac ProAdvance every 3 hours, gradually increasing to full oral feeds.

On admission to the NICU, the infant's vital signs were temperature 98.1°F, heart rate 172 beats/min, mean blood pressure 83/65 mmHg. Initial blood glucose was 79 mg/dL. Arterial blood gas showed pH 7.27, pCO<sub>2</sub> 43.4, pO<sub>2</sub> 179, HCO<sub>3</sub> 19.1. The respiratory exam was significant for subcostal retractions, tachypnea, and grunting with spontaneous respiratory effort. The abdominal exam was insignificant with a flat abdomen, normal bowel sounds in all four quadrants, and no organomegaly.

On day 2 of life, the infant was comfortable with grunting, and retractions improved. Follow-up chest X-ray showed stable pneumomediastinum (Figure 1C) with the patient on room air. The infant was

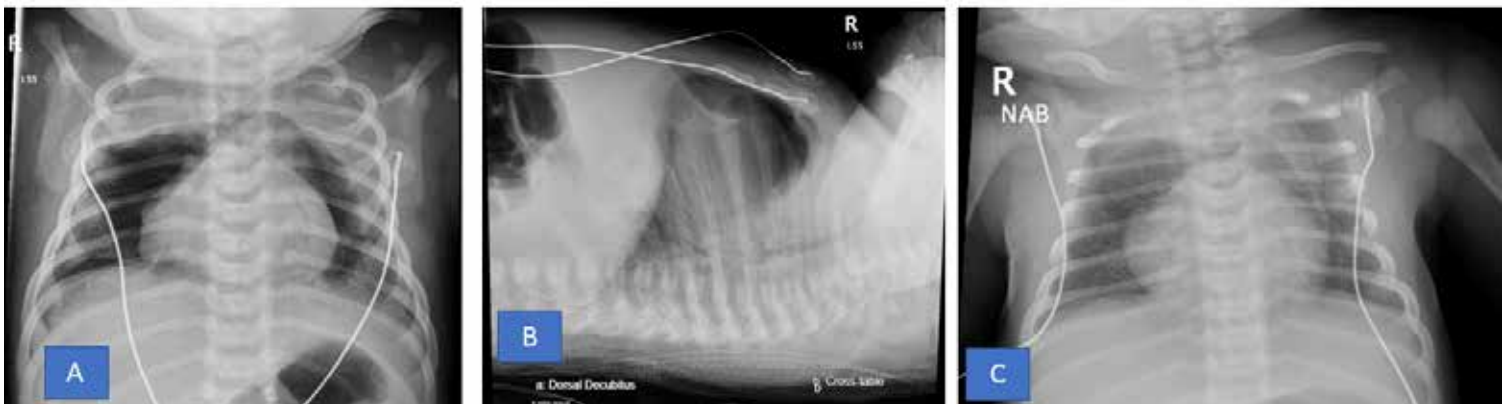


Figure 1 A: Chest x-ray, AP view, with significant pneumomediastinum; Figure 1 B: Chest x-ray, cross-table lateral view, with significant anterior pneumomediastinum; Figure 1 C: Chest x-ray, AP view, with significant resolution of pneumomediastinum

discharged home and last seen in the clinic on day 5 of life in stable condition with no residual respiratory distress and gaining weight.

#### Discussion:

Neonatal pneumomediastinum occurs in approximately 2.5 per 1000 live births (8).

A study performed in Zurich, Switzerland, showed that the incidence of pneumomediastinum (PM) was 0.1% of ICU neonates (4).

Pneumomediastinum in neonates is associated with prematurity, pneumonia, meconium aspiration, difficult delivery, and the need for positive pressure during resuscitation or mechanical ventilation (5). Furthermore, respiratory difficulties that may predispose to pneumomediastinum can occur due to cesarean delivery (6). We can infer from this information that this infant's difficult delivery (unsuccessful vacuum assistance and progression to c section) and need for CPAP during resuscitation may have led to PM findings.

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**“Diagnosis of PM is first confirmed by chest X-ray, which may show the Spinnaker-Sail sign (7). PM treatment in the neonate is based primarily on symptoms and predominantly includes respiratory support such as oxygen therapy and CPAP (9).”**

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#### Conclusions:

In conclusion, while often asymptomatic, infants with respiratory distress should be evaluated for pneumomediastinum with X-ray and treated with respiratory support. Follow-up x-rays should be obtained to evaluate for spontaneous resolution.

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# Briefly Legal: Need for Glucose Screening After Fetal Distress, A Misadventure in the Normal Nursery

Maureen E. Sims, M.D., Barry Schifrin, M.D.

## Facts of the Case:

A 27 y/o primigravida patient presented at 40 2/7 weeks gestation with vaginal spotting, back pain, and contractions. To that point, her pregnancy had been uncomplicated, although her Group B Streptococcus status was unknown. External fetal monitoring, initiated on admission, revealed a Category 1 tracing, which evolved in association with misoprostol, oxytocin, excessive uterine activity, and epidural anesthesia to a Category 2 for the remaining 8 hours of labor. During the last 2 hours, repetitive late decelerations and minimal variability were apparent (a Category III tracing). The mother was given oxygen intermittently, placed in the left lateral position for pushing, and given multiple fluid boluses containing glucose. Because of deterioration of the fetal heart rate pattern, an emergency cesarean section was performed with a vacuum assist of the fetal head. At delivery, a nuchal cord was easily reduced. Scalp swelling and bruising in the midspinal area were noted. At birth, the baby was appropriate for gestational age (AGA), with a birth weight of 3260-g, length 50.8 cm, and head circumference of 36 cm. Apgar scores were 6<sup>1</sup> and 8<sup>5</sup>. The cord was clamped after 30 seconds. Umbilical cord blood gas analysis revealed: Artery pH 7.09, pCO<sub>2</sub> 74mm Hg, pO<sub>2</sub> 10 mm Hg, Base excess -8.8; Vein: pH of 7.2, pCO<sub>2</sub> 56 mmHg, pO<sub>2</sub> 28 mmHg base excess of 7.2.

***“External fetal monitoring, initiated on admission, revealed a Category 1 tracing, which evolved in association with misoprostol, oxytocin, excessive uterine activity, and epidural anesthesia to a Category 2 for the remaining 8 hours of labor. During the last 2 hours, repetitive late decelerations and minimal variability were apparent (a Category III tracing).”***

The baby received blow-by oxygen from a 1<sup>st</sup>-year pediatric resident and a labor and delivery nurse – neither an RT nor a senior neonatal attending was present despite that indication for the emergency cesarean section was fetal distress. At 20 minutes, it was noted that he had a normal physical examination except for elevation of the heart rate (HR) 186 beats per minute (bpm), a respiratory rate of 64 breaths per min (BPM), intercostal retractions with a “rare cry.”

***The plaintiff obstetrical experts were critical of the defendant obstetrician and nurses for failing to appreciate that this fetus was not tolerating the labor well. The prospects of safe vaginal delivery were significantly diminished despite the excessive uterine activity. They averred that the delay in performing a cesarean section earlier subjected the fetus to a prolonged period of hypoxia and ischemia. The obstetrical***

***expert for the defendant disagreed. The mother stated in her deposition that she was not asked permission for a vacuum assist. Depositions of the treating nurses and physicians for the baby revealed that they were unaware of a cord gas being sent and did not know the significance of arterial cord acidemia. The plaintiff experts were critical of this lack of awareness as well as the cord arterial acidosis on the newly born baby and the need for monitoring for a baby born after this stress. The plaintiff experts were critical of the hospital for not having the attending pediatrician or neonatologist informed of this baby’s birth. These findings mandated an evaluation from an experienced provider.***

The infant and was ultimately sent to the normal newborn nursery. The pediatric resident wrote routine orders, which included rooming-in with the mother and the option for breastfeeding. The hospital protocol did not require the pediatric resident to notify the on-call attending pediatrician. An hour after birth, the nurse called the on-call pediatrician to inform him of the birth of a new baby who was not interested in breastfeeding and who remained symptomatic.

***In their depositions, the pediatric nurse stated that she did not inform the pediatrician on-call about the emergency cesarean section for fetal distress or the cord blood gases and the pediatrician admitted that he did not inquire about such details. He said that he assumed it was a normal baby who was transitioning. The plaintiff neonatologist pointed out that not only was the history important, but the baby’s symptomatology required attention and investigation.*** The attending pediatrician on-call ordered the baby to be transferred to the normal nursery from the rooming-in with the mother to where he could be “closely observed.” The baby arrived in the normal nursery about 1.5 hours after birth and was cared for by a labor and delivery nurse. In addition to the persisted high HR and RR and intercostal retractions, the nurse noted the development of lethargy.

***“In their depositions, the pediatric nurse stated that she did not inform the pediatrician on-call about the emergency cesarean section for fetal distress or the cord blood gases and the pediatrician admitted that he did not inquire about such details. He said that he assumed it was a normal baby who was transitioning.”***

***The plaintiff’s expert neonatologist was critical of the nurse and the on-call pediatrician allowing this symptomatic baby to be cared for in the normal nursery rather than in the NICU, where dedicated surveillance was available. The plaintiff’s experts drew attention to the differential diagnosis, which included hypoxic-ischemic injury, intracranial hemorrhage, as well as hypoglycemia. Given the history of prolonged fetal distress and difficult delivery, hypoglycemia should be ruled***

**out irrespective of the remainder of the differential diagnosis. Any symptomatic baby without known reasons for the symptoms mandated the determination of a serum glucose level.**

**The defense experts countered that since the baby was at term and appropriate for gestational age (AGA) and the mother was not known to be diabetic, the (prenatal historical) risk factors did not put this baby at risk for hypoglycemia. Plaintiff experts strongly disagreed. The symptoms immediately after birth were probably secondary to the response from the ongoing hypoxic-ischemic insults and the mechanical forces exerted on the fetal head, given the obstetrician's difficulty in extracting the fetal head at birth. There was no evaluation of blood gases (despite the indication of fetal distress for operative delivery). Nor was a chest radiograph obtained. It was not possible to be more specific except to opine he was acidotic at the time of birth and had increased metabolic demands with his increased work of breathing. While the immediate glucose levels in the neonate are close to those of the mother's glucose concentration at birth, perinatal stress mobilizes glucose via the release of catecholamines. When the maternal supply is cut off at birth, neonatal hypoglycemia becomes an etiology that should have been considered, as well as several other etiologies of the baby's symptoms. A bedside glucose evaluation is simple to obtain and rapidly available: if found to be abnormally low, it allows easy intervention. But if low serum glucose remains, it risks an adverse outcome, including seizures and neurological injury. Intrapartum hypoxia and ischemia coupled with hypoglycemia are far worse together compared to either alone.**

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***“The plaintiff experts explained that it was below the standard of care to fail to evaluate this baby with increasing symptoms properly. The nurses should have insisted that the physician come to the bedside, and protocols should have been in place for a bedside glucose evaluation.”***

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The baby began having intermittent desaturations, which responded to blow-by oxygen. The nurse called the on-call pediatrician again to inform him of the desaturations. **The plaintiff experts explained that it was below the standard of care to fail to evaluate this baby with increasing symptoms properly. The nurses should have insisted that the physician come to the bedside, and protocols should have been in place for a bedside glucose evaluation. Plaintiff experts pointed out that the baby had experienced intrapartum distress, likely had an abnormal arterial cord gas and was symptomatic. He should have been admitted to the Newborn Intensive Care Unit (NICU). The plaintiff experts were critical of the nurses for not advocating for this baby. They should have known that a baby born with non-reassuring tracings, a vacuum assist, cord acidemia required higher-level care than that provided in a normal nursery. The symptomatology by itself was sufficient to mandate NICU admission. They should have insisted upon a physician's presence, gone through their chain of command if they could not persuade the physician to come to the bedside and admit the baby to the NICU or directly called the neonatologist on-call.**

Because the oxygen desaturations continued, the nurse, at 1.5 hours of life, did a point of care glucose assessment and found it below the readable range (<10mg/dL). The nurse informed the on-call pediatrician about the low glucose and received an order to gavage feed the baby 25 ml of formula and to recheck the glucose after 20 minutes. **The plaintiff pointed out that it was inappropriate to gavage feed a baby with a prohibitively low serum glucose level. When a baby who should be nipple is too sick to do so, gavage feeding is not an appropriate substitute and is potentially dangerous. The likely reason this baby did not feed was the several hours of hypoxemia and acidosis in utero. Furthermore, hypoglycemic babies tend not to want to feed. Rather, the standard of care required the immediate administration of an intravenous bolus of glucose.** A point of care glucose was repeated after the gavage feed; it was again below the readable range. The infant's HR and RR remained high, the oxygen saturations were intermittently low, and the infant remained lethargic. Several conversations between the nurse and the physician occurred while the baby was in the normal nursery, with the physician eventually assuring the nurse he would come in soon.

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***“Two and a half hours after birth, the pediatrician arrived at the bedside. Two additional bedside glucose evaluations were again unreadable. The pediatrician called the neonatologist requesting admission to the NICU.”***

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Two and a half hours after birth, the pediatrician arrived at the bedside. Two additional bedside glucose evaluations were again unreadable. The pediatrician called the neonatologist requesting admission to the NICU. The pediatrician entered several orders at this point: 15 ml formula to be gaviged, a bolus of 6 ml of 10% dextrose, a complete blood count (CBC) and blood culture, a peripheral intravenous line, ampicillin and gentamicin, and admission to the NICU. At this point, the baby had decreased tone and was minimally responsive; his HR was 148 bpm, temperature 36.5°C, a RR of 66 BPM, a blood pressure of 60/38 with a mean of 45 mm Hg. At 3½ hours after birth and 2 hours after the initial unreadable glucose assessment, a bolus of 6 ml of 10% dextrose was given intravenously.

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***“The baby was discharged at two weeks on no medications and breastfeeding. The child had severe developmental delay, cerebral palsy, and a seizure disorder at a three-year follow-up examination.”***

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During the first 24 hour period in the NICU, the baby remained minimally responsive. His glucose values ranged from 27-47 mg/dL. A lumbar puncture revealed no evidence of infection. During the following 24 hours, with higher, more stable glucose values, seizures began for which phenobarbital was provided. Disseminated intravascular coagulopathy (DIC) developed with elevated liver enzymes. A cranial ultrasound showed a region suspicious

for parenchymal hemorrhage in the temporal, occipital region. An MRI showed intraventricular hemorrhage, scattered bilateral parenchymal hemorrhages, and left cerebellar and posterior fossa subdural hemorrhages. The baby was discharged at two weeks on no medications and breastfeeding. The child had severe developmental delay, cerebral palsy, and a seizure disorder at a three-year follow-up examination.

The obstetrical staff was sued for:

1. Failure to properly evaluate and timely respond to the abnormal FHR tracing.
2. Failure to appreciate the diminished feasibility of safe vaginal delivery
3. Failure to timely deliver by cesarean section.

The hospital was sued for:

1. Allowing this symptomatic baby to remain with the mother for an hour, then in a normal nursery,
2. Delayed assessment of glucose
3. Failing to notify the attending pediatrician promptly
4. Failure to appropriately supervise the pediatric resident
5. Not appreciating the emergency nature of profound hypoglycemia
6. Not intervening timely with intravenous glucose
7. Not advocating for this baby by insisting on the presence and appropriate actions from the on-call pediatrician.
8. Failure to go up the chain of command.

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***“The on-call attending pediatrician was sued for not responding and intervening appropriately to the baby timely. Each party blamed the others for the adverse outcome. All parties settled.”***

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The on-call attending pediatrician was sued for not responding and intervening appropriately to the baby timely. Each party blamed the others for the adverse outcome. All parties settled.

## Discussion

### General:

Glucose is the major energy source for fetuses and neonates. Fetal fuel metabolism is based primarily on glucose oxidation, which is supplied from maternal plasma glucose whose levels are regulated by maternal insulin secretion that does not cross the placenta. Fetal insulin secretion increases cellular glucose uptake, deposits glucose as glycogen, facilitates lipogenesis, and inhibits the breakdown of fatty acids triglycerides in preparation for the energy demands of the newborn. Thus, while fetal insulin is responsive to plasma glucose concentrations, its response in the normal newborn is delayed compared to the adult or the infant of the diabetic mother. Its primary function is the regulation of fetal growth.

Within 1 to 1.5 hours after birth, blood glucose concentrations have fallen rapidly by 20–25 mg/dL from their fetal glucose concentrations to a nadir of about 55–60mg/dL. By 3 hours, they have risen and stabilized even in the absence of any intake. During

this time, plasma insulin levels fall, and plasma glucagon levels rise. They are presumably mediated through a surge in catecholamines and other counterregulatory hormones. By 12–24 hours, blood glucose concentrations stabilize between 43 and 90 mg/dL reaching a steady-state by 2 to 4 days of life. These relationships are altered under various conditions, including maternal diabetes, Rh isoimmunization, and preeclampsia. Further, during severe fetal distress, where the supply of glucose from the mother is curtailed by placental insufficiency, cord compression, or cerebral ischemia, the fetus obtains glucose from stored glycogen, and fetal insulin is required to move glucose into the cells for energy.

Although all organs can use glucose, the human brain uses it almost exclusively as a substrate for energy metabolism. The high brain-to-bodyweight ratio in the newborn results in a proportionately higher demand for glucose compared with the capacity for glucose production than that encountered later in life, with cerebral glucose use accounting for as much as 90% of total glucose consumption. The fetus is exposed to circulating glucose concentrations about 9 mg/dL below those of maternal plasma, which normally are 70–90 mg/dL. With the abrupt severing of the umbilical cord, exogenous glucose supply is terminated, and nutrient and neonatal glucose levels fall. The newly born embarks upon a transition of complex and physiologic challenges that require metabolic adaptation to maintain appropriate plasma glucose concentrations.

First, a word must be said about the normal response to a decreasing glucose concentration in older babies, children, and adults. In normal individuals, the maintenance of normal plasma glucose concentrations is highly protected. The two metabolic responses to hypoglycemia are 1) to lower insulin levels and 2) to mobilize alternate fuel sources. The metabolic response that opposes or counters the insulin secretion to maintain euglycemia is referred to as a “counterregulatory response.” The main counterregulatory hormones are glucagon, epinephrine, cortisol, and growth hormone. The other response to maintain euglycemia is to tap into alternate fuel sources, namely lactate, a major gluconeogenic substrate,  $\beta$ -hydroxybutyrate (BHB), a major ketone, and free fatty acids, a robust energy source released from adipose tissue.

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***“These mechanisms to regulate glucose are sluggish at birth, putting the newly born at risk for hypoglycemia. These mechanisms are especially challenged in babies born with increased glucose demands or when exogenous or endogenous glucose supply is limited. Immediately after birth, the newborn experiences a drop in glucose.”***

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These mechanisms to regulate glucose are sluggish at birth, putting the newly born at risk for hypoglycemia. These mechanisms are especially challenged in babies born with increased glucose demands or when exogenous or endogenous glucose supply is limited. Immediately after birth, the newborn experiences a drop in glucose. In the healthy full-term infant, the nadir usually is no lower than 40 mg/dL between 30 and 90 minutes after birth. Thereafter, the plasma glucose concentration rises and is maintained at a steady level of about 55–60mg/dL by 1–2 hours. It steadily rises over the next 1–2 days and is in the normal range for infants,



children, and adults. The plasma glucose concentration during the first 24 h after birth in healthy, asymptomatic breastfed babies has been reported to have a mean of 65 mg/dL compared to formula-fed babies with an average of 72 mg/dL.

### Clinical Categorization

A reasonable classification of neonatal hypoglycemia is to categorize them into four groups.:

1. **“Transitional neonatal hypoglycemia” or “early transitional-adaptive hypoglycemia”** is a common variety of neonatal hypoglycemia and occurs in the first 3-12 hours after birth. The pathophysiology involves the failure of one or more of the early adaptive responses to birth. This “normal hypoglycemia” is most likely due to the persistence of the fetal pattern of insulin regulation resulting in higher insulin levels for the newly born. Speculation is that the low glucose threshold for suppressing insulin release at birth reflects a fetal islet adaptation that allows the fetus to secrete sufficient insulin to maintain fetal growth even at fetal glucose concentrations that are lower than in the mother and also at times when maternal glucose concentrations are reduced (e.g., during fasting or limited calorie consumption). An interesting finding of neonatal hypoglycemia in normal newborns is that the plasma glucose levels are lowest **early on the first day of life** and then progressively increase. Also of interest is that during transitional neonatal hypoglycemia in normal infants, plasma glucose concentrations are **remarkably stable and relatively unaffected by the timing of initial feeding or interval between feedings**. This data should be considered when relying on preprandial glucose assessments.
2. **Impaired metabolic adaptation** is a heterogeneous group and relatively common in neonates. These babies are born with various conditions that make them at risk for hypoglycemia. Although there is overlap concerning the pathophysiology of hypoglycemia in the various conditions, a predominant feature is a lower glucose threshold for suppression of insulin secretion than expected and results in impaired glucose and ketone production. Included in this group are babies born with various conditions, including asphyxia, preterm, SGA, IDM, congenital heart disease, infection, and some conditions that develop after birth, such as iatrogenic cold stress
3. **Intrauterine growth restriction (IUGR)**, where undernutrition is the dominant feature. This disturbance affects glycogen and lipid stores, gluconeogenic capacity, and ketone production.
4. **Severe recurrent hypoglycemia** is secondary to specific primary enzymatic or metabolic-endocrine abnormalities involving glucose homeostasis.

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***“It can be challenging to identify and distinguish newborn infants having transitional hypoglycemia from several other conditions during the first 48 hours.”***

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It can be challenging to identify and distinguish newborn infants having transitional hypoglycemia from several other conditions during the first 48 hours.

### Alternate Fuels:

While the newborn brain can use alternative metabolic substrates,

such as lactate and ketone bodies, the supply of these is limited, and the newborn's immature counterregulatory response limits their availability. Lactate provides a potential alternative fuel in the first 48 h and ketones may be available on days 3-4, but each can provide only a small proportion of total brain energy requirements. Neither lactate nor BHB is likely to provide neuroprotection during early or acute hypoglycemia. Hypoglycemia, irrespective of feeding or fasting, suppresses plasma-free fatty acids (FFA) as well as ketones. It cannot be assumed that ketones are available as an alternative fuel to support brain metabolism when normal neonates develop hypoglycemia or that breastfed babies are protected against potential adverse effects of hypoglycemia by ketones if their postnatal fasting period extends too long. Interestingly, pregnant women develop hyperketonemia much earlier than non-pregnant women (accelerated starvation), thereby providing the fetus with alternative fuel to protect the brain when plasma glucose is low, thus making it unnecessary for the fetus to switch off insulin secretion and thereby avoid limiting growth and development.

### Defining Neonatal Hypoglycemia:

The definition of a blood glucose level below which hypoglycemia should be designated is complex and cannot be based on a single number uniformly applied to all infants. Attempts at such definitions have been based on *statistical* thresholds derived from the study of serial changes of blood glucose in *normal* infants; on *operational* thresholds based on blood glucose levels and the presence or absence of symptoms or risk factors; on *neurophysiological* thresholds based on changes in brain stem auditory evoked responses (BSAERs), cerebral blood flow (CBF), or cerebral glucose metabolism; and on neurological outcome thresholds based on neurodevelopmental outcome as a function of different blood glucose levels. What is needed is the identification of the threshold at which treatment would prevent brain injury.

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***“However, thresholds vary depending on gestational age, postnatal age, concurrent metabolic demands, co-morbidities, intrapartum challenges, and availability of alternative metabolic fuels. Further, even if healthy term babies have low glucose concentrations during the transition, their reference ranges should not be normative for infants who have impaired metabolic adaptation.”***

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However, thresholds vary depending on gestational age, postnatal age, concurrent metabolic demands, co-morbidities, intrapartum challenges, and availability of alternative metabolic fuels. Further, even if healthy term babies have low glucose concentrations during the transition, their reference ranges should not be normative for infants who have impaired metabolic adaptation.

For example, a term baby with a benign prenatal period who then is subjected to hypoxic and ischemic challenges during labor and delivery is metabolically very different from the healthy term baby with a normal intrapartum course. Infants who are ill enough to be admitted to the NICU automatically will receive bedside glucose evaluations soon after admission and receive the needed inter-

ventions. However, the fetus who had a challenging intrapartum course who is compromised but has a heart rate and is breathing (even if he needed positive pressure briefly to achieve a normal respiratory drive), who has decreased tone, weak or absent cry, whose color is “off” often will be roomed-in with mother or be admitted to the normal nursery to be “closely observed.” Glucose evaluations are only performed when symptoms are appreciated.

#### Screening for Hypoglycemia:

**Routine screening in an acute setting** occurs on babies admitted from the delivery suite to the NICU, with the usual reason for admission being immaturity, small size, cardiovascular or respiratory instability, or significant anomalies. It is common practice in developed countries to screen certain categories of asymptomatic babies known to be at risk for hypoglycemia.

**Routine screening for asymptomatic babies in a non-acute setting** occurs for infants of diabetic mothers (IDM), and small for gestational age (SGA), large for gestational age (LGA), and the late preterm (LPT, 34 - 36 6/7 weeks gestation) gestations. Such babies are well known to be at risk, and even when appearing healthy and stable, they room in with their mother or are cared for in the normal nursery. The initial screening is usually done 1-2 h after birth, followed by regular measurements over the next 12-48 h until the baby is consistently euglycemic.

#### Escaping the Safety Net:

**Routine screening is not done on a large swath of asymptomatic babies who nevertheless are at risk for hypoglycemia while rooming in with their mother or residing in the normal nursery.** These are the babies who appear healthy and stable immediately after birth **because neonatal adaptation appears satisfactory.** But in fact, they have a history of prenatal or perinatal stressors that put them at risk for hypoglycemia. **At times, stability is achieved in the delivery room after the baby is born because they briefly receive positive pressure ventilation or blow-by oxygen. Sometimes the tone is decreased, or the cry is not present or strong. Sometimes the color is not normal. They enter areas where they are presumed to be normal or close enough and will be not be “observed closely.”** Many among them are born a) after fetal distress, difficult deliveries, cesarean section for intolerance to labor or difficult deliveries as in the case presented b) to mothers with hypertension; c) to mothers who received glucose infusions, especially boluses during fetal decompensation intervals; d) with IUGR e). with post dates f) with higher length compared to weight (low PI), g) born to mothers who received sympathomimetics (terbutaline, ritodrine,) and propranolol and finally, babies affected by Rh sensitization.

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**“Concern for substantial neurologic morbidity in neonates with hypoglycemia has led to the promulgation of guidelines by the American Academy of Pediatrics (AAP) in 2011, the Pediatric Endocrine Society (PES) in 2015, and most recently by Dr. Volpe (2019).”**

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#### Treatment and Justification:

Concern for substantial neurologic morbidity in neonates with hypoglycemia has led to the promulgation of guidelines by the

American Academy of Pediatrics (AAP) in 2011, the Pediatric Endocrine Society (PES) in 2015, and most recently by Dr. Volpe (2019). In reviewing the literature and guidelines, one must be careful to note whether the values represent mean glucose values or a threshold range for glucose values (e.g., below the 5<sup>th</sup> percentile (AAP). Dr. Volpe favors the following approach: infants at risk for impaired metabolic adaptation (babies who experienced in utero hypoxic-ischemic insult, IDM, and SGA) even if asymptomatic with a single low blood level to be treated with intravenous glucose. Volpe justifies this approach based on:

1. Neurophysiological, epidemiological, and clinical observations that levels less than 50 mg/dL can be associated with evidence for neurophysiological or neurodevelopmental dysfunction;
2. The PET observation that cerebral glucose utilization in the premature infant may be limited by glucose transport at levels of plasma glucose less than approximately 54 mg/dL;
3. The likelihood that degrees of hypoglycemia not sufficient to cause brain injury alone may do so when combined with other factors deleterious to the central nervous system;
4. The lack of precise information regarding the level of blood glucose below which neuronal injury is likely to occur.
5. The realization that the parietal-occipital region and higher visual functions are most sensitive to and that such cortical functions have not been carefully studied in most follow-up reports; and
6. The ample experimental evidence that blood glucose levels are not accurate predictors of brain glucose levels, particularly in states such as asphyxia or seizures.

The physician must consider the status of both hypoglycemia and *cerebral glucose delivery* (i.e., CBF) and blood glucose content and *cerebral glucose utilization*. Once a decision is made to treat an infant for hypoglycemia, a bolus of 2mL/kg 10% dextrose is given over 1 minute, immediately followed by a continuous glucose infusion of 5 to 8 mg/kg per minute is standard. This minibolus infusion results in rapid correction of blood glucose level (usually within 1 minute), and relative stability of values between approximately 70 and 80 mg/dL occurs after that with the continuous infusion of 5 to 8 mg/kg per minute. This infusion rate is based on the rate of endogenous glucose production in healthy newborn infants.

*Careful assessment of the initial clinical response after the minibolus infusion is essential*, especially if the indication for the infusion was a seizure because of variability in response to blood glucose level; a second minibolus infusion may be necessary.

*Continued careful monitoring of clinical response and blood glucose level* also is important because certain infants (e.g., those with hyperinsulinism) may require higher maintenance doses of glucose, whereas some infants require lower maintenance doses to avoid hyperglycemia. In general, after blood glucose levels are stable at 70 to 100 mg/dL, the dextrose concentration in the infusion may be decreased by 1 to 2 mg/kg per minute every 6 to 12 hours. Glucose levels are monitored closely and should be maintained at more than 50 mg/dL. It is essential not only to correct but also to avoid hyperglycemia. For infants whose glucose levels do not increase adequately despite higher infusion rates of at least 10 to 12 mg/kg per minute or who require infusion rates of more than 12 mg/kg per minute or if hypoglycemia recurs, hyperinsulinism should be considered. Treatment for the latter condition includes diazoxide or octreotide (both suppress insulin secretion) or pancreatic surgery. Less likely causes include specific hormonal defects (e.g., hypopituitarism) or a metabolic disorder that requires specific therapy. Hydrocortisone, previously used in this context

at 5 mg/kg every 12 hours, has increased gluconeogenesis (from protein sources) and decreased peripheral glucose utilization. This agent has been used less in recent years; if administered, it should be discontinued as soon as feasible.

Feeding of the hypoglycemic baby has several layers to unfold. A baby we expect to feed well, such as the term healthy infant, but is feeding poorly, should be evaluated as to the cause. It is inappropriate to gavage this type of baby without understanding the reason for the poor feeding. Since hypoglycemia causes poor feeding, this is another reason for the inability of the baby to feed. In circumstances where an evaluation is being performed to determine if a congenital hypoglycemic disorder is present, some investigators suggest that the feeding should be given only as a constant-rate nasogastric drip to avoid hormonal excursion and simplify the assessment.

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***“Some have advocated using dextrose gel to stabilize infants with very low glucose while preparing for a peripheral intravenous line. This treatment approach has not yet been widely adopted in the United States.”***

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In infants with hypoglycemia being breastfed, establishing adequate milk let down, and ingestion may take 1-2 days. In these cases, the introduction of formula may create some controversy with respect to the success in subsequently establishing breastfeeding. If causes for the hypoglycemia have been assessed and one is convinced the mildly low glucose level is secondary to transitional neonatal hypoglycemia, some centers used oral dextrose gel as a supplemental management option. This gel can be applied directly to mucosal surfaces of the mouth, including buccal and lingual surfaces, with rapid access to the circulation. The estimated rise in blood glucose concentration following dextrose gel is 0.4 mmol/L (40 g of dextrose per 100 mL, administered at 200-400 mg/kg). The risk of rebound hypoglycemia, however, is a possibility and needs close monitoring. Some have advocated using dextrose gel to stabilize infants with very low glucose while preparing for a peripheral intravenous line. This treatment approach has not yet been widely adopted in the United States.

#### **Symptoms:**

Neonates with hypoglycemia may be asymptomatic or manifest nonspecific symptoms similar to many disorders in newborn infants. The symptoms of hypoglycemia reflect brain responses to glucose deprivation and consist of 2 types of reactions: neurogenic and neuroglycopenic. The neurogenic symptoms are caused by activation of sympathetic discharge and include tachycardia, tremors, lethargy and diaphoresis. The neuroglycopenic symptoms include desaturations, apnea, bradycardia, respiratory distress, hypothermia, seizures, and coma. Limited data suggest that the glucose thresholds for both neurogenic and neuroglycopenic responses to hypoglycemia may not be different in newborn infants than in older children and adults.

Physiologically, hypoglycemic symptoms may present when glucose delivery is inadequate to meet glucose demand and can occur over a range of glucose concentrations, depending on the status of the infant. For example, a 2-hour-old healthy infant who has

a blood glucose of 30 mg/dL ( 1.7 mmol/L) might not demonstrate impaired organ function, but a stressed infant might demonstrate physiologic hypoglycemia at a blood glucose concentration of 50 mg/dL ( 2.8 mmol/L ) if the rate of glucose delivery to the brain is less than the rate of glucose utilization. Given the neonates' proportionately greater demand for glucose by the brain, many advise that there is no reason to assume that a lower threshold for intervention is likely appropriate in neonates. Even if the health care team is astute at detecting hypoglycemia-related symptoms that usually are caused by either counter-regulation or the absence of alternate substrates to fuel brain oxidative metabolism, the cause for lack of symptoms remains evasive. The asymptomatic state may relate to a lack of the compensatory counter-regulatory hormonal response similar to the unawareness state described in older children, which may be ominous. The greatest variance in the management of hypoglycemia is seen in the asymptomatic infant diagnosed soon after birth, during the first 2 hours. Controlled studies examining the benefits or impact of this early feeding on recovery from hypoglycemia have not been performed. It has been suggested that as many as 10% of healthy infants who are the appropriate size for gestational age develop transient asymptomatic hypoglycemia, which in most cases is managed by the initiation of early, normal feeding. Considering that data show that plasma glucose concentrations in transitional hypoglycemia are at their lowest in the first 2 hours and are remarkably stable and relatively unaffected by the timing of initial feeding or interval between feedings and that the lowest level of glucose concentration, the hope that the feeding will resolve the low glucose level seems at some level overly hopeful.

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***“The combination of hypoglycemia, hypoxemia, and/or ischemia leads to greater cerebral metabolic derangement than observed with either condition alone. The deleterious effects of hypoxemia secondary to fetal distress are potentiated after delivery if low plasma glucose concentrations occur.”***

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#### **Hypoglycemia and Asphyxia**

Pathogenetic factors in asphyxia resulting in hypoglycemia are (1) enhanced cerebral utilization of glucose secondary to anaerobic glycolysis, (2) glycogen depletion secondary to intrapartum stress-induced catecholamine release, and (3) hypersecretion of insulin. Hypoglycemia secondary to asphyxia usually has its onset on the first day of life (although usually later than in the early transitional group), duration is variable, the degree is relatively mild, and response to glucose therapy is prompt. However, in the severely asphyxiated infant, the onset is earlier, the degree is marked, and depending on the degree of hyperinsulinism, the response to glucose may not be prompt. Affected infants often require high glucose infusion rates to maintain a normal glucose concentration, suggesting either an increased insulin concentration or increased insulin sensitivity. Because asphyxia also increases plasma glucagon, interleukin-6, hydrocortisone, and other counter-regulatory



hormones, with associated changes in insulin receptor binding, it can also induce an insulin-resistant state.

The combination of hypoglycemia, hypoxemia, and/or ischemia leads to greater cerebral metabolic derangement than observed with either condition alone. The deleterious effects of hypoxemia secondary to fetal distress are potentiated after delivery if low plasma glucose concentrations occur. Depending on the severity and duration, either alone would not necessarily cause brain injury but may do so when acting in concert. An ischemic insult is significant because of the likelihood of ischemia to certain brain regions during hypoglycemia with moderate hypotension. This likelihood relates to the impairment of vascular autoregulation. Intervening with blood pressure and glucose control is critically important. Similar to pure hypoxemia, the degrees of ischemia and hypoglycemia alone would not cause brain injury might do so when acting together.

---

***“The dominant finding has been abnormal signal intensity by magnetic resonance imaging (MRI) in the parietal-occipital region. The involved areas exhibit restricted diffusion on diffusion-weighted MRI (DWI). The topography is seen better in the acute stage by DWI than by conventional MRI.”***

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#### **Technical issues:**

There are many potential artifacts in measuring plasma glucose concentrations:

1. Venous and capillary blood have lower glucose concentrations than the concentration of arterial plasma glucose to which the brain is exposed.
2. The glucose concentration in plasma is approximately 15% higher than in whole blood due to the volume occupied by red blood cells,
3. Glucose concentrations in whole blood specimens decline rapidly with delays in processing due to consumption by red and white blood cells
4. Glucose measurements by bedside glucometer testing have a 15% imprecision inherently and are also highly susceptible to multiple artifacts of sampling and operator errors.

#### **Imaging:**

The dominant finding has been abnormal signal intensity by magnetic resonance imaging (MRI) in the parietal-occipital region. The involved areas exhibit restricted diffusion on diffusion-weighted MRI (DWI). The topography is seen better in the acute stage by DWI than by conventional MRI. Magnetic resonance spectroscopy shows no or mild lactate elevations with advanced lesions, indicating that the lesion is not basically ischemic but rather related to glucose deprivation. Although 10% to 15% of the lesions resolve, most are followed in subsequent weeks and months by loss of cerebral cortex and white matter, often with ventricular dilation. A more diffuse pattern of cerebral cortical injury may occur with very

severe hypoglycemia. In general, the posterior cerebral involvement includes both cortex and underlying white matter, seen best acutely by DWI imaging. Conventional MRI sequences often show predominantly white matter involvement.

#### **Outcome:**

Mortality and neurological outcome in neonatal hypoglycemia relate to the level and duration of the low plasma glucose and the timeliness of appropriate intervention. The most common sequelae include developmental delay, mental retardation, visual disturbances, and seizure disorders.

#### **Summary of Case:**

This case involved an AGA term baby who was a healthy, normally grown, and normally responsive fetus entering at the onset of labor. Over time and prolonged labor with excessive uterine activity, his heart rate pattern worsened, especially during the 2<sup>nd</sup> stage of labor resulting in an emergency Cesarean section with vacuum assistance needed to deliver the fetal head. He needed some blow-by oxygen and had Apgars of 6<sup>1</sup> and 8<sup>5</sup>; the arterial cord pH was 7.09. He had a rare cry, and at 20 minutes, he was tachycardic and tachypneic with intercostal retractions. Nevertheless, he was sent to room-in with his mother. His tachypnea and tachycardia, likely secondary from his fetal distress and potentially traumatic delivery were attempts to increase cardiac output and blow off CO<sub>2</sub>. Any baby with either this history **or** these symptoms should have been admitted directly to the NICU from the delivery room; a blood gas and a chest radiograph should have been done; and interventions provided to stabilize his cardiovascular, respiratory, and metabolic conditions. He would have had a peripheral intravenous line with glucose, and his plasma glucose levels would have been monitored intermittently. However, because he was sent to room-in with his mother and failed to show interest in feeding, he was brought to the normal nursery where he continued to have an elevated RR and HR, became lethargic, and developed multiple desaturations. Eventually, markedly low bedside glucose prompted gavage feedings, an inappropriate approach to bypass the respiratory distress. The baby eventually was admitted to the NICU, where a bolus of glucose was administered 3 ½ h after birth, 2 h after the first of several unreadable glucose evaluations. The baby was minimally responsive in the NICU for the first 24 hours, developed seizures the following day, and had a stormy course, including DIC. MRI showed intraventricular, parenchymal, and subdural hemorrhages. On follow-up, he had severe developmental delays, cerebral palsy, and a seizure disorder.

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***“Preventive care was required during labor and in the neonatal period. Avoiding fetal distress (avoiding the need to rescue the fetus), admitting the newborn directly to the NICU would most probably have resulted in a normal child today.”***

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Preventive care was required during labor and in the neonatal period. Avoiding fetal distress (avoiding the need to rescue the

fetus), admitting the newborn directly to the NICU would most probably have resulted in a normal child today.

### Conclusion:

Babies with symptoms should not room in with their mothers or go to the normal nursery. Even asymptomatic babies born after fetal distress need to have their glucose monitored. Prevention of hypoglycemia is essential. Screening protocols should be expanded to include a larger target population and include babies born a) after fetal distress, cesarean section for intolerance to labor and complicated deliveries, with cord acidemia b) to mothers with hypertension; c) to mothers who received glucose infusions, especially boluses during fetal decompensation intervals; d) with IUGR e). with postdates f) with higher length compared to weight (low Ponderal Indices), g) born to mothers who received sympathomimetics (terbutaline, ritodrine,) and propranolol. Prompt intervention with intravenous glucose is critically important for the hypoglycemic newborn.

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# 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.

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# Gravens By Design: Gravens Conference 2022: Transformational Change – Making it Happen in the NICU

Robert D. White, MD, Joy Browne, PhD, PCNS, IMH-E(IV),  
Vincent C. Smith, MD, MPH, Mitchell Goldstein, MD, MBA, CML

*“In 2021 we met virtually; we lost much of the interpersonal value this meeting had always provided but developed the capability to offer this option for future meetings. In 2022 we will return to an in-person meeting but offer a hybrid format, allowing our content to be shared much more widely and broadening our audience while regaining the opportunity for interpersonal synergy.”*

From our origin in the 1980s through 2020, the Gravens Conference was held in person, providing a stimulating mix of scientific presentations, small group discussions, and restorative time on the Florida beach. In 2021 we met virtually; we lost much of the interpersonal value this meeting had always provided but developed the capability to offer this option for future meetings. In 2022 we will return to an in-person meeting but offer a hybrid format, allowing our content to be shared much more widely and broadening our audience while regaining the opportunity for interpersonal synergy.

## Day 1

Our opening day will begin with a special presentation by parents about the ethical considerations in how parents perceive their baby's participation in research studies. Dr. Terrie Inder, from Brigham & Women's Hospital in Boston, will discuss her experience with neurodevelopmental care, especially in their open-bay step-down area. She will describe how NICU design should be flexible to meet the neurodevelopmental needs of all infants. Dr. Bobbi Pineda from the University of Southern California will present the most recent data from her SENSE program, which provides the structure for neurodevelopmental stimulation at each stage of a baby's NICU stay. Dr. Livio Provenzi will present some fascinating data on the epigenetic changes seen in early-born babies and the influence of early caregiving on those changes. As a proponent of early developmental and family-centered care, he will provide insights from his experience with NICU babies and families and their outcomes. Dr. Daphna Barbeau will then address arousal and sleep changes during fetal and newborn development and how the early caregiving environment impacts sleep outcomes.

As always, we will present the Gravens award for Leadership in Promoting the Environment of Care for Babies and Families in Intensive care. We will end the day with the specifics of how to

affect change by some of the people who do it best. Recent publications on how to affect change in the NICU reveal specific strategies that have worked and can be replicated in your work.

## Day 2

TRACK A: Over the last few decades, we have experienced a change in our interactions with family members in the NICU. We will explore the transformational change that has occurred in understanding the essential role of parents and family members in the care of their baby. We will also hear the implications for the physiologic, social, and emotional short and long-term best outcomes as well as the why and the how of supporting them as members of our NICU teams.

*“As always, we will present the Gravens award for Leadership in Promoting the Environment of Care for Babies and Families in Intensive care. We will end the day with the specifics of how to affect change by some of the people who do it best.”*

TRACK B: We will have a team presentation of recommendations from the “ReImagining the NICU” workshop with an open discussion from the floor to refine further these proposals before the next Recommended Standards for Newborn ICU are developed. There will be two New Unit Presentations, followed by an update by Judy Smith on the “State of the Art in NICU Design,” followed by a Crowd-sourcing session at which experts and clinicians in the audience will address design questions and challenges from participants.

We all love our opportunity to network, stroll the beach, and party. We will have a “toes in the sand” dinner at sunset, full of stimulating conversation and dancing.

## Day 3

Our lead presentation on Friday will be by Natalie Johnson, co-founder of ViDLSolutions. She will discuss how we can develop resilience and strength during change and then present a workshop following the plenary session. As always, we will benefit from hearing abstracts of the latest research and innovative programs in skin to skin care, developmental care, feeding, NICU design, family-centered care, and other new and exciting topics. Workshops will follow, allowing you to interact with featured speakers, get hands-on experience with successful program approaches, and get updated on the newly published infant and family-centered developmental care standards and competencies.

## Day 4

We know from anecdotal accounts that the NICU journey for fathers and partners is different than for the parent who gave birth. One of our goals is to hear more about the NICU journey from the perspective of a father and/or partner. There are also evidence-informed approaches to support fathers and partners. We plan to explore these options and come up with some practical tips on how we in the NICU can extend our support beyond the birth parent.

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***“Since many of the disparities that we see are related to the experience of race and ethnicity in society, we plan to explore the role of microaggressions on outcomes with an eye toward practical approaches to address them in local settings.”***

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There is plenty of literature that shows there are racial and ethnic disparities in health care. This observation is valid for the NICU as well. Given that the basis of these disparities is not usually biological, it can be hard to understand their origins. In the late morning session, we plan to explore some of the healthcare disparities we see in the NICU and use environmental and social factors to help explain them. Since many of the disparities that we see are related to the experience of race and ethnicity in society, we plan to explore the role of microaggressions on outcomes with an eye toward practical approaches to address them in local settings.

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# COVID-19

## STOP THE SPREAD AT HOME

What to do when you or a loved one is infected.

### HYGIENE TIPS

- MOUTH**
  - Wear a face mask or face shield.
  - If in car, wear mask & put windows down.
  - NO cloth face masks for children younger than 2yrs.
  - Avoid kissing.
- EYES**
  - Wear protective eye gear (glasses)
- HANDS**
  - ALWAYS wash your hands down.
- CLOTHING**
  - Wear a jacket when dealing with infected.
  - DO NOT share clothing, sheets, or pillows.

### SELF ISOLATION

- Sick should be separate from household.
- Room with window preferred.
- Aerate room 3x day.
- Create a room divider with sheet.
- Keep water and sanitation liquids near room.
- Don't cuddle with pets.



Practice social distancing

### KITCHEN

- Use SEPARATE utensils.
- Clean utensils separately.
- If sick avoid the kitchen.



#STOPTHESPREAD

Stop the Spread at HOME

Miora



### BATHROOM

- Sanitize EVERYTHING.
- Clean after every use.
- Patient gargle Listerine every morning & night.



### PROTECT

- If infected, notify everyone in contact from the past 10 days.
- Ask Dept. of Health for further assistant.
- Call 211 for FREE delivery services.



If you are feeling sicker, DON'T WAIT. Call your doctor immediately.

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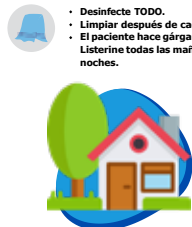
# COVID-19

## DETENER LA PROPAGACION EN CASA

Qué hacer cuando usted o un ser querido está infectado.

### CONSEJOS DE HIGIENE

- BOCA**
  - Use una mascarilla o careta.
  - Si está en el automóvil, use una máscara y baje las ventanas.
  - NO mascarillas de tela para niños menores de 2 años.
  - Evitar besos.
- OJOS**
  - Use equipo de protección para los ojos (lentes)
- MANOS**
  - SIEMPRE lávate las manos
- ROPA**
  - Use una chaqueta cuando se trata de infectados.
  - NO comparta ropa, sábanas o almohadas.



- Desinfecte TODO.
- Limpia después de cada uso
- El paciente hace gárgaras con Listerine todas las mañanas y noches.



### PROTEGER

- Si está infectado, notifique a todos los contactos de los últimos 10 días.
- Pídale al Departamento de Salud por más ayuda.
- Llame al 211 para obtener servicios de entrega GRATUITOS.



Si te sientes más enfermo, NO ESPERES. Llame a su médico de inmediato.

Miora

Visitar Miora.org



Tráido por Miora en asociación con United2Care

### ASLAMIENTO

- Los enfermos deben estar separados del hogar.
- Habitación con ventana preferida
- Alinea la habitación 3x al día
- Crear un separador de ambientes con sábanas.
- Mantener agua y líquidos de saneamiento cerca
- Mantenga una bolsa de basura en la habitación.



Practica el distanciamiento social

### COCINA

- Use utensilios SEPARADOS.
- Limpie los utensilios por separado.
- Si está enfermo, evite la cocina.



#STOPTHESPREAD

## Maneras de manejar COVID-19 en casa

### Hogar

- Manténgase 6 pies de distancia de los demás en todo momento.
- Use una cubierta protectora sobre la boca y la máscara para los ojos y el protector / gafas / anteojos cuando esté cerca de otras personas. No ponga máscaras a niños menores de 2 años.
- Hacer gárgaras todas las mañanas y noches con productos de enjuague bucal antiséptico que contienen alcohol.
- Lavé la manos 10-11 veces al día, y antes de cada comida por lo menos 20 segundos.
- Mantenga Buena ventilación en toda la casa. Abra las ventanas y puertas cuando sea posible.
- No compartá toallas, cobijas, y almohadas con personas que estén infectados.
- Llame al 211 para obtener servicios de entrega gratuitos.
- Use ropa protectora, chaqueta, guantes, máscara que se pueda quitar después de estar cerca de infectados.

Detén la propagacion en CASA

Miora



### Enfermo

- Aíslase permaneciendo en una habitación separada con baño separado. No vayas a espacios compartidos
- Si no se puede aislarse crea un separador de ambiente con una sábana.
- Ventile la habitación con aire fresco por lo menos 3 veces al día.
- Mantenga agua y productos de saneamiento en la habitación.
- Mantenga una bolsa de basura en la habitación.
- Proteja a las mascotas, no las abra.
- Notifique a todos los contactos de los últimos 10 días.
- No espere! Si se siente peor llame a su médico.

## Ways to Manage Covid 19 @ Home

### Household

- Stay 6 feet apart from others at all times.
- Wear protective covering over mouth and eyes (mask AND shield/goggles/glasses) when near others. (Do not put masks on children under 2 years old)
- Gargle with antiseptic mouthwash in the morning and evening.
- Wash hands 10-12x a day, before each meal for at least 20 seconds.
- Keep good ventilation throughout home. (open windows/doors) where possible
- Do not share towels, blankets, pillows with sick.
- Call 211 for assistance/free delivery of services.
- Wear protective clothing (jacket, gloves, mask) that can be removed after being around infected.

### Sick

- Self-isolate by staying in separate room with separate bathroom where possible. Don't go into shared spaces.
- Create a room divider with sheet, if shared space is unavoidable.
- Ventilate room with fresh air at least 3x per day.
- Keep water and sanitation products in room.
- Keep plastic garbage bag in room.
- Protect pets - don't cuddle.
- Notify contacts in last 10 days.
- Don't wait! Call doctor if symptoms get worse.

Stop the Spread at HOME

Miora



# WEAR A MASK

PROTECT PARENTS + BABIES

COVID-19

When we all wear masks...

We protect parents and babies.



Project Sweet Peas + National Perinatal Association

# USA UNA MASCARILLA

PROTEGER A LOS PADRES Y BEBÉS

COVID-19

Cuando todos usamos mascarillas ...

Protegemos a los padres y los bebés.



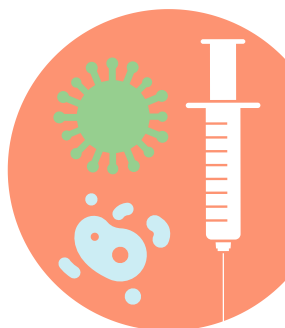
Project Sweet Peas + National Perinatal Association

# PROTECT YOUR FAMILY FROM RESPIRATORY VIRUSES

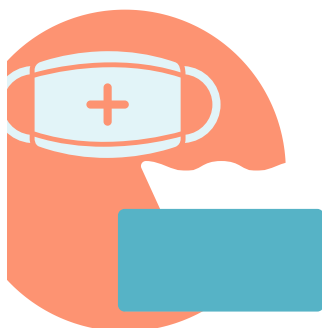
flu coronavirus  
pertussis RSV



**WASH YOUR HANDS** often with soap and water for 20+ seconds. Dry well.



**GET VACCINATED** for flu and pertussis. Ask about protective injections for RSV.



**COVER COUGHS AND SNEEZES.** Sneeze and cough into your elbow.



**USE A HAND SANITIZER THAT IS 60%+ ALCOHOL.**



**STAY AWAY FROM SICK PEOPLE** Stay at home to protect vulnerable babies and children. Avoid crowds when out.



[nicuparentnetwork.org](http://nicuparentnetwork.org)  
[nationalperinatal.org](http://nationalperinatal.org)



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

## KEEPING MOTHERS + INFANTS TOGETHER

Means balancing...



## EVIDENCE

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

## PARTNERSHIP

SHARED DECISION-MAKING

What is the best for this unique dyad?

- 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.



National Association of Neonatal Nurses

[nann.org](http://nann.org)



[nationalperinatal.org](http://nationalperinatal.org)



# Health Equity Column: Framing the Importance of Health Equity and Antiracism in the NICU

Jenné Johns, MPH, Tamorah Lewis MD, PhD, Jamesia Donato MD



In this month's Health Equity Column, I am honored to share highlights of my interview with two health equity champions in delivering antiracist and equitable neonatal care. Through our interview, you will learn about the health and racial equity-focused strategies and initiatives led by Dr. Lewis at the Children's Mercy Hospital in Kansas City, MO, and from Dr. Donato, a Neonatal-Perinatal Medicine Fellow at Children's Mercy Hospital.

As you learn about these timely opportunities to address and reduce healthcare disparities in neonatal care, I encourage you to leverage these resources within your respective institutions and to support the closing of racial and ethnic disparities in perinatal and neonatal health outcomes based on Children's Mercy Hospital health equity framework.

***"We also encourage you to join the Once Upon A Premie Academy on October 28th and November 22nd from 1:00-2:00 pm EST for one hour live CEU trainings."***

We also encourage you to join the Once Upon A Premie Academy on October 28<sup>th</sup> and November 22<sup>nd</sup> from 1:00-2:00 pm EST for one hour live CEU trainings. This year, our theme is: *"Going Deeper In Addressing Health and Racial Equity in the NICU."* For more information, please visit [www.onceuponapremieacademy.com](http://www.onceuponapremieacademy.com).

## **What is your definition of health equity?**

Dr. Lewis: When I think about health equity, the main thing I think about is customized care, a "one size fits all" approach that we generally apply in medicine right now. This systematically disadvantages certain populations. I think one really important aspect of equity is each family comes into the NICU with a different life experience, different medical literacy, and different access to social networks and economic networks. We have to customize our communication, customize our medical care, and really customize the experience of each family in order to have equal health outcomes.

Dr. Donato: My definition of health equity is just finding fairness in all aspects of medicine, treatment, and the patient experience. When it comes to just walking in the door and feeling welcomed to just receiving the standard of care regardless of your race, gender, or socioeconomic background, being treated fairly and the same is essentially how I define health equity.

## **What are your organizational priorities for addressing health and racial equity in perinatal and neonatal care?**

Dr. Lewis: At our big academic children's hospital, there are multiple ways that we are working to improve health equity. The first one is a hospital-wide health equity surveillance system, where there's a team of doctors and other providers that is beginning to

systematically collect data to understand disparities in all aspects of the care we provide at the hospital. That can be disparities in what families are accessing telemedicine during the pandemic or if there are certain babies that are more or less likely to get readmitted after discharge.

Those are the kind of disparities that this health equity surveillance system is trying to quantify. Once you can identify and quantify the disparity, you can design interventions to reduce that disparity. Some examples of things we are doing specifically in the NICU include a health equity task force within our Division of neonatology that is run by our division chief, of which I am an active member of. In this task force, we are really doing the hard work of looking at our own data in our own NICU and stratifying outcomes by race to look for racial disparities in NICU outcomes to understand the root causes of those disparities and then to design interventions to mitigate them. One project that is coming out of our health equity task force is understanding how to bring a health equity lens to all of our QI work. Historically in our NICU, our quality improvement projects have not necessarily been designed with a health equity lens. For example, when we look at improvement in whatever outcome of a QI project, we historically have not stratified it by race, so we don't understand everything fully. Are all babies benefitting equally from this intervention? Are there certain racial or primary language sub-cohorts that are not benefitting equally from these QI interventions? For the first time, we're really trying to make a health equity lens required for all of our QI design and also the way we look at the QI data. So that, I think, is a huge step in the right direction.

***"Are there certain racial or primary language sub-cohorts that are not benefitting equally from these QI interventions? For the first time, we're really trying to make a health equity lens required for all of our QI design and also the way we look at the QI data. So that, I think, is a huge step in the right direction."***

I will say that one of the biggest barriers to health equity and health disparity work is the extremely haphazard and unorganized way that racial data is currently collected in the NICU. We are doing all of our current work based on retrospective data, which is

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highly variable how maternal and infant race is documented in the medical records. We understand that our data is imperfect, but we are not letting that stop us. There is no granular demographic data in our electronic health record about SES status, about education status, about neighborhood safety, and all of those other really important social determinants of health.

We understand the shortcomings of our current data availability, and now, what we are doing is thinking with the greater hospital health equity surveillance system about if we were going to change things going forward, how would we change our data collection to facilitate improved health equity and QI work? That is really equity-focused. For example, right now, we are launching a project in multiple divisions in the hospital. It is not just the NICU, but we are participating prospectively by going to actually ask families, "What is your family's racial and ethnic background?" We plan to ask this about moms, dads, and babies in a very structured standard way.

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***"Our hope is that we can show that this data is much more valuable than the way it is currently collected in the EHR now. We cannot even really pinpoint where the current racial data comes from with the help we collected, so I will not even pretend to explain how we do it now."***

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Our hope is that we can show that this data is much more valuable than the way it is currently collected in the EHR now. We cannot even really pinpoint where the current racial data comes from with the help we collected, so I will not even pretend to explain how we do it now. However, what we do know is that it probably has some inaccuracies. Also, we are not doing justice to the wide range of racial and ethnic backgrounds that are in our NICU because we are trying to pigeonhole this amazingly diverse group of families into two or three categories.

Dr. Donato: As a recent fellowship graduate from neonatology at Children's Mercy, one of the things that I really appreciated, especially with the racial climate that is currently present in this country, is that our division leader was very transparent about his desire to identify racial disparities, health inequities, and even took the time to create a safe and protected space for our entire Division to share personal experiences, concerns, and situations where families may have been treated differently or may not have been serviced best in our NICU.

That was really powerful for me, to see our leadership passionate about it, determined about it, and open to hearing different professional experiences from physicians, nurse practitioners, nurses, and trainees. Also, to be invited to that forum as a trainee was very helpful and provided more transparency in that forum. I remember several sessions where Dr. Lewis touched on health equity. I don't think people's minds immediately went there, but I think the most important part of it is that people were able to candidly share situations where they had actively participated in committing something that may have made someone not feel like they were receiving equitable care. People are able to report experiences where they may have noticed some maltreatment or situations where we could have made patients' or families' experiences better, and people were on board with learning how to bet-

ter meet families where they are. I thought that was a really good intervention that may still be ongoing in our Division.

**What personal and professional experiences led you to focus on health equity in perinatal and neonatal care?**

Dr. Lewis: I remember being in medical school, and we were taught that health disparities were kind of a foregone conclusion. We were taught that certain populations have worse outcomes than others -- end of sentence. We didn't benefit as medical students from the really rich sociologic practices like the critical race theory and structural competency, all of the things that could have put those disparity data and statistics into a larger context in a way that medical trainees and physicians would feel empowered to address them and eliminate them. As I went through residency and fellowship, I became more knowledgeable about the deeply entrenched disparities in maternal outcomes, perinatal outcomes, and neonatal outcomes. The honest truth is, I just became so disillusioned with the fact that more people in power in academic medicine were not openly talking about this, funding research about this, designing interventions, and studying interventions about this.

I really came to realize that health disparities are one of the many challenges in medicine, and they really have been neglected when it comes to research, interventions, and elimination. I want to be clear that it is not because people are not smart enough or driven enough in medicine. We have tackled the most complex, molecularly diverse cancers. We have taken a whole new viral pandemic and created advanced vaccines in less than a year. There is something unique about health disparities that have made that issue in medicine chronically neglected.

I think the unique aspect is that many of the providers in medicine will never experience the impact of those disparities, and no one in their family and close circle of friends will ever experience the impact of those disparities, so there is less urgency. People are not equipped with the larger sociological knowledge to understand that these disparities are not based on biology or genetics; they are based on the societal experience of being a minority, whatever that minority subgroup may be in the United States.

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***"People are not equipped with the larger sociological knowledge to understand that these disparities are not based on biology or genetics; they are based on the societal experience of being a minority, whatever that minority subgroup may be in the United States."***

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That's a very long-winded answer to say that I am passionate about eliminating health disparities and improving health equity because I know that I'm one of the few voices in academic medicine that is willing to do the hard work of learning this new topic that we were never taught in our medical training. I am willing to do the hard work of educating my colleagues about the topic and willing to do the hard work of spending professional capital social capital, knowing that I will offend people and will alienate myself at times by speaking loudly and proudly about these disparities and our need to eliminate them.

Because I am in the minority in academic medicine, I have this deep sense that if I do not help do this, who will? Historically,

the answer has been, “We have made very little progress in the elimination of health disparities, not just in perinatal and neonatal care, but all across medicine.” More time is not an option for me. Patients are suffering every day. Mothers are dying every day. Preterm infants are dying every day. We need to begin to work on this now actively. I can’t sit with that truth and that reality and not act on my feelings. I feel compelled to make a change.

Dr. Donato: Really, what I think led me to neonatology is probably what makes health equity important to me. I was a premature baby being born at twenty-six weeks back in the nineteen-eighties. My mom shared several experiences with me about how she may have felt judged or not treated fairly because we were more of a low, middle-class family. Maybe she could have received counseling on the prenatal end so that she would be able to gain more knowledge that maybe could have prevented a premature outcome.

We have had those discussions. I think that experience as a twenty-six-week-old premature baby in the nineteen-eighties really fueled my passion for really dedicating my life to neonatology. Naturally, being a minority in medicine with the personal experience of prematurity and some of the statistical outcomes that were projected onto my life even before I was out of the womb really remain important to me, and I really strive to not create those same experiences for families. I think a lot of times, lack of health equity or lack of socioeconomic equity is what drives a lot of minority mothers to be a part of this health disparity that currently exists. For this reason, I am very passionate about maternal mortality and very passionate about infant mortality. I think the only way that we can truly address these issues systematically is to start with health equity. That is kind of my personal experience and why I am so passionate about it. I really feel like not only is this a job, but this is really my life’s work.

This is truly why I survived prematurity, and it is really my goal to make sure that families coming behind me that look like me really have a better experience and just get better access to care upstream before the prematurity happens, before the NICU experience happens so that we can have better outcomes overall for all patients and specifically minorities.

**What is your call to action for the industry as we seek to eliminate health and racial inequities in perinatal and neonatal care?**

Dr. Lewis: It is interesting; just last week, I spoke with a group of medical students in Kansas City, and I told them what my call to action is for them. I told them, “You are still early in your medical training. I beg of you to make your passion for learning and understanding structural inequity in this country, structural racism, and the core determinants of health, which are far outside the walls of medicine. Please make that as much of a priority for what you learn to later serve your patients as you do learning about the heart, the lungs, medicines, and surgeries because if you come out of your training and you lack this critical understanding, health disparities will not improve.” That is my same call to action for even all practicing providers in neonatology that are done with their training. They need to make space to learn about and think about these very difficult topics because the brutal truth is that if you are not doing that, you are not serving your patients of color to the optimal amount.

Dr. Donato: I think for me, being a research fellowship graduate and knowing how it felt to be a minority even in training, one of my big calls to action is for graduate medical education to also prioritize health disparities and health equity as a part of our training. I think it is important, certainly, as Dr. Lewis mentioned, for it to be ingrained very early. Maybe we need to start talking about it in a pre-medical curriculum in college. We certainly need to prioritize it in medical training.

As you get closer and closer to being an active practicing provider and available provider, these topics need to be prioritized. We glaze over them occasionally. Every now and then, it is implemented in a common curriculum, or maybe we get a lecture here and there. If we are even lucky, we might get a grand round presentation, but that is very rare as trainees. This needs to be prioritized in our education.

Then, my next call to action would be to my colleagues in academia and in private practice. As I embark on a career in private practice, one of my biggest fears is that these minority populations may be more apparent to me because a lot of times, dollars drive private practice. Continuing to prioritize this population is going to be a big deal for me. Calling not only my fellow neonatologists to action to make it a priority but also calling hospital leadership in the private practice world to understand that yes, dollars matter, but patient experiences within your hospital and within the NICU matter.

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***“NICUs are powerful whether they realize it or not. They are big dollar drivers for these hospitals. Our voices should be heard, and our concerns should be prioritized. I think it is our duty as practicing providers within that very special population to make that heard and to make that a continual priority.”***

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NICUs are powerful whether they realize it or not. They are big dollar drivers for these hospitals. Our voices should be heard, and our concerns should be prioritized. I think it is our duty as practicing providers within that very special population to make that heard and to make that a continual priority.

**Disclosure:** The authors have no disclosures.

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**About the Author: Jenné Johns, MPH:**



President, Once Upon A Premie [www.onceuponapremie.com](http://www.onceuponapremie.com)

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Jenné Johns, MPH is President of Once Upon A Premie, Founder of Once Upon A Premie Academy, mother of a micropreemie, author, speaker, advocate, and national senior health equity leader. Once Upon A Premie is a non-profit organization with a two-part mission: 1.) to donate Once Upon A Premie books to NICU families in under resourced communities, and 2.) lead virtual health and racial ethnic training programs and solutions to the neonatal and perinatal community through the Once Upon A Premie Academy. Jenné provides speaking, strategic planning and consultation services for fortune 500 companies focused on preemie parent needs from a cultural lens and reading as a tool for growth, development, and bonding. Jenné is also a national senior health equity thought leader and has led solutions-oriented health equity and quality improvement portfolios for the nations' largest health insurance and managed care companies.

**About the Author: Tamorah Lewis MD, PhD**



**Title:** Physician and Researcher and Associate Professor

**Organization:** Physician and Researcher, Children's Mercy Hospital in Kansas City, MO and Associate Professor, The University of Missouri, Kansas City School of Medicine

**Bio:** Tamorah Lewis MD, PhD is a physician and researcher at Children's Mercy Hospital in Kansas City, MO. She is dual trained in neonatal/perinatal medicine and clinical pharmacology. Her research program focuses on developmental pharmacology and pharmacogenetics in the neonatal population. As an Associate Professor in the Department of Pediatrics at The University of Missouri, Kansas City School of Medicine, she practices clinical neonatology. She works collaboratively to design, implement, and manage her clinical and translational research program in Neonatal Precision Therapeutics. The overarching goal of her research program is to bring individualized medicine to the NICU population using modern pharmacology tools. Her research career will focus on elucidating the pharmacokinetics, pharmacodynamics, and pharmacogenetics of both old and new drugs used to treat neonatal disease, emphasizing optimizing and individualizing drug therapy in neonates.

Dr. Lewis serves as the Director of Clinical Research Logistics for her Division. She has established the Maternal Neonatal Pharmacogenetic Repository at Children's Mercy Hospital and has multiple prospective pharmacogenetic cohort studies enrolling and depositing diverse bio-samples to this repository. In addition, she has established research collaborations at UCSF (steroid pharmacogenetics), Vanderbilt (ductus arteriosus pharmacogenetics), and the University of Buffalo (NSAID PK). She is actively engaged as site PI in multi-site studies assessing neonatal drug safety and efficacy.

Dr. Lewis is actively engaged in research societies. She sits on the Board of Directors for the American Society of Clinical Pharmacology and Therapeutics and is on the Executive Committee of the American Academy of Pediatrics (AAP) Section on Clinical Pharmacology and Therapeutics. Dr. Lewis is also a member of the International Neonatal Consortium, a multi-stakeholder collaboration run by the Critical Path Institute to advance neonatal therapeutics.



**About the Author: Jamesia Donato MD**



**Title:** Neonatologist

**Organization:** Sunflower Neonatology

**Bio:** Dr. Donato is from Atlanta, GA, and received her medical degree from Meharry Medical College in Nashville, TN. She moved to Kansas City and completed her residency training in Internal Medicine and Pediatrics at the University of Missouri-Kansas City/Children's Mercy Hospital and completed her Neonatal-Perinatal Medicine fellowship training at Children's Mercy Hospital. She is passionate about improving the care of preterm and term neonates through the systematic study of health disparities and health inequities amongst minoritized populations. As a previous 26-week gestation neonate, this field is more than just a job; it is truly her purpose and life's work to accomplish. She is married and loves spending time with her husband and two dogs. She volunteers with Big Brothers Big Sisters of Kansas City and enjoys running, softball, reading, yoga/pilates, and baking.



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2021

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Addressing Health and Racial Equity in Neonatal Care



**Valencia Walker, MD**  
Nationwide  
Children's Hospital



**Jenné Johns, MPH**  
Once Upon A  
Premie Academy

**MON, NOV. 22, 1 - 2 PM EST**

Addressing Structural Racism and the Impact on Neonatal Care and Health Disparities



**Tamorah Lewis, MD**  
Children's Mercy  
Hospital



**Jenné Johns, MPH**  
Once Upon A  
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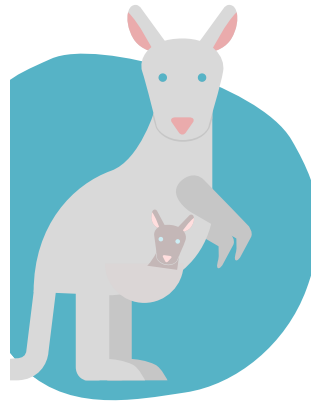
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## SUPPORTING KANGAROO CARE

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



[nicuparentnetwork.org](http://nicuparentnetwork.org)  
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# The Only Constant is Change: New ICD-10 Codes in Neonatology

Scott D. Duncan, MD, MHA

*“The philosopher Heraclitus stated, “the only constant in life is change.” With nearly 30 years of experience as a neonatologist and 45 years within the hospital setting, Heraclitus’ adage holds true when considering healthcare. Advances in knowledge surrounding technology, genetics, diagnostic evaluations, and therapeutic interventions remain at the forefront in the practice of most clinicians.”*

The philosopher Heraclitus stated, “the only constant in life is change.” With nearly 30 years of experience as a neonatologist and 45 years within the hospital setting, Heraclitus’ adage holds true when considering healthcare. Advances in knowledge surrounding technology, genetics, diagnostic evaluations, and therapeutic interventions remain at the forefront in the practice of most clinicians. Strategies employed to “keep current” include reviewing recent literature, attending conferences, workshops, CME events, MOC activities, etc. However, physicians often ignore the changing facets of the business of neonatology.

Both Current Procedural Terminology (CPT®) and International Classification of Disease (ICD-10-CM) codes are updated on a regular timetable. The CPT® Editorial Panel maintains the CPT® code set, supported by the CPT® Advisory Committee. CPT® codes are updated annually, with their use begins on January 1 each year. (1) ICD-10 codes are also updated annually by the Centers for Medicare & Medicaid Services (CMS). Announcements and updates for the 2022 ICD-10-CM, effective October 1, 2021, can be found on the CMS website (2), as well as guidelines for coding and reporting for the current year. (3)

October 1 finds the expansion of two ICD-10-CM code sets of significance to neonatologists. (4)

The first is the addition of the **P09** code set, which adds Abnormal Findings on Neonatal Screening. Included in this set are:

- P09.1 Abnormal findings on neonatal screening for inborn errors of metabolism
- P09.2 Abnormal findings on neonatal screening for congenital endocrine disease
- P09.3 Abnormal findings on neonatal screening for congenital hematologic disorders
- P09.4 Abnormal findings on neonatal screening for cystic fibrosis
- P09.5 Abnormal findings on neonatal screening for critical congenital heart disease

- P09.6 Abnormal findings on neonatal screening for neonatal hearing loss
- P09.8 Other abnormal findings on neonatal screening
- P09.9 Abnormal findings on neonatal screening, unspecified

The second expansion is of the P00.8 code set to include P00.82, Newborns affected by (positive) maternal group B streptococcus (GBS) colonization. A type 2 exclusion exists for P00.2 Newborn affected by maternal infectious and parasitic disease. If a different infectious and/or parasitic disease affects the newborn, both P00.82 and P00.2 may be reported.

Q: An infant is born via vaginal delivery to a GBS-positive mother following rupture of membranes for 26 hours. The maternal temperature peaked at 101° F, and the mother received two doses of Penicillin greater than 4 hours prior to delivery. The infant is well appearing. Using the Neonatal Early-Onset Sepsis Calculator, the neonatologist orders vital signs every 4 hours for 24 hours. The correct ICD-10-CM code is:

- A. P00.2
- B. P02.7
- C. P00.82
- D. Z05.1



The correct answer is B. The evaluation was undertaken due to the maternal history of GBS colonization associated with the maternal and neonatal clinical presentation. P00.2 is incorrect as there are no other maternal infectious complications recorded. P02.7 is a Newborn affected by chorioamnionitis. This diagnosis would be applicable should the obstetrician determine that the mother had chorioamnionitis. Z05.1 Observation and evaluation of newborn for suspected infectious condition ruled out would be used once the evaluation was determined to be negative.

Most neonatologists would rather concentrate on patient care; however, at least one member of the practice should focus on the business aspects of the practice. Areas of emphasis should be on proper CPT (charges) and ICD-10 (diagnosis) coding. The American Academy of Pediatrics provides numerous resources to allow the physician to stay up to date, including publications such as the Pediatric Coding Newsletter, Coding for Pediatrics, Pediatric ICD-10-CM, as well as AMA publications such as CPT Professional Edition and ICD-10-CM. Section members have access to the Coding Committee for questions and educational content. In addition, questions can be submitted to the Coding Corner via the web (email) or through the Coding Hotline (web) at <https://form.jotform.com/Subspecialty/aapcodinghotline>.

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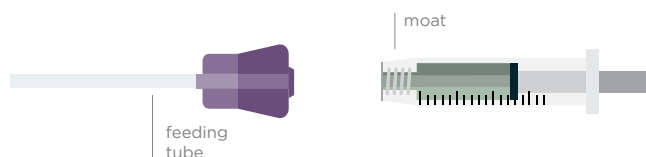
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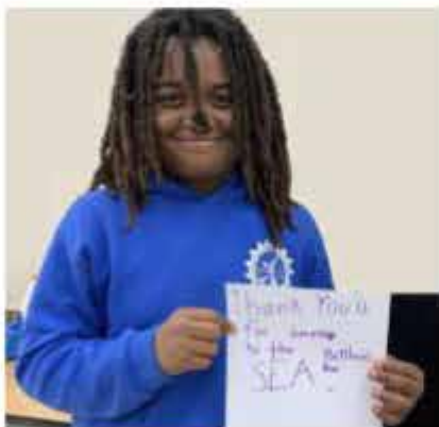
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As we indicated last month, we look forward to a number of new features as well.

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.

Neonatology Today will continue to promote our Academic True Open Model (ATOM), never a charge to publish and never a charge to subscribe.

If there are any questions about the new website, please email Dr. Chou directly at:

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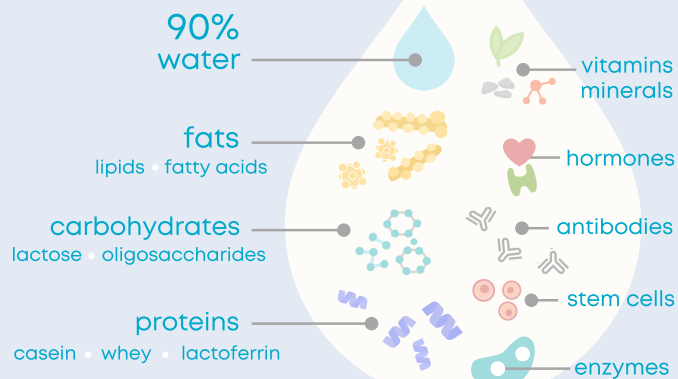
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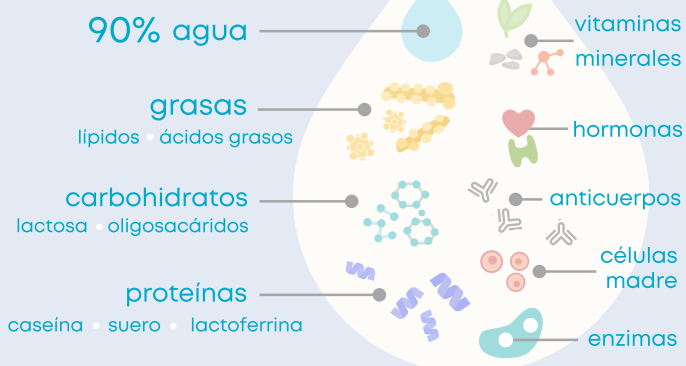


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## A Life's Journey

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.

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# From the National Perinatal Information Center: World Mental Health Day: Embracing Maternal Mental Health within a Pandemic

Elizabeth Rochin, PhD, RN, NE-BC

The National Perinatal Information Center (NPIC) is driven by data, collaboration and research to strengthen, connect and empower our shared purpose of improving patient care.

For over 30 years, NPIC has worked with hospitals, public and private entities, patient safety organizations, insurers and researchers to collect and interpret the data that drives better outcomes for mothers and newborns.



*“I remember having a discussion with [my wife] a week before when she came out of a fog, and she said ‘I can’t control my own thoughts and I hate it. I want to be myself again. I’m lost.’ That next week, my wife committed suicide. Our baby was three months old, and I was devastated. Postpartum depression is real. Education is so important, and making these women feel safe to reach out, and that people will listen, is important.” –R.M., 2016”*

**Stigma: (noun) Association of disgrace or public disapproval with something, such as an action or condition (1)**

*“I remember having a discussion with [my wife] a week before when she came out of a fog, and she said ‘I can’t control my own thoughts and I hate it. I want to be myself again. I’m lost.’ That next week, my wife committed suicide. Our baby was three months old, and I was devastated. Postpartum depression is real. Education is*

*so important, and making these women feel safe to reach out, and that people will listen, is important.” –R.M., 2016*

*“October 10th each year is recognized throughout the globe as World Mental Health Day. The overall objective of World Mental Health Day is to raise awareness of mental health issues worldwide and mobilize efforts in support of mental health (2).”*

October 10<sup>th</sup> each year is recognized throughout the globe as World Mental Health Day. The overall objective of World Mental Health Day is to raise awareness of mental health issues worldwide and mobilize efforts in support of mental health (2). Recently fourteen state maternal mortality review committees (MMRC) reviewed 421 deaths and found 11% of these deaths were due to mental health conditions (3). Within the COVID-19 pandemic, mental health care and resources have become a priority through the lenses of isolation, fear, and the unknown, particularly surrounding pregnancy and the postpartum period. Pregnant and postpartum women may self-impose more severe social distancing practices that inherently conflict with behavioral activation and other standard-of-care interventions for depression and anxiety (4). Even in low-risk populations, pregnant women assessed during the COVID-19 pandemic showed higher depressive and anxiety symptoms than a separate cohort of pregnant women assessed prior to the pandemic; widespread concern has been verbalized that the pandemic will increase disparities in mental health treatment (5).

#### *NPIC Database Exploration/Maternal Mental Health*

In May 2021, The National Perinatal Information Center (NPIC) focused on maternal mental health, specifically through the lens of substance use disorder (SUD) and neonatal abstinence syndrome (NAS). NPIC has not historically reported on the more comprehensive data collected related to maternal mental health. However, as conversations continue to generate accelerated importance and engagement in this space, providing meaningful information at the hospital level as well as the aggregate will be helpful to contribute to both the local and national discourse on the impact of maternal mental health and continue to normalize those discussions. NPIC utilized the Perinatal Center Database for the

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Table 1. ICD-10 Mental disorders and diseases of the nervous system complicating pregnancy, childbirth, and the puerperium. Centers for Disease Control, National Center for Health Statistics, ICD-10-CM

O99.3	Mental disorders and diseases of the nervous system complicating pregnancy, childbirth, and the puerperium
O99.31	Alcohol use complicating pregnancy, childbirth, and the puerperium
O99.32	Drug use complicating pregnancy, childbirth, and the puerperium
O99.34	Other mental disorders complicating pregnancy, childbirth, and the puerperium
O99.35	Diseases of the nervous system complicating pregnancy, childbirth, and the puerperium

Table 2. ICD-10 Mental and behavioral disorders associated with the puerperium, not elsewhere classified. Centers for Disease Control, National Center for Health Statistics, ICD-10-CM

F53	Mental and behavioral disorders associated with the PUERPERIUM; not elsewhere classified
F53.0	Postpartum depression
F53.1	Puerperal psychosis

Table 3. National Perinatal Information Center Perinatal Center Database 04/01/2020 – 03/31/2021

ICD-10-CM Coding Overview  $n = 334,402$

ICD-10-CM Diagnosis Codes		Numerator	%
O99.3x	Cases with one or more o99.3x diagnosis code	55,018	16.5%
O99.31	Alcohol use complicating pregnancy, childbirth, and the puerperium	444	0.1%
O99.32	Drug use complicating pregnancy, childbirth, and the puerperium	8,489	2.5%
O99.33	Tobacco use disorder complicating pregnancy, childbirth, and the puerperium	11,048	3.3%
O99.34	Other mental disorders complicating pregnancy, childbirth, and the puerperium	38,144	11.4%
O99.35	Diseases of the nervous system complicating pregnancy, childbirth, and the puerperium	9,591	2.9%
F53x	Cases with one or more F53x codes	451	0.1%
F53.0	Postpartum depression	430	0.1%
F53.1	Puerperal psychosis	24	0.0%

*(Rounded to one (1) decimal place)*

period 04/01/2020 – 03/31/2021 to review the current landscape of mental health documentation and coding within this national database. This exploratory overview included all MDC-14 discharges (antepartum, deliveries, postpartum,  $n = 334,402$ ). Tables 1 and 2, respectively, note the ICD-10 classifications utilized for this exploratory data review.

The NPIC Perinatal Database cohort provides an illustrative sample of maternal health diagnoses within a multistate sample during the COVID-19 pandemic. It is also important to note that this information depends on coding and documentation at the hospital level and may have limitations. In addition, researchers have questioned current classifications of perinatal mental health disorders and whether these disorders are unique in terms of their

causes and psychopathology in pregnancy, or the same as mental disorders at other times of a woman's life (6).

### Discussion

It has been estimated that, for each woman requiring psychiatric admission following birth, 2.5 require outpatient treatment, and 12 receive pharmacological treatment in primary care(7). Understanding the structural, social, and community barriers to obtaining maternal mental health treatment is an essential exercise that must be performed by hospitals and healthcare organizations routinely. Identification of maternal mental health disorders without proper referral and treatment options and availability is of tremendous concern. Depression and anxiety affect one in seven women

during the perinatal period and are associated with increased risk of preterm delivery, reduced mother-infant bonding, and delays in cognitive/emotional development of the infant, which may persist into childhood(8). Psychiatric and mental health care availability and access can be challenging and, in some cases, completely absent, depending upon location, geography, payer source, and availability of skilled and competent providers. This becomes even more challenging for a mother navigating a NICU admission, exacerbating mental health issues and additional stressors. This is also particularly evident with women who lose insurance coverage between pregnancy and the postpartum period. In a multistate cohort of women who reported needing mental health care and had become uninsured after pregnancy, 61.1% of the uninsured (n=66 of 108) vs. 27.1% of the insured (n=49 of 181) reported an inability to obtain mental health care(9). It cannot be overstated the issues of inequity and access for women of color(10), including a statewide study that revealed particularly low mental health treatment initiation rates in Black women (4%) and Latinas (5%), as compared to white women (9%) within six months of delivery(11). Maternal mental health awareness, access, and advocacy must remain a focal point of the healthcare discussion. Ending the stigma of mental health and mental illness is one of many steps required to assure proper screening, identification, and treatment.

The NPIC Perinatal Center Database findings for the aforementioned period include the date range within the COVID-19 pandemic. NPIC will continue to track this data and share the findings to inform regional and national discussions that can improve and enhance the care of women, and subsequently their newborns, their families, and their communities, both during and after a pandemic.

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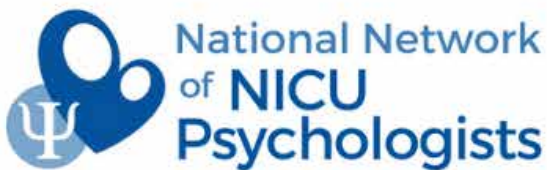


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# Understanding the Obstacles and Influences in Adopting Infant Safe Sleep Practices

Alison Jacobson, Barb Himes, IBCLC



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**“Sudden Infants Death Syndrome (SIDS), making it the single leading cause of infant mortality in the U.S. Evidence indicates adherence to infant Safe Sleep Guidelines developed by the American Academy of Pediatrics (AAP) reduces these mortality rates.”**

## Abstract:

**Background:** About 3,500 infants die annually within their first year of life from Sudden Unexplained Infant Death (SUID) and its subset Sudden Infants Death Syndrome (SIDS), making it the single leading cause of infant mortality in the U.S. Evidence indicates adherence to infant Safe Sleep Guidelines developed by the American Academy of Pediatrics (AAP) reduces these mortality

rates. Still, since an initial decline following the 1994 guidelines introduction, SIDS rates have leveled, and SUID rates have increased. In addition, SUID rates per 100,000 live births are twice as high among Black and Native American infants than white. The AAP last updated the guidelines in 2016 and is scheduled to issue the next updated guidelines in late 2021.

**Objective:** To examine perceptions of the AAP guidelines held by parents and health care providers as they relate to guidelines comprehension and compliance, and to share this information with the AAP 2021 guidelines task force.

**Methods:** First Candle commissioned a qualitative research study in 2020, consisting of three online focus groups in three different states to identify perceptions and potential barriers to guidelines adoption by family members and providers, the outcomes of which were shared with the AAP for review as its guidelines task force develops the updated version to be released in 2021.

**Results:** Regarding how the AAP guidelines were viewed, there were responses across geographic and sociocultural variation regarding varying levels of general comprehension and trust in them, depending on the resource and acceptance of the language used. Additional factors were the emotional and practical realities of parenting, cultural and family traditions, and the belief that parental volition in decision-making is important.

**Conclusion:** Evidence-based protocols regarding infant safe sleep practices and their impact on reducing infant mortality rates may have proven value. Still, professional caregivers and family members feel that more cultural context and personal relevance are needed in presentation and communication if families are to trust and consider them for adoption and compliance.

## Keywords:

infant mortality, infant safe sleep, implicit bias, Sudden Unexplained Infant Death (SUID).

## Definition of terms:

**Qualitative research:** Information gathered first-hand regarding individual feelings, opinions, and perceptions, through focus group questions and discussion. The information is not quantified.

**Purposive:** qualitative research conducted with a sampling whose characteristics indicate it will likely have knowledgeable responses to the topics to be introduced.



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Infant Safe Sleep Guidelines: the evidence-based recommendations developed by the American Academy of Pediatrics Task Force, to reduce the risk of Sudden Unexplained Infant Death, including Sudden Infant Death Syndrome and Accidental Suffocation and Strangulation in Bed (ASSB). The current revision in use was released in 2016.

Implicit bias: bias that can occur automatically, without conscious thought.

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***“At the core of its Straight Talk for Infant Safe Sleep, train-the-trainer program is the AAP set of recommendations for infant safe sleep, last updated in 2016. (1) This version is the latest in a series dating to the original Back to Sleep campaign, which was developed by a coalition including NICHD, the AAP Task Force, NHLBI, HRSA, and the SIDS Alliance (now First Candle) in 1994.”***

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#### **Background:**

First Candle is a national 501c (3) whose mission is to eliminate Sudden Unexpected Infant Death Syndrome (SUID) and other sleep-related infant deaths while providing bereavement support for families who have suffered a loss. At the core of its Straight Talk for Infant Safe Sleep, train-the-trainer program is the AAP set of recommendations for infant safe sleep, last updated in 2016. (1) This version is the latest in a series dating to the original Back to Sleep campaign, which was developed by a coalition including NICHD, the AAP Task Force, NHLBI, HRSA, and the SIDS Alliance (now First Candle) in 1994. The recommendations focused on a supine infant sleep position on a firm flat surface, alone, with no extraneous bedding and no bed-sharing.

In 2011 the AAP expanded the guidelines to recommend regular prenatal care and breastfeeding for mothers and that infants should receive all recommended vaccinations.

Between 1994, when Back to Sleep (now Safe to Sleep®) began, and 1999, the overall SIDS rate in the U.S. dropped by more than 50%. (2) However, since then, the national SIDS rate has changed little. One explanation is the classification has broadened into Sudden Unexpected Infant Death (SUID), which includes SIDS and accidental suffocation and strangulation in bed (ASSB), and deaths that might once have been considered SIDS are otherwise identified.

Although the causes of SIDS are still unknown and not preventable, the causes of ASSB are. Nonetheless, the CDC reports SUID is the single leading cause of death for infants one month to one year of age, currently resulting in an average of 3,500 infant deaths annually in the U.S. From 1990 to 2015, while SIDS rates decreased 35.8%, ASSB rates increased 183.8% (3), and the rate is more than twice as high for Black, American Indian/Alaska Native babies as white babies.

Although compliance with the AAP guidelines can prevent infant death from ASSB, First Candle had become anecdotally aware, from its training work and collaboration with other maternal and infant health organizations, of resistance to adopting the recommendations, especially from communities of color. Reasons that were given included cultural preferences, socioeconomic realities, implicit bias within the language of the guidelines themselves, and bias in how health care professionals communicated the information.

Therefore, as the AAP task force prepared to develop the next set of updated guidelines, scheduled for release in 2021, First Candle commissioned a qualitative study to collect input from family members and health care providers regarding infant sleep practices and the AAP guidelines to help inform its work and to provide to the AAP task force, which agreed to review.

#### **Methods:**

First Candle commissioned research firms to conduct focus groups in Michigan, Georgia, and Connecticut, selected for geographical and statistical diversity. Per 100,000 live births, Michigan's SUID rate is 98.7; Georgia's is 124.7, and Connecticut's is 59.6.

The Michigan research was funded by a grant from the W.K. Kellogg Foundation. The Connecticut research was funded in part by a grant from The Community Foundation for Greater New Haven, and the Georgia research in part by a donation from Regal Lager, a Georgia-based distributor of infant and children's products. None of the funders had involvement in the study.

Each state study consisted of five separate sessions of 90 minutes to two hours, and participants included parents, grandparents, guardians, professional caregivers (nurses, doulas, midwives, and other healthcare workers), and breastfeeding mothers.

The first set of online focus groups was conducted in Michigan in October 2020, with a total sample size of 43. Age ranges were from 20 to 60+ and geographies included Detroit Metro, North, Central, and Western Michigan, and the Upper Peninsula. Ethnicities included Black, Native American, Hispanic, White, and Asian.

The second set of online focus groups was conducted in Georgia in November 2020 with a sample size of 24. Age ranges were from 18 to 39, and geographies included Atlanta, Dublin, Macon, Pitts, and Cochran. Ethnicities included Black and White.

The third set of online focus groups was conducted in Connecticut in February 2021 with a sample size of 20. Age ranges were from 16 to 64, and geographies included Hartford, Norwalk, New Haven, Waterbury, and Stamford. Ethnicities included Black, Hispanic, Asian, and White.

The objective of this qualitative research was to:

- Determine the level of awareness about infant safe sleep practices among target audiences.
- Obtain feedback and reactions from the target audience to definitions of SUIDS/SIDS and related messaging statements.
- Identify and understand underlying factors that influence barriers to SIDS/SUIDS guidelines.
- Understand obstacles to safe sleep practices and guidelines among parents and care providers (doulas, agency, and private and public sector care provider program workers).



- Understand obstacles and objections to safe sleep practices and guidelines as they relate to breastfeeding mothers.
- Gain insight into current practices, cultural beliefs, and behaviors related to safe sleep for babies.

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There was a purposive element in sample selection and question development. Through its training sessions and organizational outreach, First Candle has been anecdotally aware of the presence and effects of racial bias on maternal and infant health outcomes, including perceptions of the AAP safe sleep guidelines.

Therefore, it was considered essential to have racial diversity and discuss racial bias with families and care providers, including their own potential biases.

**Results:**

Overall, there was a general awareness about infant safe sleep, with understandably more knowledge about the guidelines from caregivers. There was greater awareness of SIDS than SUID and ASSB terminology, although parents recognize risks in suffocation. The language of the guidelines and the absence of cultural considerations were considered off-putting for some. Caregivers may choose to interpret the guidelines in what they feel are more understandable, contextual ways, such as La Leche League’s Safe Sleep Seven, and may choose to defer to the mother’s decisions regarding how and if they will be used.

Although some respondents may have agreed that the guideline statements are valid, they also may feel they are not always realistically achievable in daily life, including lack of access to resources to create this normative safe sleep environment and the challenges of work-life balancing.

*“I think all moms... we’ve all been given advice. Baby needs to sleep in their own bed, whether it’s a crib or a Pack and Play, firm mattress, tight-fitted sheet, no toys, no blankets, no pillows. A lot of times, you go into motherhood thinking, “I’m going to do it,” but then when it comes down to it, it’s like, this is not going to work.”*  
– Grandmother

*“My baby sleeps right next to me, so all I have to do is literally roll over and pull out my breast. So, I’m not losing as much sleep. That’s the reason why we chose that method, because if you have to get up and nurse, then that changes your level of exhaustion. You’re more rested if you can just give the baby the breast in that*

*way.” - Breastfeeding Mother*

*“Books and doctors are almost the same thing. They’re going to tell you what’s in the books...They want you to listen to a, b, and c. But sometimes a, b, and c doesn’t work for everybody.... I feel like if I can control it, I’m going to control it. - Mother*

Fathers and mothers also may have different concerns about infant sleep practices, but the fathers will tend to defer to the mothers’ wishes. Fathers may want to have a greater role in the decision-making on safe sleep but may feel they do not have sufficient information. Family and cultural influences will affect whether the guidelines are adopted and to what degree.

*“I think my wife is obviously just naturally nurturing. I think I’m capable, but I always see she’s a little more capable than I am. I think naturally women take on that role a little differently, so I think they’re naturally better at it.” - Father*

*“My boyfriend personally doesn’t like [bedsharing], but I’m the one that gets up with the baby, so I feel like that’s my decision if I want her to sleep in the bed with us or not.” - Mother*

Obstacles to adopting the AAP guidelines include family-held bed-sharing beliefs, practices, and cultural influences that run counter to the guidelines, as well as uncertainty about messages from external resources and if they trust them. Therefore, alternatives such as the Safe Sleep Seven, which explores bed-sharing under certain conditions, may be considered.

Parenting is seen as deeply personal and cultural, shaped by experience and relationships with family, community, health care professionals, other care providers, and other parents. This may include feeling that making the infant sleep in a separate bed is a form of abandonment and that the infant is safer if the mother is nearby in bed.

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***“Parenting is seen as deeply personal and cultural, shaped by experience and relationships with family, community, health care professionals, other care providers, and other parents. This may include feeling that making the infant sleep in a separate bed is a form of abandonment and that the infant is safer if the mother is nearby in bed.”***

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*“America is like the highest rate of Sudden Infant Death Syndrome, but there are many, many other countries that sleep with their babies and babies don’t die. So, I think that if it’s done properly, it’s a great thing for baby... it’s huge for attachment developmentally for the baby.” - Breastfeeding Mother*

*“As a breastfeeding mom, with your baby right there, you’re constantly being affirmed throughout the night. Your baby is fine; your baby is alive and well to the point that they’re able to latch and swallow and go back to sleep. That’s comforting.” - Breastfeeding Mother*

*“I know it’s dangerous because SIDS and stuff like that. But it’s any time they move or cough, or it’s like I’m right there and I feel like they’re not right there with me it’s like I couldn’t get to him quick enough.”- Breastfeeding Mother*

Those following safe sleep practices may cite personal experience or how the information was presented, or an awareness that there may be newer information than what their parents knew.

*“I definitely respect the advice from the pediatrician. I respectfully understand that I guess. But at the end of the day, I’m going to do what works best for me and my baby.” - Mother*

*I’m not saying I don’t trust my child’s pediatrician, but white coat syndrome is real. She’s a white physician; I’m going to just be honest. I’d rather go to my black medical professionals that I know.” – Grandmother*

*“I ignored the doctor because I just thought it was something that couldn’t happen to me. We’re sleeping together, but we’re safe. Then there was just that one night that I thought my husband rolled over on her, and I freaked out, and I said nope, she’s got to go to her own crib. I just thought that wouldn’t happen to me.” – Mother*

*“I go to my mom, but also my mom is old school more because her kids are older, so a lot of her information is also outdated, so if she tells me something, sometimes I’ll just Google it just to make sure that there’s- it’s not an outdated, don’t do it anymore, like laying them on their bellies.” - Mother*

Parent-infant bonding and breastfeeding are considered essential, and guidelines that appear to interfere with that may be set aside, even if their safety intent is understood.

*“I don’t want to see my baby cry, so of course, I allow him to sleep in the bed with me. But does he need to be in a crib? Does he need to be his own safe space?”- Mother*

*“I’m scared of SIDS for real, and that’s why I don’t necessarily want her to sleep in her crib or in her bassinet. Because if she sleeps on my wife’s arm or occasionally on my arm, I have control of how she’s turned and how she can move.” - Father*

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***“Understanding and consideration of them may depend on the interpersonal presentation and discussion with whoever is advocating them: medical professional, coach, social worker, doula, or other resources. The higher the level of trust in the messenger, the higher the chances are for guideline adoption. Trust is influenced by perceptions of racial or socioeconomic bias and a lack of meaningful two-way communication.”***

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## **Conclusion:**

A “bottom line” assessment is that the context in which the AAP guidelines are conveyed is critical. The guidelines are less likely to be taken up by families as a standalone document. Understanding and consideration of them may depend on the interpersonal presentation and discussion with whoever is advocating them: medical professional, coach, social worker, doula, or other resources. The higher the level of trust in the messenger, the higher the chances are for guideline adoption. Trust is influenced by perceptions of racial or socioeconomic bias and a lack of meaningful two-way communication.

In addition, the greater the relevance the guidelines have to parents’ lives, the greater the potential for them to be considered. The context reflects the realities of their lived experiences and examples that aid understanding. Clear and constructive communication that considers literacy levels and language needs could positively affect receptivity and potential adoption of the guidelines.

## **Next Steps:**

The focus group study was commissioned as part of a larger initiative involving community task forces that can more effectively communicate infant safe sleep messages in more relevant ways and in line with families’ lived experiences.

First Candle intends to work collaboratively with the AAP and the community task forces to deliver the new guidelines as they are released.

The desire would be for the task forces to represent both diverse and coalescent perspectives and to review and advise on how the revised guidelines could best be disseminated within their communities, both in terms of language, format, and interpersonal communications channels.

A digital media campaign would support this outreach with messages targeted to audiences within the infant ecosphere. It is expected that this could serve as a pilot for localized communications in regions across the country.

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*Disclosure: The authors are affiliated with First Candle, Inc., a Connecticut-based not for profit 501(c)3 corporation.*

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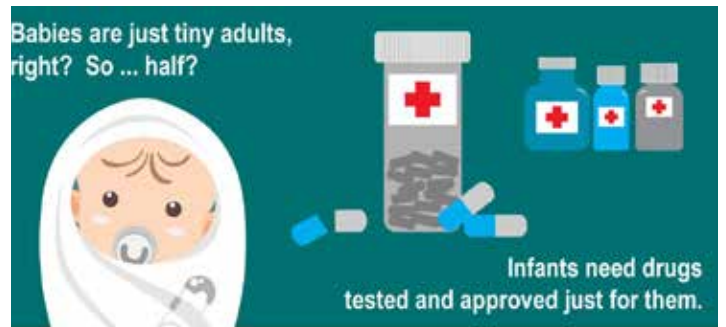
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### About First Candle

First Candle, based in New Canaan, CT, is a 501c (3) committed to eliminating Sudden Infant Death Syndrome and other sleep-related infant deaths 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 3,600 infant deaths nationwide per year.



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# Neonatologist Opportunity

## Davenport, Iowa

### Looking to make a change? We have the total package...

The Department of Pediatrics at the University of Illinois College of Medicine and OSF Healthcare are partnering with Genesis Medical Center-Davenport and currently seeking a board certified Neonatologist. Genesis Medical Center-Davenport is a Level II nursery with roughly 1,700 deliveries/year. An excellent benefits package is available including vacations, sick time, malpractice coverage, CME, health and life insurance and retirement plan.

Genesis Medical Center-Davenport is a licensed 502 bed facility, which offers a wide range of inpatient and outpatient medical

services. Specifically, the NICU is a 20 bed unit, which consists of ten private rooms and three open bays. The NICU functions as a Level II intensive care nursery. The NICU is equipped to stabilize and manage neonates with acute and chronic illness. It is equipped with emergency and resuscitative equipment including:

- Cardiac and apnea monitors with capabilities for trending/monitoring pulse oximetry
- Non-invasive and invasive blood pressure monitoring
- Oxygen therapy (ventilators, CPAP, bag/mask, high flow nasal cannula, RAM cannula and nasal cannula)
- Warmer units
- Isolettes
- Neonatal instruments for insertion of UAC/UVC lines, PICC lines and chest tubes

The Quad Cities (made up of 5 cities, including Davenport Iowa), representing roughly 400,000 people, is the largest metropolitan area on the Mississippi River between Minneapolis and St. Louis. It is three hours west of Chicago and two and a half hours east of Des Moines, Iowa. The area has recently been ranked as a “best place to live” and is known for safe neighborhoods, short commute times and a reasonable cost of living. The community is fortunate to have excellent schools (in the Quad Cities and surrounding areas), the Niabi Zoo, museums, fine arts, a local festival scene, minor league baseball and hockey, and many seasonal outdoor activities. The John Deere Classic, PGA Tour event, and the Bix 7 road race bring in people from all over the world every summer. The Quad Cities International airport located in Moline, IL connects our community to almost a dozen other cities in the US.

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 PEDNOTES

# Neonatal Nurse Practitioner Opportunity

## Davenport, Iowa

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The Department of Pediatrics at the University of Illinois College of Medicine and OSF Healthcare are partnering with Genesis Medical Center-Davenport to provide neonatology coverage in Davenport, Iowa. Genesis Medical Center-Davenport is a Level II nursery with roughly 1,700 deliveries/year. An excellent benefits package is available including vacations, sick time, malpractice coverage, CME, health and life insurance and retirement plan.



Reporting to the Medical Director of the Neonatal Intensive Care Unit, and according to professional nursing standards of care, performs a variety of advanced nursing diagnostic and therapeutic procedures for the high risk neonates in the critical care setting at Genesis Healthcare—Davenport (Davenport, IA). Demonstrates the knowledge and skills necessary to provide patient care that is appropriate to the ages of the patients served.

Genesis Medical Center-Davenport is a licensed 502 bed facility, which offers a wide range of inpatient and outpatient medical services. Specifically, the NICU is a 20 bed unit, which consists of ten private rooms and three open bays. The NICU functions as a Level II intensive care nursery. The NICU is equipped to stabilize and manage neonates with acute and chronic illness. It is equipped with emergency and resuscitative equipment

The Quad Cities (made up of 5 cities, including Davenport Iowa), representing roughly 400,000 people, is the largest metropolitan area on the Mississippi River between Minneapolis and St. Louis. It is three hours west of Chicago and two and a half hours east of Des Moines, Iowa. The area has recently been ranked as a “best place to live” and is known for safe neighborhoods, short commute times and a reasonable cost of living. The community is fortunate to have excellent schools (in the Quad Cities and surrounding areas), the Niabi Zoo, museums, fine arts, a local festival scene, minor league baseball and hockey, and many seasonal outdoor activities. The John Deere Classic, PGA Tour event, and the Bix 7 road race bring in people from all over the world every summer. The Quad Cities International airport located in Moline, IL connects our community to almost a dozen other cities in the US.

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# Technical Difficulty in the NICU

Kelly Welton, BA, RRT-NPS

***“As an educator, it’s one thing to get staff to study and read about how the equipment works. And another thing to show people how things work, and then require a return demonstration. Requiring them to utilize their critical thinking skills on the spot is another story.”***

Ouch. I just smacked my head again. This is the third call in as many days from the NICU medical director. The transport ventilator is broken. Again. The baby just got out of surgery, is in the transport isolette, and the ventilator won’t run. “Whose job is it to ensure the ventilator works?!? Didn’t BioMed fix this yesterday?! Aren’t your RT’s supposed to check this thing every morning??!” Ours, yes, and yes, I tell her. But the ventilator is not the problem.

As an educator, it’s one thing to get staff to study and read about how the equipment works. And another thing to show people how things work, and then require a return demonstration. Requiring them to utilize their critical thinking skills on the spot is another story.

What exactly are “critical thinking skills,” and how can one assess if another person has these mysterious powers?

I set out to answer this question a few years back in a survey sent to RT managers across the US.

## Definition of Critical Thinking

Critical Thinking skills are a desirable trait in health care professionals. However, there is much debate about how critical thinking skills are acquired and how they can be measured.

The results from the RT Manager survey revealed several definitions:

- “The ability to assess a situation, to see the whole picture”
- “The ability to analyze multiple sensory inputs and identify options for appropriate responses”
- “The ability to think through and then anticipate where they are going.”
- “The ability to analyze a situation and select a course of action”
- “Seeing and processing what you see and know.”

The community, [criticalthinking.org](http://criticalthinking.org) states: “Critical thinking is self-di-

rected, self-disciplined, self-monitored, and self-corrective thinking.”

Most hospitals put their staff through an annual competency review. Someone has to check off each therapist on equipment and procedures used by their department. Many new and seasoned RT’s can pass an equipment competency, such as setting up and managing a certain type of ventilator, or a procedure competency, resulting in an ABG with a critical value. In an ideal situation, nothing would go wrong. No exhalation valve leaks, no patient desaturating in the middle of a procedure would occur. Annual competencies may or may not include ‘what – if’ scenarios to allow RT’s to show that they can think on their feet, so to speak.

Competence, in the RT setting, refers to an individual’s ability to perform a task. A competent person may also be able to troubleshoot basic problems. Competency assessments, therefore, can vary from hospital to hospital. For example, an RT that passes annual competency on a NICU ventilator at a Level I NICU facility may have a very different actual skill level than an RT who passes an annual competency on the same ventilator at a Level III NICU.

***“Competence, in the RT setting, refers to an individual’s ability to perform a task. A competent person may also be able to troubleshoot basic problems. Competency assessments, therefore, can vary from hospital to hospital.”***

One very significant point is that health care workers acquire competence over time. (1) However, even the most proficient expert at something - calibrating an ABG analyzer, for example - does not mean they possess critical thinking skills to handle the unexpected. They may have memorized each step, anticipating only a green light to complete the next task.

## Examples of Critical Thinking

MR SOPA in NRP

If the RT finds they have difficulty ventilating via bag-valve-mask when resuscitating a baby, they are taught the “MR SOPA” acronym. Mask, Reposition head, Suction mouth and then the nose, Open mouth, adjust Pressure, Airway. While these are the correct steps, an experienced RT would go through these steps without thinking. A newer, occasional NICU/newborn RT will practice those steps and the mnemonic until the steps become automatic.

## Classifying Critical Thinking

Some thought leaders think of critical thinking as an ‘If → Then’

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process as if all possibilities for the next steps have been neatly laid out in a decision tree.

Others consider it simply “anticipating next steps.” The majority of respondents classified critical thinking as both.

These ideas can apply to equipment, patients, or situations:

- If the ventilator is not pressurizing, there must be a leak or disconnect
- If the patient’s chest is not rising on inspiration, the set PIP may be too low.
- If the patient is connected to the ventilator, but the sat’s are 77%, I need to bag.

### Are Critical Thinking Skills Teachable?

If acquiring critical thinking skills requires experience, it would be nearly impossible to teach critical thinking in the classroom. But what about in the clinical setting? By the time the student has learned to do A, then B, then step C, and then performs these steps at the bedside, does that allow the student to think critically?

Often, RT and Nursing schools are burdened with attaining a certain pass rate, so instructors and students are most interested in ‘the right answer’ rather than next steps or outlier possibilities.

### But back to the transporter dilemma.....

Baby in surgery 2 hours = tanks emptied

The Crossvent2i ventilator, like many others, is a pneumatically-powered infant transport ventilator. There is a set flow to achieve pressure during a set I-time. There is also a ‘logic gas’ flow, which powers the ventilator. If flow-triggering is chosen, that also requires an additional amount of flow through the ventilator.

But this was not a math or calculation problem.

No matter how many times the staff were told to turn off the TANKS and not just the ventilator after a transport, that small fact was repeatedly forgotten. And now, for about the tenth time, we have a post-op intubated baby in the transporter and no way to ventilate. This tenth iteration of the same incident prompted the national survey.

The Root cause analysis was complete: No equipment malfunctions, just user error.

In the interest of safety, self-inflating bags were added to the transporter.

Although many would consider this a “Plan B” solution, Plan A (acquisition of Critical Thinking skills) still takes time, repetition, and experience.

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**“Although many would consider this a “Plan B” solution, Plan A (acquisition of Critical Thinking skills) still takes time, repetition, and experience.”**

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Disclosures: The author is President of the Academy of Neonatal Care, A Delaware 501 C (3) not for profit corporation.

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Phone: 877-884-4587  
Email: [Educator@academyofneonatalcare.org](mailto:Educator@academyofneonatalcare.org)

"

# Academic Physician - Neonatology Section Chief #PED088

**The University of Chicago: Biological Sciences Division: Department of Pediatrics**

## Description

The University of Chicago's Department of Pediatrics is searching for a full-time faculty member at the associate or full professor rank to serve as the Chief of the Section of Neonatology. The appointee will be a nationally recognized scholar focused on making fundamental discoveries of high impact in one or more aspects of neonatology. The appointee will also serve as the inaugural Stephen Family Chair in Pediatrics. We are particularly interested in individuals with expertise in genomics, metabolomics, neonatal pharmacology, and/or neurodevelopmental disorders. Other duties will include teaching and supervision of trainees and students. Academic rank and compensation (including a generous package of fringe benefits) are dependent upon qualifications.

The Chief of the Section of Neonatology has responsibility for supervising the 71 bed Level IV NICU at UChicago Medicine Comer Children's Hospital, and for oversight of the UChicago Medicine perinatal network that stretches across the region. In addition, the successful individual will assume a leadership role in our evolving partnership with the Chicagoland Children's Health Alliance, the largest pediatrics program in the state of Illinois. Together, we care for over 25,000 deliveries per year across metropolitan Chicago, adjacent counties in Illinois, and Northwest Indiana.

We anticipate a leader who will grow the clinical program, enhance the training of our fellows and residents, have a commitment to outstanding quality and efficiency, lead an outstanding group of clinical and translational neonatology investigators, and develop programs of fundamental impact. We are particularly interested in individuals who will exploit the enriching environment of the Biological Sciences Division, The Pritzker School of Molecular Engineering, and the other Divisions of the University to advance neonatal medicine.

Prior to the start of employment, qualified applicants must: (1) have a MD or MD/PhD or equivalent, (2) hold or be eligible for medical licensure in the state of Illinois, and (3) be board certified or board eligible in Neonatology.

To be considered, those interested must apply through The University of Chicago, Academic Recruitment job board, which uses Interfolio to accept applications: <http://apply.interfolio.com/87879>. Applicants must upload: a CV including bibliography and cover letter. Review of applications ends when the position is filled.

For instructions on the Interfolio application process, please visit <http://tiny.cc/InterfolioHelp>.

We seek a diverse pool of applicants who wish to join an academic community that places the highest value on rigorous inquiry and encourages diverse perspectives, experiences, groups of individuals, and ideas to inform and stimulate intellectual challenge, engagement, and exchange. The University's Statements on Diversity are at <https://provost.uchicago.edu/statements-diversity>.

The University of Chicago is an Affirmative Action/Equal Opportunity/Disabled/Veterans Employer and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender identity, national or ethnic origin, age, status as an individual with a disability, protected veteran status, genetic information, or other protected classes under the law. For additional information please see the University's [Notice of Nondiscrimination](#).

Job seekers in need of a reasonable accommodation to complete the application process should call 773-702-1032 or email [equalopportunity@uchicago.edu](mailto:equalopportunity@uchicago.edu) with their request.



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



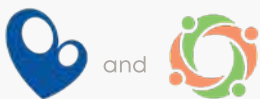
Provide culturally-informed and respectful care.

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](http://myNICUnetwork.org)



National Perinatal Association  
NICU Parent Network

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

## TOP 10

### RECOMMENDATIONS FOR THE PSYCHOSOCIAL SUPPORT OF NICU PARENTS



Essential evidence-based practices that can transform the health and well being of NICU families and staff

based on the National Perinatal Association's Interdisciplinary Recommendations for Psychosocial Support of NICU Parents

#### 1 PROMOTE PARTICIPATION

Honor parents' role as primary caregiver. Actively welcome parents to participate during rounds and shift changes. Remove any barriers to 24/7 parental involvement and avoid unnecessary separation of parents from their infants.



#### 2 LEAD IN DEVELOPMENTAL CARE

Teach parents how to read their baby's cues. Harness your staff's knowledge, skills, and experience to mentor families in the principles of neuroprotection & developmental care and to promote attachment.



#### 3 FACILITATE PEER SUPPORT

Invest in your own NICU Parent Support program with dedicated staff. Involve veteran NICU parents. Partner with established parent-to-parent support organizations in your community to provide continuity of care.



#### 4 ADDRESS MENTAL HEALTH

Prioritize mental health by building a team of social workers and psychologists who are available to meet with and support families. Provide appropriate therapeutic interventions. Consult with staff on trauma-informed care - as well as the critical importance of self-care.



#### 5 SCREEN EARLY AND OFTEN

Establish trusting and therapeutic relationships with parents by meeting with them within 72 hours of admission. Follow up during the first week with a screening for common maternal & paternal risk factors. Provide anticipatory guidance that can help normalize NICU distress and timely interventions when needed. Re-screen prior to discharge.



#### 6 OFFER PALLIATIVE & BEREAVEMENT CARE

Support families and NICU staff as they grieve. Stay current with best practices in palliative care and bereavement support. Build relationships with service providers in your community.

#### 7 PLAN FOR THE TRANSITION HOME

Set families up for success by providing comprehensive pre-discharge education and support. Create an expert NICU discharge team that works with parents to find specialists, connect with service providers, schedule follow-up appointments, order necessary medical supplies, and fill Rx.



#### 8 FOLLOW UP

Re-connect with families post-discharge. Make follow-up calls. Facilitate in-home visits with community-based service providers, including Early Intervention. Partner with professionals and paraprofessionals who can screen families for emotional distress and provide timely therapeutic interventions and supports.

#### 9 SUPPORT NICU CARE GIVERS

Provide comprehensive staff education and support on how to best meet families' psychosocial needs, as well as their own. Acknowledge and address feelings that lead to "burnout."



#### 10 HELP US HEAL

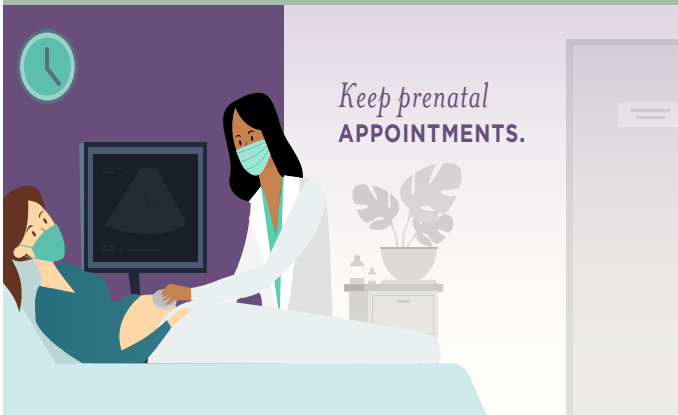
Welcome the pastoral care team into your NICU to serve families & staff.

[SUPPORT4NICUPARENTS.ORG](http://SUPPORT4NICUPARENTS.ORG)

## The PREGNANT MOM'S Guide To Staying SAFE DURING COVID-19



Maintain at least  
**A 30-DAY SUPPLY**  
OF YOUR MEDICATIONS.



## 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



[nicuparentnetwork.org](http://nicuparentnetwork.org)  
[nationalperinatal.org/skin-to-skin](http://nationalperinatal.org/skin-to-skin)



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+ Dawn Godbolt, Ph.D.  
National Birth Equity Collaborative



+ Dalia Feltman, MD, MA, FAAP  
Univ. of Chicago Pritzker School of Medicine



+ Chavis A. Patterson, Ph.D.  
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The first and only virtual training academy focused on delivering health and racial equity educational programs for perinatal and neonatal healthcare professionals. Our purpose is to raise awareness and offer real-time solutions for addressing health and racial equity.



# 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 5<sup>th</sup> 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](http://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.



# 2021 Hand to Hold NICU Community Conference: The First Ever Conference for NICU Parents and Professionals

Kelli Kelley



*“Join us November 3-5 for the Hand to Hold NICU Community Conference, three days full of information and inspiration meant to encourage, educate and empower NICU families and the professionals who care for them.”*

Join us November 3-5 for the Hand to Hold NICU Community Conference, three days full of information and inspiration meant to encourage, educate and empower NICU families and the professionals who care for them.

The Hand to Hold NICU Community Conference is a FREE online conference designed for current and NICU graduate parents, caregivers, and NICU professionals.

We are excited to welcome author Susan David as our keynote speaker. Recently a guest on Brene Brown's Dare to Lead podcast, David is the author of the #1 The Wall Street Journal best-selling book, *Emotional Agility*, a TED Speaker, and an award-winning Harvard Psychologist. She is one of the world's most influential management thinkers. “Because our thoughts, emotions, and actions drive everything: every aspect of how we LOVE, LIVE, PARENT, and LEAD.”

**For NICU professionals**, The NICU Community Conference is the first, and only conference specifically focused on improving support of NICU families, including topics related to equity and inclusion, trauma-informed care, palliative care, and coping with trauma. Sessions are free, and continuing education credits are available for select sessions.

**For NICU parents and NICU graduate parents**, the NICU Community Conference will address important issues ranging from mental health challenges that often follow a traumatic birth to tackling common concerns for NICU graduates, including feeding, sensory integration, and meeting developmental milestones. Select parent sessions are also available in Spanish.



**THE FIRST EVER CONFERENCE FOR  
NICU PARENTS AND PROFESSIONALS**



## Your trusted family-centered care resource

The Hand to Hold NICU Community Conference is a **FREE** online conference designed for current and NICU-graduate parents, caregivers and NICU professionals.

\*CEU credits will be available for our NICU Professional Track sessions

**NOVEMBER 3-5, 2021**

Encouragement

Education

Empowerment

Hand to Hold has worked tirelessly over the past decade to raise awareness of the devastating impact of traumatic birth and the long-term psychological maladies that plague NICU parents and directly impact their ability to bond with, and care for, their medically fragile child. These circumstances can have a devastating impact on the baby's physical, cognitive, behavioral, and emotional development.

Building upon the valuable insights we garnered in 2020, we are excited to host the first free, virtual conference for NICU parents and professionals focused on improving the long-term outcome of NICU babies and their families.

We cannot wait to see you there! Learn more and register today at <https://events.hubilo.com/handtohold/register>.

*Disclosures: There are no relevant disclosures identified.*

**NT**

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# The Survey says RSV



What you need to know about RSV

**RSV** stands for **Respiratory Syncytial Virus**

RSV is a **Really Serious Virus**

**WHEN IS RSV SEASON?**

Typically RSV season runs from November - March. But it can begin as early as July in Florida and end as late as April in the West.

Protect babies and families this RSV season  
**Educate. Advocate. Integrate.**

National Perinatal Association

Consult the CDC's RSV Census Regional Trends to learn more [www.cdc.gov/rsv/census/regional-trends](http://www.cdc.gov/rsv/census/regional-trends)

[www.nationalperinatal.org](http://www.nationalperinatal.org)

## National Perinatal Association PERINATAL SUBSTANCE USE

[nationalperinatal.org/position](http://nationalperinatal.org/position)  
[www.nationalperinatal.org/Substance\\_Use](http://www.nationalperinatal.org/Substance_Use)

**Why do women wait?**  
The threats of discrimination, incarceration, loss of parental rights, and loss of personal autonomy are powerful deterrents to seeking appropriate perinatal care.

Educate. Advocate. Integrate.





# Under Pressure: “Just Right” is a Moving Target

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.*

***“Despite many advancements in the technology behind mechanical ventilators, normal breathing involves negative pressure, and PPV is fundamentally unnatural.”***

Ever since mechanical ventilators were first used on babies nearly 60 years ago, the consequences of positive pressure ventilation (PPV) have been apparent. Despite many advancements in the technology behind mechanical ventilators, normal breathing involves negative pressure, and PPV is fundamentally unnatural. Despite the best of intentions and use of lung-protective ventilation strategies, PPV too often results in abnormal pulmonary development with attending long-term sequelae.

While the whole may be greater than the sum of its parts, the failure of one of those parts makes that part the most valuable of all. This is never more so than when the lungs fail. The failure of lungs before they have fully developed presents a veritable quagmire akin to a whack-a-mole game from hell; the fix for one problem creates or is the opposite fix for another.

Pulmonary development is at its infancy (no pun intended) in the sub-25-week post-conceptual age (PCA) baby, and barely able to sustain life, let alone growth at 22 weeks PCA. Be that as it may, Dr. Jonathan Klein of Iowa has shown us that with extreme skill, these infants can and do survive and grow, albeit after a long, costly course in the hospital. Even with the best of care, much of the NICU stay is spent recovering from our efforts to keep them alive.

It is well known that the lungs are most prone to injury during recruitment. While this is true regardless of their stage of develop-

ment, as PCA decreases, the risk of damage and its severity also increase. PPV is the only tool available to us; the only option we have is how we use it. Things get complicated because how much pressure is required to recruit the lung changes depending on what stage of development the lung is in and changes as recruitment ensues. A one size fits all approach simply does not exist.

If critical opening pressure is not reached, recruitment will not occur. The conducting airways must tolerate this pressure without structural compromise during the process. In a mature lung, this is not generally a problem since the airways are robust, but the airways of the extremely premature infant are not well stented or supported and have relatively thin walls. Critical opening pressure may be as much as or more than they can withstand. Alveolar ducts are particularly prone to damage. In the 22-week PCA infant, these are also the portion of the lung most capable of gas exchange at this point; critical opening pressure is their opening pressure and, once reached, must be reduced promptly in order not to induce volutrauma. As PCA increases, there is more lung to recruit downstream of the alveolar ducts, but the ducts themselves remain prone to injury until alveolarization; pulmonary interstitial emphysema likely has its origins in leaking or ruptured alveolar ducts.

***“As PCA increases, there is more lung to recruit downstream of the alveolar ducts, but the ducts themselves remain prone to injury until alveolarization; pulmonary interstitial emphysema likely has its origins in leaking or ruptured alveolar ducts.”***

Initial resuscitation is a critical time for the micro-premature infant. Several years ago, changes in the Neonatal Resuscitation Program provided us with oxygen saturation (SpO<sub>2</sub>) targets based on time since delivery and initial FiO<sub>2</sub> settings. Before these changes came about, there was a rush to have babies' SpO<sub>2</sub> rise above 90% as quickly as possible and an FiO<sub>2</sub> of 1.0 and PPV with generous peak pressure given. Aside from the neurological consequences of rapid hyperoxygenation in a preterm baby, this rapid transition likely also increased the likelihood of alveolar duct injury. By allowing more time, that the slower transition now NRP dictates, recruitment may be gentler as the extra time may allow

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lower pressure to achieve the same result.

Intubation presents the second (and likely greatest) risk of iatrogenic pulmonary injury even before mechanical ventilation. It is common practice to assess endotracheal tube placement by auscultating manual breaths given via a resuscitation bag. Unfortunately, the pressures used for those breaths are determined mainly by the acuity of the listener's hearing. At this point, the lungs are very likely not fully recruited, and volume is not delivered uniformly; hence, those open areas are potentially subject to barotrauma and volutrauma. The use of a CO<sub>2</sub> detector eliminates the bias associated with auscultation and works with the baby connected to the ventilator. I strongly recommend that before an endotracheal tube is placed, the ventilator should be ready to go with appropriate settings so that the baby can be placed on the ventilator immediately. This preparation gives more precise control of pressure and lessens the risk of damage.

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***“Volume targeting may be used if available to protect the lungs further. Still, it may provide a false sense of security since a target volume of 4 mL/kg translates to 8 mL/kg if delivered to lungs which are only half recruited.”***

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Volume targeting may be used if available to protect the lungs further. Still, it may provide a false sense of security since a target volume of 4 mL/kg translates to 8 mL/kg if delivered to lungs which are only half recruited. This disconnect is an excellent way to rupture alveolar ducts in an extremely premature baby. Lacking alveoli, extremely premature babies have minimal lung volume to ventilate, and that volume is predominantly composed of the alveolar ducts. I do not believe conventional ventilation modes are suitable for this patient population, and they will not be discussed.

Avoidance of lung injury during resuscitation and recruitment should be the team's primary goal and has the greatest impact on long-term outcomes. Avoid manual ventilation and place a baby on a ventilator using lung-protective ventilation modes and strategies as quickly as possible.

Healthy, recruited, and undamaged lungs require less pressure to ventilate, less PEEP to keep inflated, and are less prone to further damage. The goal of the team in Iowa is to have micro-premature infants on high-frequency jet ventilation (HFJV) by 10 minutes of life; doing so may be why they use low PEEP successfully. It is important to note that PEEP is adjusted to the desired measured PEEP on the jet, not simply dialed in on the conventional ventilator.

Why HFJV? Gas trapping. Tiny babies are very prone to gas trapping, which, in turn, produces hyperinflation. Most of these babies are either hyperinflated or about to become hyperinflated. Avoidance of hyperinflation is key to successful ventilatory management and reducing its effects on not just the lungs but the cardiovascular system as well. There are so many paths to hyperinflation that it might be called the Rome of mechanical ventilation: all roads lead there. The question of how much pressure

is required depends on what is producing hyperinflation. If PEEP (or mean airway pressure (MAP) if oscillating) is not sufficient to maintain airway patency, gas will be trapped distal to any reduction in the airway lumen. As trapped gas accumulates, it presents as hyperinflation on a chest film. In this situation, clinicians may be led to decrease PEEP/MAP, but since insufficient PEEP/MAP created the problem, further reduction increases gas trapping and worsens the hyperinflation. Conversely, too much PEEP/MAP will also create hyperinflation, and decreasing it will decrease or eliminate hyperinflation.

The real problem lies in identifying the root cause of hyperinflation and adapting ventilation to reduce or eliminate that cause. Airway diameter, distending pressure, breath volume, and ventilation rate or frequency are all part of the hyperinflation equation. Small airways have high resistance, which increases time constants and is dependent on adequate distending pressure to maintain airway patency. Larger breath volumes require more time to deliver and even more to exit, and rate or frequency determine how much time is available to accomplish this. Higher rates lead to gas trapping.

How do we know which part or parts of the equation are the problems? Our tests for hyperinflation are very sensitive except lack specificity, but some clues may help. One is PEEP/MAP. The appearance of hyperinflation when PEEP/MAP are relatively low is more likely a result of insufficient pressure than too much but may also be the result of too high a rate or frequency. Decreasing pressure may worsen the problem (and if subsequent CxRs show worsening hyperinflation with a reduction in pressure, it should be increased). Since our goal is to avoid hyperinflation, perhaps the best action in this situation is to reduce the rate or frequency. HFJV rate may be reduced as low as 240 to provide an I:E ratio of 1:12. Reducing frequency in oscillation will provide a more absolute exhalation time but will not change the I:E ratio. On some newer ventilators incorporating HFO modality I:E ratio can be increased to 1:3; however, the increase in amplitude required to deliver the same volume may offset any gains made against gas trapping. Knowing if too much PEEP/MAP is the problem is a more difficult deduction, but if reducing pressure makes the problem worse, it likely is not. Again, here rate reduction is the best course of action.

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***“If proper action is not taken to mitigate (or preferably eliminate), gas trapping hyperinflation will ensue and progress with malignancy to cystic lungs, extraluminal gas, and pulmonary interstitial emphysema (PIE).”***

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If proper action is not taken to mitigate (or preferably eliminate), gas trapping hyperinflation will ensue and progress with malignancy to cystic lungs, extraluminal gas, and pulmonary interstitial emphysema (PIE). Hyperinflation is very difficult to eliminate once established, doubly so if it has progressed to cystic lungs/PIE. Once a veritable death sentence, PIE is best treated with HFJV. Even here, there is debate regarding how much pressure is required. Extraluminal gas accumulation exerts pressure against

the conducting airways, alveolar ducts, and whatever lung has developed distal to them. Without sufficient PEEP/MAP to maintain airway patency and pulmonary recruitment, the result is increased gas trapping, worsening hyperinflation, and finally, complete lung collapse. The “old school” approach to gross hyperinflation and/or PIE was to decrease pressures to allow the lungs to collapse and then re-recruit them. The problem with this approach is in the process, whatever areas of the lungs that are providing gas exchange also collapse. If  $\text{FiO}_2$  is already high, it may not be possible to maintain adequate oxygenation in the interim, and atelectasis creates its own problems coined “atelectrauma.” This course of action may be one of the reasons PIE has been associated with such poor outcomes.

With HFJV, we have another tool with which to assess gas trapping: measured PEEP. Measured PEEP displayed on the jet is a very close approximation to tracheal PEEP. This is generally lower than the PEEP value set on the conventional ventilator due to the nature of the jet breath. As measured PEEP on the jet approaches set, PEEP gas trapping is likely occurring, and if it exceeds set PEEP, there is no doubt it is. Measured PEEP reading lower than set PEEP does not necessarily mean gas trapping is not happening since it reflects the average state of affairs and cannot detect regional gas trapping. It is safest to operate on the assumption that tiny babies are gas trapping or soon will be and choose ventilation strategies to mitigate it.

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***“When uniformly recruited and at distending pressures that maintain the lung in an optimally compliant state, these larger volumes are not as big an issue, although they may still produce shear forces, particularly in the premature infant.”***

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The severity of hyperinflation is not just gauged by rib counting on a chest film; the ventilation mode makes a difference. When using conventional ventilation (CV) modes, there can be less tolerance of hyperinflation since already inflated lungs must accept relatively large volume breaths with inflating the lungs even more. When uniformly recruited and at distending pressures that maintain the lung in an optimally compliant state, these larger volumes are not as big an issue, although they may still produce shear forces, particularly in the premature infant. The traditional eight ribs of inflation is appropriate here, although even that may be too much for fragile, developing lungs. When a high-frequency ventilation mode is used, a greater degree of hyperinflation may be acceptable since very tiny volumes are imposed on the inflated lungs, and shear forces are significantly reduced. Ten ribs of inflation, in this case, may be acceptable, particularly if the baby is doing well. As they say, the babies do not read the book; if MAP is decreased on a baby with apparent hyperinflation on CXR and they subsequently crump, likely, that baby is not hyperinflated according to their individual physiology. If  $\text{FiO}_2$  is low, blood pressure and perfusion are good, the baby may be hyperinflated by

definition, but it is not creating a problem. Of course, this must be monitored closely in order to prevent it from becoming a problem.

Another subset who may tolerate a degree of hyperinflation are those babies with evolving chronic lung disease (CLD). Alveolar simplification, reduced secondary crests, and a thickening of the gas exchange interface are all hallmarks of CLD and lead to a profoundly decreased surface area to support gas exchange and an interface through which gas diffuses with much greater difficulty than in a normal lung. Since  $\text{CO}_2$  diffuses 20 times more readily than  $\text{O}_2$ , this presents as a relatively easy baby to ventilate but extremely difficult to oxygenate. This is a challenging situation. The lungs are often at least mildly hyperinflated, suggesting a reduction in pressure; however, reducing pressure also reduces diffusion gradient and leads to increased  $\text{FiO}_2$  requirements. Here a balance must be struck between hyperinflation and acceptably low  $\text{FiO}_2$ . Where that balance lies is a matter of considerable debate. Personally, if cardiac output is good, I am inclined to accept pressure and hyperinflation at the point where  $\text{FiO}_2$  is lowest. This represents the compliance “sweet spot” of these lungs.

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***“Once severe hyperinflation takes over, options are severely limited. Decreasing MAP may decrease hyperinflation but is just as likely to increase it through increased gas trapping. This will progress to total lung collapse as interstitial gas exerts pressure against parenchymal structures.”***

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A mild to moderate degree of hyperinflation in the face of CLD may actually improve both ventilation and oxygenation in two ways. Because the lungs are stretched, there is an increase in surface area, and the gas exchange interface also thins, and the higher pressure also increases diffusion. This improves overall gas exchange, particularly  $\text{O}_2$ , as long as mild to moderate hyperinflation is not allowed to progress to severe hyperinflation. The degree depends on the balance struck by the clinician between oxidative stress and hyperinflation. In my practice, I find many CLD babies do quite well when the lungs are kept at a degree of hyperinflation.

Once severe hyperinflation takes over, options are severely limited. Decreasing MAP may decrease hyperinflation but is just as likely to increase it through increased gas trapping. This will progress to total lung collapse as interstitial gas exerts pressure against parenchymal structures. If total collapse is one’s end game, this may be fine (apart from the consequences of total lung collapse).

Another approach may work better and avoid total collapse, i.e., reducing PEEP/MAP and introducing recruitment maneuvers. In this case, they might be referred to as “anti-derecruitment measures.” Imposing low peak inspiratory pressure (PIP) conventional breaths with a long inspiratory time ( $T_i$ ) may accomplish two things: prevent the collapse of those parts of the lung that are actively contributing to gas exchange while facilitating gas exit



from the lungs by stenting the airways open. I usually start with inspiratory pressure 5 cmH<sub>2</sub>O above PEEP or MAP, Ti of 2 seconds, and a rate of 5. MAP may be the same overall, but the way it is delivered changes to give parts of the lung with varying degrees of compliance some time to function at pressure closer to what is optimal for them. Ti may be increased to 3 seconds, PIP may be increased slightly, and the rate may be increased depending on the severity of the situation and resulting effect. In the face of active air leaks, this approach should be avoided or used with extreme caution. Alas, support for this strategy is strictly anecdotal.

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***“The best way to avoid all of this is to avoid CLD entirely. There is growing evidence to support the intratracheal administration of a surfactant/budesonide preparation in reducing the instance of CLD. (1, 2) Once CLD is established, there may also be some benefit to late or “rescue” surfactant administration. (3)”***

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The best way to avoid all of this is to avoid CLD entirely. There is growing evidence to support the intratracheal administration of a surfactant/budesonide preparation in reducing the instance of CLD. (1, 2) Once CLD is established, there may also be some benefit to late or “rescue” surfactant administration. (3) Nitric oxide (iNO) with or without late surfactant may also improve ventilation and oxygenation in CLD. (4) Once a naysayer, when it came to late surfactant and/or iNO, I now believe there is a place for both. While metanalysis does not support iNO use in preterm infants, there are theoretical reasons it may help, particularly with pulmonary vascular growth. The cost of iNO combined with the length of time it takes to affect pulmonary vasculature growth, along with the 2011 consensus statement from the NIH, has likely discouraged further investigation. (5) I concur with this reference that further study is warranted. (It is also a good summary of current approaches to CLD treatment). The aforementioned studies suggest that late surfactant/budesonide administration may be even more beneficial; a clinical trial is wanting. (I could find no studies using late surfactant/budesonide).

While I have been discussing invasively ventilated infants, those receiving non-invasive ventilation (NIV) are also “under pressure.” Hereunder is too often the operative word as clinicians may under-support babies leading to extubations failure. When transitioning from an endotracheal tube to NIV, it is essential not to over-wean pressures prior to extubations and provide sufficient support pressure once on NIV. This support should initially be at the level of the last MAP when intubated. Finally, infants should be extubated from pressures that can be reliably maintained using an NIV interface while not creating severe gastric distention.

There is no silver bullet to treat established catastrophic hyperinflation. While the nature of HFJV makes it the best mode in this situation, it takes time and careful management; we can provide

careful management, but we cannot create time. Appropriate pressure and timely response to changing resistance and compliance are vital to avoiding this dilemma or reducing its severity, but they cannot always be avoided.

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***“When transitioning from an endotracheal tube to NIV, it is essential not to over-wean pressures prior to extubations and provide sufficient support pressure once on NIV. This support should initially be at the level of the last MAP when intubated.”***

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In the meantime, we are all under pressure.

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*Disclosures: The author receives compensation from Bunnell Inc for teaching and training users of the LifePulse HFJV in Canada. He is not involved in sales or marketing of the device nor does he receive more than per diem compensation. Also, while the author practices within Sunnybrook H.S.C. this paper should not be construed as Sunnybrook policy per se. This article contains elements considered “off label” as well as maneuvers, which may sometimes be very effective but come with inherent risks. As with any therapy, the risk-benefit ratio must be carefully considered before they are initiated.*

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## National Perinatal Association PERINATAL MENTAL HEALTH

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All perinatal health care providers need training and education that will help them support families.



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# 5 THINGS YOU CAN DO TO CELEBRATE NICU AWARENESS



- 1 Educate Yourself**  
Did you know that more than half of the babies admitted to NICUs were not born prematurely? See our fact sheets.
- 2 Post on Social Media**  
See examples at [nicuawareness.org](http://nicuawareness.org) and [nationalperinatal.org/NICU\\_Awareness](http://nationalperinatal.org/NICU_Awareness)
- 3 Recognize NICU Staff**  
Let them know the difference they are making in our babies' lives. Write a note, send an email, or deliver a gift to show them that you appreciate them.
- 4 Share Your Story**  
Most people have never heard of a NICU before. Let others know about the extraordinary care that NICUs provide.
- 5 Join Our Community**  
Get involved. Become a member of our organizations and share your talents.

This project is a collaboration between



[www.nicuawareness.org](http://www.nicuawareness.org)  
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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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1 year_____	\$1,080
Middle School_____	\$3,240

*The Emily Shane Foundation is a 501(c)3 nonprofit charity, Tax id # 27-3789582. Our flagship SEA (Successful Educational Achievement) Program is a unique educational initiative that provides essential mentoring/tutoring to disadvantaged middle school children across Los Angeles and Ventura counties. All proceeds directly fund the SEA Program, making a difference in the lives of the students we serve.*



# Spotlighting Women's Health in October – Intimate Partner Violence

Elizabeth Filipovich, MPH

The National Perinatal Association (NPA) is an interdisciplinary organization that strives to be a leading voice for perinatal care in the United States. Our diverse membership is comprised of healthcare providers, parents & caregivers, educators, and service providers, all driven by their desire to give voice to and support babies and families at risk across the country.

Members of the NPA write a regular peer-reviewed column in Neonatology Today.



***“Although breast cancer dominates the women’s health spotlight throughout the month of October, domestic violence – also known as intimate partner violence – is a public health problem that deserves equal spotlighting.”***

Each October, women’s health becomes the focus of national awareness campaigns, media advocacy, and all sorts of imagery dedicated to pink - the color of

breast cancer awareness month. Did you know that October is also Domestic Violence Awareness month? Although breast cancer dominates the women’s health spotlight throughout the month of October, domestic violence – also known as intimate partner violence – is a public health problem that deserves equal spotlighting.

***“Intimate partner violence (IPV) refers to any abuse directed at one household member from another. IPV can be physical abuse, emotional, psychological, or sexual abuse.”***

Intimate partner violence (IPV) refers to any abuse directed at one household member from another. IPV can be physical abuse, emotional, psychological, or sexual abuse. For those experiencing pregnancy, the incidence of intimate partner violence is even higher. IPV is the primary cause of injury for women between ages 16-44. (1) In the United States, about 1.5 million women report being victims of some form of IPV every year. Of these reported cases, approximately 325,000 are pregnant during acts of violence. (2) The reason for this spike in IPV during pregnancy is unknown but could be due to the relationship dynamic changes between partners or that the frequency of prenatal visits yields more positive screens simply because patients are being screened more frequently. What is known is that intimate partner violence affects pregnancy more than any other common pregnancy complication like gestational diabetes, hypertension, and pre-eclampsia. Though IPV contributes to several known poor health outcomes, specific risks of IPV in pregnancy include physical injury, chronic pain, gastrointestinal injury, gynecological problems (including sexually transmitted infections), complications during childbirth and pregnancy (such as inadequate weight gain, infec-

tions, and bleeding), and adverse pregnancy outcomes (such as low birth weight, preterm delivery, and neonatal death). (3) Experiencing IPV during pregnancy has been shown to be associated with higher rates of depression, suicide attempts, and behavioral risk factors, including the use of tobacco, alcohol, and drugs. (3)

The perinatal and postpartum periods create unique opportunities for screening for IPV and intervention for prenatal, postpartum, and pediatric providers. Screening for IPV should be completed for each patient and done appropriately and privately. Providers must navigate screening, taking care of their patients, who in many cases may not be the parent, and providing their patients with a safe and comfortable atmosphere. Several studies noted that provider constraints served as a barrier to effective screening for IPV. A meta-analysis of studies that researched barriers to screening identified a provider’s discomfort with discussing IPV, lack of knowledge, and time constraints as the greatest barriers to screening. (4) Clinicians’ lack of confidence in their ability to screen women for IPV or to provide assistance to women experiencing violence were also identified as barriers. (5) Although most physicians feel they should screen patients for IPV, only a small percentage do so, largely because they feel uncomfortable having such conversations. (6)

***“Although most physicians feel they should screen patients for IPV, only a small percentage do so, largely because they feel uncomfortable having such conversations. (6)”***



The challenge for perinatal care leaders lies in creating a top-down and bottom-up systemwide approach for understanding, identifying, and responding to IPV. Education of all levels of perinatal caregivers, standards of care that support uniform clinical protocols, and effective linkage with community resources contribute to a system that promotes better outcomes for IPV victims and their families. All of us have a role to play in reducing the harm of IPV. Clinical care leaders and staff are key to creating a safe environment for women to answer honestly about their experiences and be connected to supportive services. Health system executives and administrators create and endorse the culture and environment that communicate internally and externally that the institution considers IPV is a serious health risk. Educators can ensure that curriculum content addresses IPV at an appropriate level for their student audience, whether the learners are health professionals, childbearing families or members of the public. Advocacy for public policy supportive of violence prevention is a role for everyone.

**“Educators can ensure that curriculum content addresses IPV at an appropriate level for their student audience, whether the learners are health professionals, childbearing families or members of the public. Advocacy for public policy supportive of violence prevention is a role for everyone.”**

Mindfulness of the opportunities we have to make a difference is a task that we should take seriously.

The National Perinatal Association supports the following initiatives to improve perinatal outcomes related to intimate partner violence:

- All providers of perinatal care should utilize screening tools to identify victims of intimate partner violence.
- All patients should be screened for intimate partner violence at the time of routine gynecologic care.
- All pregnant people should be screened for intimate partner violence at least once per trimester and whenever behavioral indicators or physical complaints suggest.
- All healthcare providers should familiarize themselves with local or regional resources, including crisis shelters, helplines, and safe spaces, and should be prepared to expedite referrals when indicated.

To learn more about the National Perinatal Association’s advocacy and education regarding intimate partner violence, please visit [www.nationalperinatal.org](http://www.nationalperinatal.org).

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Disclosure: The National Perinatal Association [www.nationalperinatal.org](http://www.nationalperinatal.org) is a 501c3 organization that provides education and advocacy around issues affecting the health of mothers, babies, and families.

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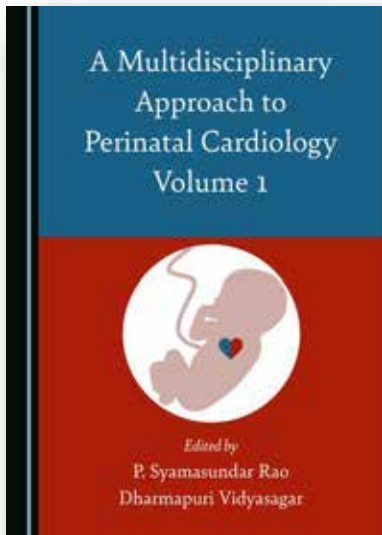


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# A Multidisciplinary Approach to Perinatal Cardiology Volume 1

*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.

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## 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.

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*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](#).





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Continuing education credits provided by



# 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 PPRM 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 PPRM 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 PPRM Foundation, Denver, CO

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## 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](mailto:help@myperinatalnetwork.org) to learn more.



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**Linda Baker, PsyD**

Psychologist at Unstuck Therapy, LLC, Denver, CO.

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**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](mailto: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 Provisership 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)™*. 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](mailto:help@myperinatalnetwork.org).

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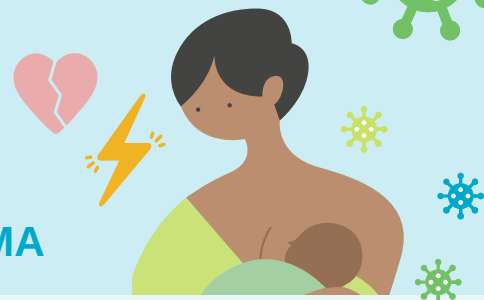
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## PARTNERSHIP

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.

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Nurses

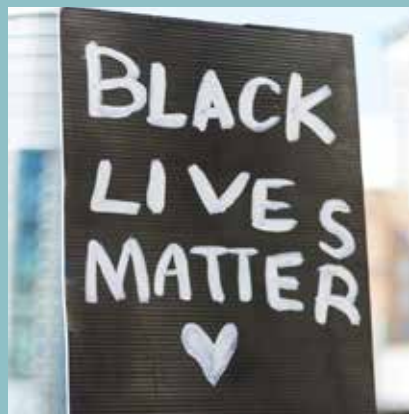


# Coping with COVID-19



A viral pandemic

A racial pandemic within a viral pandemic



Will mental illness be the next inevitable pandemic?

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- Caregivers Need Care Too



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and NICU Parent Network  
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# Stepping Up the Fight Against Infant and Maternal Mortality

Michelle Winokur, DrPH, and the AfPA Governmental Affairs Team, Alliance for Patient Access (AfPA)

The Alliance for Patient Access ([allianceforpatientaccess.org](http://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.



***“Among the world’s developed countries, the United States holds the unwanted distinction of leading maternal and infant deaths. In an attempt to turn the tide, the federal government announced a new \$350 million investment last month.”***

Among the world’s developed countries, the United States holds the unwanted distinction of leading maternal and infant deaths. In an attempt to turn the tide, the federal government announced a new \$350 million investment last month.

Through a [series of grants](#), (1) the government will particularly target the stubborn racial inequity that has long left non-white mothers and babies with higher-than-average mortality rates.

## **Maternal, Infant, and Early Childhood Home Visiting Program:**

Most of the funding, \$342 million, will expand the Maternal, Infant, and Early Childhood Home Visiting Program. As the name

implies, the program supports home medical visits to expectant moms and those with young children.

The infant and maternal health experts visit low-income mothers primarily to guide pregnancy health and parenting skills. They also bring essential baby care supplies like diapers and help families secure food, link them to federal nutrition programs, and locate stable or more suitable housing, among other services.

## **Healthy Start Initiatives:**

Federal funding is also going to the [Healthy Start Initiative](#) (2), which operates in communities where the infant death rate is 1.5 times higher than the national average.

Some of the funds will support the increased use of doulas, who provide physical and emotional support to expectant moms and their partners through pregnancy and childbirth. [Research](#) shows that doula support better health outcomes and can reduce cesarean and preterm births. (3)

***“A portion of the Healthy Start funding will augment existing support to 10 states participating in the State Systems Developmental Initiative. (4) The program is focused on collecting and reporting timely, high-quality maternal health data, which has long been a challenge.”***

A portion of the Healthy Start funding will augment existing support to 10 states participating in the [State Systems Developmental Initiative](#). (4) The program is focused on collecting and reporting timely, high-quality maternal health data, which has long been a challenge.

## **Persistent Infant and Maternal Mortality:**

Despite progress in recent years, the United States continues to trail other wealthy countries on measures of infant health.

The United States’ infant death rate is 71% higher than average, according to a [2017 study](#) of 12 developed countries. (5) And within the United States, mortality rates among babies born to non-Hispanic Black, Native American, and Alaska Native mothers remain disproportionately high compared to babies born to white mothers.

A similarly discouraging trend persists with maternal mortality, with the United States [trailing other wealthy countries](#) in preventing deaths from pregnancy or childbirth. (6) The maternal death rate among non-Hispanic Black women was more than twice as high as that of non-Hispanic white women, according to recent [data](#) from the National Center for Health Statistics. (7)

These statistics and the factors that contribute to them are well

known. “We know that many mothers and their children do not receive the care they need to stay healthy throughout their lives,” said Acting HRSA Administrator Diane Espinosa in announcing the new federal awards. “These programs will allow us to better tackle the root causes of these challenges,” she added.

Digging deep to address infant and maternal mortality is a must if the United States wants to reverse its current trend – and do right by mothers and infants of all races and classes.

#### References:

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This content article was also published at [InstituteofPatientAccess.org](https://www.instituteofpatientaccess.org)

Disclosures: Michelle Winokur, DrPH, is the Policy Communications Director for the Alliance for Patient Access.

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## Still a Premie?

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 PREMIE**

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



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



### Born preterm at a "normal" weight?

**STILL A PREMIE**

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.

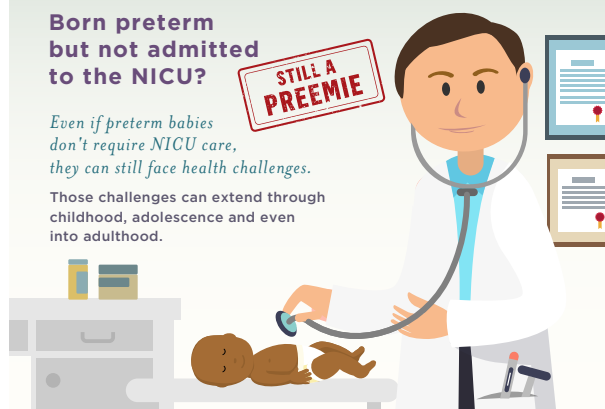


### Born preterm but not admitted to the NICU?

**STILL A PREMIE**

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 Premies

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

#### All Premies

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

**NCJIH** National Coalition for Infant Health  
Protecting Access for Premature Infants through Age Two  
[www.infanthealth.org](http://www.infanthealth.org)



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# Keeping Your Baby Safe

during the COVID-19 pandemic

## How to protect your little one from germs and viruses

Even though there are some things we don't know about COVID-19 yet, there are many more things that we do know. We know that 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. Protecting your baby from flu and pertussis lowers their risks for complications from coronavirus.



**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.



# 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

We can help protect each other.

[Learn more](#)

[www.nationalperinatal.org/COVID-19](http://www.nationalperinatal.org/COVID-19)



[www.infanthealth.org](http://www.infanthealth.org)

# I CAN Digitally Involved (I CANDI): New Horizons in Pediatric Drug Development Symposium

Amy Ohmer



***“The two-day virtual symposium is being held to bring together thought leaders and innovators in pediatric drug development to share new developments in the field and collaborate on new ideas to advance pediatric drug development into a new era.”***

Happy fall from your friends at the International Children's Advisory Network, Inc. (iCAN). We are kicking off the month of October with a few exciting events! This month, iCAN's Director, Amy Ohmer, along with Theresa Shalaby, Senior Regulatory Services Manager, Functional Plain Language Summaries, at Synchrogenix (a Certara Company), share support for how to involve young people throughout the lay summary design. Certara, a global leader in biosimulation, will host the inaugural “New Horizons in Pediatric Drug Development Symposium” from October 28-29, 2021. The two-day virtual symposium is being held to bring together thought leaders and innovators in pediatric drug development to share new developments in the field and collaborate on new ideas to advance pediatric drug development into a new era.

Additionally, iCAN and Jumo Health will be finalizing the details on the beautiful “I CAN” book designed to inspire children (and families and doctors) on what they can accomplish in the world. Watch for more to come next month on how you can order your copy to keep or to give as an inspiring present this holiday season.

Next month, iCAN has partnered with Eli Lilly to participate at the annual Lilly Symposium to be held virtually on November 3rd, 2022. At the symposium, iCAN and the KIDS Illinois Chapter at the Ann & Robert Lurie Children's Hospital will present five diverse

youth members' experiences through their participation within pediatric clinical research trials. This dynamic session will be moderated by KIDS Illinois Chapter Leader Lisa Mulvaney, a long-time supporter of sharing youth perspectives within iCAN.

In case you missed it, on September 22nd, iCAN presented at the International Society of Pediatric Innovation (iSPI) annual conference called PEDS2040. Founded by Dr. Anthony Chang, this is a leading conference on pediatric innovation, designed to inspire and innovate. iCAN assembled a panel discussion with two youth members (ages 11 and 16) to share their experience living with both rare and chronic health needs, including unique ideas to help improve future care for kids everywhere. If you did not get the chance to participate, a recording of “Innovative Kids & iCAN” is available at [www.icanresearch.org/videos](http://www.icanresearch.org/videos). On September 30<sup>th</sup>, iCAN presented an inside look at “Diversity and Inclusion” to the Food & Drug Administration MUDFA V from the perspective of children living with rare, chronic, and complicated conditions. This session helped spark a conversation about supporting the patient's voice at the onset of pediatric clinical trial design. iCAN's Amy Ohmer shared, “Including the voice of a child at the very beginning of the project can help support patient needs and help to increase patient participation.” Are you looking for ways to better engage patients within your projects? iCAN is continuing the effort to get all kids to where they need to be to share their own expert experiences through our continued community patient partnership with the FDA and through collaborative events and partnerships with Ask the Experts, MRCT, PFMD, and AIMed. Each session is recorded, and all recordings may be found of our youth member sessions sharing support of medical device wear, insight to health conditions, and more on <https://www.icanresearch.org/videos>. If you would like to be an expert for our monthly sessions, please email Amy Ohmer at [amyohmer@icanresearch.org](mailto:amyohmer@icanresearch.org).

***“On September 30th, iCAN presented an inside look at “Diversity and Inclusion” to the Food & Drug Administration MUDFA V from the perspective of children living with rare, chronic, and complicated conditions. This session helped spark a conversation about supporting the patient's voice at the onset of pediatric clinical trial design.”***

Do you have an iCAN chapter at your hospital? There is no cost to create a chapter or for a child to participate, as iCAN is supported through sponsoring partnerships. Starting a chapter is free and easy to do, as iCAN helps each group to get started and up and running. If you would like to create a chapter, often, the best



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# 2022 SUMMIT



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Hosted by iCAN KIDS France

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place to start is through your hospital's ChildLife center. We are happy to meet with your ChildLife team to help share how iCAN is making a difference in patients' lives around the world. To set up a meeting, please contact us by email at [info@icanresearch.org](mailto:info@icanresearch.org) or visit [www.icanresearch.org](http://www.icanresearch.org). If any interested kids are not involved in an iCAN chapter but would still like to participate, iCAN offers a Virtual Chapter to accommodate any child, anywhere in the world. All children are welcome and are encouraged to join us!

---

***“In 2022, for the second week of July, iCAN and their KIDS France Chapter will be hosting the 8th Annual iCAN Summit, June 11th - June 15th, 2022, in Lyon, France. Looking ahead to 2022, iCAN is busy creating the Summit 2022 agenda.”***

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In 2022, for the second week of July, iCAN and their KIDS France Chapter will be hosting the 8th Annual iCAN Summit, June 11th - June 15th, 2022, in Lyon, France. Looking ahead to 2022, iCAN is busy creating the [Summit 2022](#) agenda. Check out our BRAND NEW [2022 Summit video](#) to better understand what iCAN is all about. [Get ready for the iCAN 2022 Summit Lyon, France!](#) To keep track of all of the new content being added for the Summit, be sure to check out <https://www.icanresearch.org/2022-summit> and add a bookmark to connect easily.

Through this endeavor, iCAN will be seeking sponsorship for our kids to attend the iCAN Summit and continue supporting the pediatric voice by including children in research, science, innovation, and medicine/medical device development. To help us by sponsoring a youth member, please email Amy Ohmer, Director, [amyohmer@icanresearch.org](mailto:amyohmer@icanresearch.org). All donations support iCAN, a tax-exempt organization described in Section 501(c)3 of the Internal Revenue Code. All donations are welcome and appreciated. <https://www.icanresearch.org/sponsoring>

#iCANMakeADifference #iCAN #iCANBeDigitallyInvolved #iCAN-2022Summit

**Disclosure:** The author has no conflicts of interests to disclose.

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Respiratory Syncytial Virus is a

# Really Serious Virus

Here's what you need to watch for this RSV season

Coughing that gets worse and worse



Breathing that causes their ribcage to "cave-in"

Rapid breathing and wheezing



Bluish skin, lips, or fingertips

RSV can be deadly. If your baby has these symptoms, don't wait.

Call your doctor and meet them at the hospital.

If your baby isn't breathing call 911.



Thick yellow, green, or grey mucus



that clogs their nose and lungs, making it hard to breathe

Fever that is higher than 101° Fahrenheit



which is especially dangerous for babies younger than 3 months

 National Perinatal Association

[www.nationalperinatal.org/rsv](http://www.nationalperinatal.org/rsv)

PROTECT YOUR FAMILY FROM RESPIRATORY VIRUSES

flu

coronavirus

pertussis

RSV



SOAP

**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.

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# Disaster Series: Elements of a Disaster

Daved van Stralen, MD, FAAP, Sean D. McKay, Thomas A. Mercer, RAdm, USN

## Abstract

*A disaster is an environmental disruption of medical care, a victim generator that disrupts the ability to treat multiple patients. Death can come from physiological, physical, social, or behavioral threats within the disaster environment. Legal or administrative definitions of disasters are necessary for out-of-area resource allocation. Topological dynamical systems describe the continuous transformations within the topological space of a disaster. A functional description of disasters focuses on the damage produced by the disaster rather than how the damage was caused. An ecological description underscores how damage creates a new environment within our familiar, formerly safe work environment. The disaster environment can have a latent effect on physiology in several ways. The disaster forms an embedded problem, an ill-structured problem embedded in the environment. We extend operations into disasters by developing capabilities rather than assessing risk.*

***“The disaster environment can have a latent effect on physiology in several ways. The disaster forms an embedded problem, an ill-structured problem embedded in the environment. We extend operations into disasters by developing capabilities rather than assessing risk.”***

## Introduction

A disaster is an *environmental* disruption of medical care, a *victim generator* that disrupts the *ability to treat* multiple patients. This functional and ecological definition directs our attention to the immediate environment inside the NICU and around the neonate. No longer does the Neonatologist have control over the environment around the infant. We respond to the immediate area to ensure safe conditions, correct abnormalities, then consider sheltering or an immediate evacuation. The disaster environment has disrupted our familiar concept of medical care.

The environment of a disaster will self-organize, confounding our efforts to predict and plan a response.

“Technological systems become organized by commands from the outside, as when human intentions lead to the building of structures or machines. But many natural sys-

tems become structured by their own internal processes: these are self-organizing systems, and the emergence of order within them is a complex phenomenon that intrigues scientists from all disciplines.”

Eugene F. Yates (1)

The environment becomes a pathogen distinct from physiological pathogens. The Neonatologist, thus, responds to the environment, not to an earthquake, hurricane, ionizing radiation, etc. The Neonatologist protects neonates from uncontrolled energy in a disaster, including cold, heat, water, and contamination. The Neonatologist now collaborates with outside people who are unaccustomed to the care of a premature infant.

***“Neonatologist protects neonates from uncontrolled energy in a disaster, including cold, heat, water, and contamination. The Neonatologist now collaborates with outside people who are unaccustomed to the care of a premature infant.”***

Environmental threats are physical, social, and behavioral. In the field, death can come from any one or a combination of the three threats. While physicians focus on physiological threats (inadequate tissue oxygen delivery), in the prehospital environment, death can come from a vehicle driving into an accident scene or an angry individual physically assaulting the medics, situations one author (DvS) has experienced. In those instances, the physiological threat and the ABCs may have to wait. Death can come from physiological, physical, social, or behavioral threats during a disaster.

- Physical threats from uncontrolled energy
- Social threats from outside groups impeding care (2)
- Behavioral threats from situational cognitive distortions due to stress, fear, or threat (3-5)

With a disaster, the environment becomes an open system with an unimpeded flow of energy and the entry of outside people and resources. Thermodynamic entropy describes the dissipation of outside energy into the NICU and the energy within the NICU dissipating outward. We experience this entropy in five forms of energy: thermal, chemical, electrical, kinetic, and less commonly, ionizing radiation. Information also has entropy that follows the thermodynamic entropy equation. Information, rather than dissipating, becomes corrupted through its transmission to others (6).

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During a disaster, the NICU becomes an open system that interacts with other, often nonmedical, systems such as FEMA, EMS, the fire department, and the air traffic control system. In the Neonatology Today: Special Disaster Series, we will present High-Reliability *Organizing* as a means to describe disasters and develop an effective response toward High-Reliability *Operations*.

---

***“In the Neonatology Today: Special Disaster Series, we will present High-Reliability Organizing as a means to describe disasters and develop an effective response toward High-Reliability Operations.”***

---

### Functional description

A functional description of disasters focuses on the damage produced by the disaster rather than how the damage was caused. Neonatologists in situations within the disaster space respond to local threats to create a trajectory of stabilization and recovery. At the same time, they maintain medical care for their patients. This Lagrangian flow specification is in contradistinction to the Eulerian specification from a fixed point of reference outside the flow of events (7). This also facilitates practical descriptions of what to expect, such as the nature of increases in demand, the appearance of novel demands, and the decrease in resource availability. Operators within a disaster focus on context and what they can learn; outsiders will focus on what they already know.

**Table 1: Eulerian and Lagrangian Specifications (8)**

Eulerian, quantitative	Langrangian, qualitative
Decontextualized	Contextual
External, fixed point	Within flow
Focus on the specific location	Focus on the individual moving parcel
Flow	Trajectory
Multiple, fixed positions	Continuous measure with position and pressure
Rate of change of system	Individual parcels

### Ecological description

An ecological description underscores that damage from the event creates its own environment. The damage is unpredictable. The severe damage or penetration of the elements within a hospital may be predictable, but damage to a specific area of the NICU is not predictable. This uncertainty may contribute to planning that focuses on what caused the disaster, for example, a hurricane or an internal water leak. An ecological approach brings to the Neonatologist’s attention the more open environment and the need to identify new or hidden risks to the neonate. Taken together, the Neonatologist can better identify methods to increase the capability for the NICU and staff to evacuate or shelter neonates during the disaster.

An ecological description also helps differentiate plans in the context of the disaster environment. Planning for structure and order fits a Euclidean space, the three-dimensional space comprising points and distance measurements that readily accommodate

classification and categories. We have quantitative measures, hierarchy, metrics as points and lines, and discrete representations from the Euclidean space and Newtonian physics. We use classical logic and deductive reasoning to make the necessary inferences (9).

On the other hand, an ecological environment has more of a topological orientation based on relations, contiguity, and relative position rather than actual metric measurements that would indicate an absolute position. In a topology, elements maintain continuity of connectedness despite deformations. The focus is on how the elements are connected, for example, the closeness of connection or overlapping connection (10). Topology replaces precise characterizations with a topological differentiable state that represents possible variable states. Ecology has made use of object-oriented network topology and dynamic system field-oriented topology (11).

### Disaster topology

Network topology describes the form of disaster planning and response system. A network is a discrete, object-oriented model that involves objects, nodes, edges, and connections. The topology leads to network system properties such as connectivity, directedness, closeness, betweenness, degree, characteristic path length, small worlds, and giant components (11, 12). Note that in a topological network, the strength of relations between nodes has a greater influence than the distance between nodes that we see in a Euclidean network. Topological networks are invariant, meaning that if the network is deformed, the relations do not change,

---

***“Our presence in or out of a system is more than a different frame of reference. We have different perceptions and capabilities. For Newtonian mechanics, physicists must make specific the frame of reference when they study natural phenomena.”***

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and the formula remains true. Graph representations of network topologies include line, ring, mesh, star, tree, bus, and the fully connected mesh topology. The Incident Command System is a tree network topology.

Topological dynamical systems describe the continuous transformations or flow within a topological space. The ‘topological mixing’ of two topological systems or the effects of external noise from a stochastic environment can cause a spontaneous breakdown of topological supersymmetry. Chaos is the resultant phenomenon of this breakdown, which is an intrinsic property of these systems. It has become common knowledge that chaos is sensitive to initial conditions. But not all initial conditions result in chaos. What is less known is that chaos requires topological mixing, that is, mixing without using distances. Chaos as “sensitivity to initial conditions” is better expressed as a consequence of ‘topological mixing,’ that is, it is more relation-dependent (13).

During critical illness, the interactions, or mixing, of topological systems within the human body can generate unexpected, abrupt chaotic changes in physiology. A disaster also has topological mixing between the event and the city. As the disaster develops, the blending of multiple topological systems creates the severity and unpredictability that have become hallmarks of disasters.



## Purpose of a legal definition

The legal definition of disaster is necessary for out-of-area resource allocation. Declaration of a disaster by government authorities will bring outside resources to aid the hospital and NICU. In the US, the local jurisdiction must send a declaration of disaster to the state governor to bring in state resources. The governor can request a disaster declaration by the President to bring in federal resources. This coordination takes time for the respective authorities to collect the necessary information for a disaster declaration and the government to mobilize resources. For an internal disaster, such as a fire, the insurance adjuster may become involved early for claims documentation (14).

In medical care, a disaster explains the uncontrolled addition of pathology and constraints on providing care. In some situations, the Neonatologist must act immediately such as an earthquake, internal water leak, or hospital fire. If a disaster is predicted, such as a hurricane or wildland fire, the Neonatologist must still begin a disaster response while awaiting further determinations regarding sheltering and evacuation. This article is for that initial experience when demands approach or have breached the limits of the NICU resources. While this may occur with sufficient preparation time, it may happen abruptly, negating disaster plans and routines.

Classification of the disaster, such as earthquake or hurricane, has administrative and academic purposes (15). For the Neonatologist, however, who has become accustomed to working in a controlled environment, any abrupt, forcible encroachment of the environment into the NICU creates a disaster regardless of the cause. In the *Neonatology Today: Disaster Special Issue*, we will present *High-Reliability Organizing* as a means to use routine operations as the disaster response toward *High-Reliability Opera-*

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***“When the logic of practice is made visible, other factors lead to its suppression. Leaders and managers may believe field operators cannot grasp the necessary content or exercise the necessary judgment. This becomes self-fulfilling when the organization maintains operators at the competence skill level, the level of abstract learning, and below the practice of the particular situation.”***

---

tions.

## The Environment

A disaster creates two environments – the physical environment and a mental environment. The physical environment of uncontrolled energy is experienced as volatility, uncertainty, complexity, ambiguity, threat, and time compression (VUCA-2T). The resulting change creates a new mental environment characterized as a liminal zone of abrupt new structures and rules.

### *Physical environment*

The environment becomes an open system. The NICU environment becomes open to environmental energy, and staff become open to interactions with other, often nonmedical, systems. The environmental insulation the hospital gave the neonates is lost.

Thermodynamics now govern the exposure of neonates to the five

forms of energy: thermal, chemical, electrical, kinetic, and less commonly, ionizing radiation. The thermal energy of fires creates toxic fumes or inspired particulates. The kinetic energy of earthquakes or hurricanes exposes neonates to cold temperatures. The kinetic energy from moving neonates can become damaging energy within the neonate's body.

Information also has entropy that follows the calculus thermodynamic entropy equation. Increasing entropy for energy is its dissipation; for information, increasing energy is its corruption within the message. This corruption occurs during transmission to communicate with others (6).

Outliers, however, pose a problem in disasters. Accustomed to using probabilities and *p* values from medical research, healthcare providers may too easily disregard outliers as random, independent events. High-Reliability Organizations and those working

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***“The imperfect external view represents someone outside the situation but without full knowledge of the situation. This models leadership more closely from a distance. We assume these operational models could be wrong.”***

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in dangerous contexts evaluate the outlier as a possible precursor event, an early herald of further crisis. “If it happened once, it could happen again; if it happens again, it will happen worse.”

There also may be a tendency to rely on Bayes' Theorem for predictions or to update probabilities of events. Bob Bea, Professor Emeritus, Civil Engineering, University of California, Berkeley (8/8/2007, personal communication), (16) underscored that Bayes' Theorem “should only be used to update *epistemic* or model-parameter uncertainties.” These are ‘information-sensitive uncertainties from imperfections of the model. Increasing information reduces uncertainty. In a disaster, uncertainties are “inherent or natural uncertainties that are fundamentally information insensitive” (Bob Bea, 8/8/2007, personal communication). Acquiring more information does not necessarily reduce uncertainty.

### *Mental experience of the environment*

Disasters create a new environment within our familiar, formerly safe work environment. We can better understand this change using the military concept of “VUCA,” an acronym to describe threats to national security – Volatile, Uncertain, Complex, Ambiguous (17, 18), to which we add Threat and Time Compression. VUCA is a military concept with the implicit assumption “threat,” which we make visible (3). Time compression is the operational component of volatility, the quality of instability (3, 19, 20).

- *Volatility* comes from rapid and abrupt changes in events.
- *Uncertainty* describes the lack of precise knowledge about the situation, our need to obtain more information, the unavailability of the necessary information.
- *Complexity* refers to the large number of interconnected and changing parts that come together to create the situation.
- *Ambiguity* describes how multiple interpretations, causes, or outcomes may be possible for one situation.
- *Threat* impairs cognition and decision-making.
- *Time compression* describes the limitations on acquiring in-

formation, deciding, or acting before consequential changes in circumstances. Time compression is not a quality of time dependence or time-limitation.

The VUCA-2T environment disrupts order and bedevils classification systems. We can borrow from art historians to evaluate the visible amount of structure and degree of randomness present (21). The structure is a measure of complexity that identifies discrete objects through borders and edges, demarcating change and flat surfaces denoting continuity. Randomness is a measure of entropy that measures disorder and uncertainty, a fuzziness that disconnects various parts of what we can observe, making invisible the causes and effects (22).

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***“Being thrust into a disaster situation, particularly in our routine workplace, discomfits us – we are not meant to be there. The discomfort arises from the loss of context and the unrecognized triggering of the sympathetic nervous system. Such ‘liminal zones’ expose us to other, quite different experiences.”***

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Being thrust into a disaster situation, particularly in our routine workplace, discomfits us – we are not meant to be there. The discomfort arises from the loss of context and the unrecognized triggering of the sympathetic nervous system. Such ‘liminal zones’ expose us to other, quite different experiences. The liminal zone is that space between a world we know and a world we don’t, where our old rules don’t apply, and we haven’t learned the new rules (23). The liminal zone challenges our leadership and us. We cannot rely on plans or our experience (24). In a disaster, we find that we must engage circumstances whether we stay or leave, but we don’t yet know what works (24).

The liminal experience shapes the individual due to the environment (24). The more severe the environment of the disaster, the more profound the effect on the individual. Engagement of the situation, rather than passive endurance, changes the cognitive domain and the affective domain. Engagement reduces the immediate emotional load and long-term consequences.

The common themes across work domains in dangerous contexts include suppression of fear, trust, help the novice, protect your partner, recognize fear in fellow workers, and follow local leadership. Experienced workers accept the reality of the threat, taking personal responsibility to teach the new worker how to work around the threat (2). Specific to operators in liminal environments is the ethics of kindness (25). “Both the historical tradition among seafarers of all nations and the International Law of the Sea require mariners and aviators to respond to any life-threatening and significant damage events at sea, even among vessels and aircraft of adversarial countries. This responsibility to save life whenever remotely possible includes situations where there is a significant risk, cost, distance, and schedule impact on your own ship or aircraft.” Mountaineers will come to the aid of injured or stranded climbers, even at considerable risk to themselves. “And of all the principles by which we hold the first is that of mutual help,” George H. Leigh-Mallory, mountaineer, British Mount Everest expeditions (26).

One maladaptive approach to a liminal event is to remove one-

self as a participant through decontextualization of the experience (27). Becoming a dissociated spectator limits the influence of the affective domain but gives a false sense of cognitive control. Reducing emotions to only the motor component gives the feeling of objective thought and actions through the false sense of emotional control.

#### *Environment as pathogen*

The environment can have a latent effect on physiology in several ways. One author (DvS) has found that low humidity can decrease an infant’s body temperature, create abnormal respiratory secretions contributing to ineffective airway clearance, and lead to decreased blood volume in adults. According to published meteorological reports, the humidity in the region often could be lower than the humidity in the Sahara Desert. Because most US medical schools are near the coast or in higher humidity areas east of the Rocky Mountains, physicians do not learn to recognize the effect of low humidity on physiology. The author learned to treat abnormal secretions in asthma with oral fluids during his Fire Rescue Ambulance training in 1974 at Children’s Hospital of Los Angeles.

During pediatric critical care transports in a desert region (DvS), the body temperature of an infant would lose 0.5 Fahrenheit degree for every 30 minutes of hand ventilation, 1.0 Fahrenheit degree if the infant had sepsis or a head injury. The humidity of inspired air can be 10-15% while that of expired air is about 100%. This was also observed during trauma resuscitations and on hospital wards; however, an additional effect was air conditioning that lowers room temperature to below an infant’s thermoneutral zone (about 90° F).

Children with CNS impairment and tracheostomy-dependence often develop abnormal sputum with ineffective airway clearance during periods of low humidity. Despite treatment with N-acetylcysteine or mechanical chest physiotherapy, they often have multiple medical visits for low oxygen saturation or pneumonia. Hydrating with enteric fluids resolves the problem within 45 minutes. This improvement is due partly to the misconception that mucus is hydrophilic. While mucus readily absorbs water when it is within the cell, it takes on a three-dimensional shape exposing its protein backbone to become hydrophobic once secreted. A modest decrease in cell hydration creates thick, even sticky mucus.

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***“During pediatric critical care transports in a desert region (DvS), the body temperature of an infant would lose 0.5 Fahrenheit degree for every 30 minutes of hand ventilation, 1.0 Fahrenheit degree if the infant had sepsis or a head injury.”***

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Low humidity also influences the medical treatment of adults. One of the authors (DvS) participated in a state committee writing EMS guidelines for paramedics. A controversy developed regarding the minimal blood pressure to administer nitroglycerine for chest pain due to possible myocardial infarction. By listening closely, it was noted that physicians from northern regions advocated a lower blood pressure than the physicians from the southern regions. The humidity in the southern part of the state is markedly lower than in the northern region, contributing to occult lower blood volume. A few years later, the author discussed the effect of low humidity on blood volume, particularly in heart failure, with a physician from the desert. The physician became visibly upset because the medical staff at his hospital had recently terminated

a physician's privileges for repeatedly giving fluids to patients in cardiogenic shock. He realized the patients likely had cardiogenic shock with hypovolemia, which explained their improvement after fluid resuscitation.

Environmental extremes can cause unrecognized disease processes in adults. A 'normal' environment for adults is an extreme environment for a premature neonate. Therefore, a disaster creates a deadly environment for the neonate. Loss of insulation from the environment places the neonate in an extreme environment with findings that may be missed or misattributed to other diseases.

### The problems of disasters

The embedded problem is ill-structured or ill-defined (28) embedded in the environment (29). The environment contains information while influencing the structure of the problem. Multiple objectives compete or conflict with each other. The boundary between problem and context is fuzzy and vague. Such issues have no clear problem definition, their goal state is not defined clearly, and the means of moving towards the (diffusely described) goal state are unclear.

The ill-structured problem is a problem without a clear goal. Because algorithms are not available, we must learn while problem-solving, a process Herbert Simon and Allen Newell (30) called heuristics. The 'heuristic search' is to learn and make discoveries during the process, producing a more accurate search within a complex environment (31). While there is a fear of heuristic bias, recognition of errors provides safety and guides accuracy (32). The ill-structured problem is a 'residual concept' that does not fit classification, making the boundary between ill-structured problems and well-structured problems vague. Residual concepts are defined in terms of what they are not (15, 28) by the negative space around the object that also defines and brings attention to it (21).

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***“The well-structured problem is amenable to rules, protocols, decision trees, and algorithms, forming a hierarchy for decisions as well as who decides. The danger is loss of information and context with the operator becoming a spectator (27, 34), unable to interact in real-time with the environment.”***

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Well-structured problems are formulated explicitly and quantitatively and can be solved by known computational routines or algorithms (30). For tractability, we too easily convert an ill-structured problem to a well-structured problem through linearization of the curve or decontextualization. The system, however, then becomes susceptible to error from the frame problem, what does or does not change after an action (33). The well-structured problem is amenable to rules, protocols, decision trees, and algorithms, forming a hierarchy for decisions as well as who decides. The danger is loss of information and context with the operator becoming a spectator (27, 34), unable to interact in real-time with the environment.

A disaster is an environment embedded into already embedded problems. It brings together diverse organizational infrastructures that have different purposes and missions while in response to

a common threat. The diverse missions mean the organizations operate in different contexts; for example, a governmental agency that administers EMS may direct area disaster operations and task helicopters usually used by the NICU for interfacility transport with rescue operations or movement of critical supplies. Conflicts and disputes develop not from system or personality issues but from different contexts and infrastructures (15, 35, 36).

Medical care is accustomed to 'well-defined problems.' The problems in a disaster are not only ill-defined; they are embedded in the environment with the free exchange of energy. Emergency plans presuppose effective courses of action. Jens Rasmussen (37) describes the importance of people in the field:

Operators are maintained in [complex technological] systems because they are flexible, can learn, and adapt to the system's peculiarities. Thus, they are expected to plug the holes in the designer's imagination.

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***“Medical care is accustomed to ‘well-defined problems.’ The problems in a disaster are not only ill-defined; they are embedded in the environment with the free exchange of energy. Emergency plans presuppose effective courses of action.”***

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### Capability and Risk

We extend operations by developing capabilities rather than assessing risk. In a disaster, like resuscitation, we cannot decide to engage the situation. We evaluate the risk to match the capabilities of our team and the system (38).

#### Risk

Amos Tversky and Daniel Kahneman (39) described the important role 'imaginability' of contingencies has toward our view of risks. The vivid portrayal of contingencies can make the situation appear exceedingly dangerous. Tversky and Kahneman, however, focused decision-making on threats one could conjure, or even worse, of not conjuring enough threats.

Threat and capability, lexical elements for the HRO, became the business terms of risk and risk management using the standards for risk developed by the International Organization for Standardization (ISO) (40). (The following terms in quotations come from ISO 31000:2009).

- Plans and planning to *prepare* for contingencies became protocols and algorithms *restricting* operations.
- Assessing capabilities needed for a mission, an assignment that cannot be refused, became "risk" ("effect of uncertainty on objectives") and "risk-benefit assessment" ("decision-aiding techniques that weigh advantages against disadvantages in numerical terms").
- Increasing capabilities for mission requirements (training and materiel) became "risk management" ("coordinated activities to direct and control an organization concerning risk").
- Safety, as an operational element, became a distinct element and cost within risk management.



## Capability

Operators in dangerous contexts seek capabilities for threats, particularly capabilities they can generalize to unforeseen perils or that extend operations into novel situations (2, 7, 25, 38). The acceptance of uncertainty and fear in an HRO is unique (2). Capability calibrates the threat response (4), and operators focus on possibility over probability. The more significant delineator between spectator and operator is the willingness to say, "I don't know" (41).

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***“Common sense supports immediate action to avoid hidden consequences, thereby producing immediate results then continues that action. This results in failure avoided, sometimes invisible, and can be difficult for others to learn from these mistakes.”***

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One unrecognized capability of the HRO is pragmatic common sense, the response to consequences (42). Common sense supports immediate action to avoid hidden consequences, thereby producing immediate results then continues that action. This results in failure avoided, sometimes invisible, and can be difficult for others to learn from these mistakes. This process is immediate enacted experience and ongoing action rather than deliberate reflection (43). Thinking and thought are not nouns, but “a quality of that conduct which foresees consequences of existing events, and which uses *what is foreseen as a plan* and method of administering affairs” (44).

## Timelines

Having separate timelines in an interactive situation with different organizations and objectives can bring the various parties' perspectives into view. In a disaster, we have the cause, the hospital and NICU timeline, the infant timeline, and outside agency timelines. Essentially, the event causes damage, and the hospital and NICU prepare for and respond to the damage. The infants continue receiving care, are protected, and then evacuated or sheltered.

The event or cause timeline becomes the backbone we can measure other actions from, while the infant timeline is a form of audit for the effectiveness of those actions. Timelines for EMS, public safety, and other emergency operations can illuminate the availability of outside support that can help awareness of other NICUs in disaster planning. We can also better compare disasters, even an event like Zika compared to a tornado.

### Event timeline

- Approaching
- Imminent
- Passage
- Nature of damage
- Event ends

### Facility timeline

- Preparation
- Damage controlled

- Return to operations

### Patient timeline

- Preparation for movement
- Horizontal transfer – Away from immediate danger
- Vertical evacuation – Out of building
- Holding – Area in preparation for transport
- Transport
- Receiving hospital

### Staff timeline

- Notification
- Actions
- Recall

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***“ The disaster creates an acute resource scarcity, disrupting the ability to treat multiple patients. Hospital supplies may become damaged, or providers are unable to deliver new and replacement supplies.”***

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## Conclusion

The disaster creates an acute resource scarcity, disrupting the ability to treat multiple patients. Hospital supplies may become damaged, or providers are unable to deliver new and replacement supplies. If the NICU evacuates neonates, the level of care can be markedly reduced due to equipment and space limitations in the ambulance, car, or helicopter. The Neonatologist must now treat multiple neonates with less staff and fewer resources.

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[nationalperinatal.org/psychologists](http://nationalperinatal.org/psychologists)

# 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](http://www.cdc.gov/rsv)



Identify 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 insurance coverage for 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



\*See the NPA's evidence-based guidelines at [www.nationalperinatal.org/rsv](http://www.nationalperinatal.org/rsv)

## 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



NCJIH National Coalition for Infant Health  
Preventing RSV in Preterm Infants through Age Five

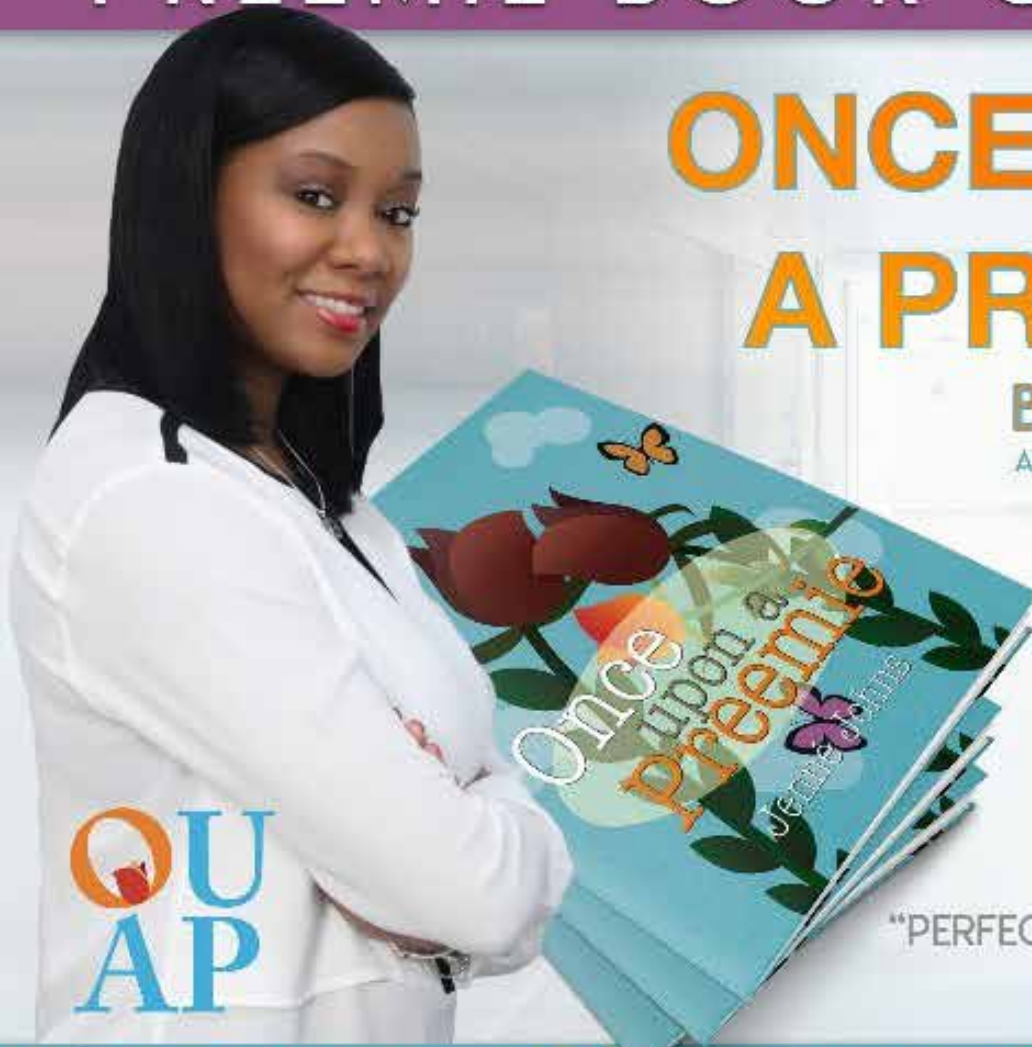
Learn More about RSV at [www.infanthealth.org/rsv](http://www.infanthealth.org/rsv)



# PREEMIE BOOK ON SALE

## ONCE UPON A PREEMIE

BY JENNÉ JOHNS  
AUTHOR | SPEAKER | ADVOCATE



OU  
AP

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- CONGRESSIONAL BLACK CAUCUS ANNUAL LEGISLATIVE CONFERENCE
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- HUDSON VALLEY PERINATAL PUBLIC HEALTH CONFERENCE
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## 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:

-  They treat RSV as a priority, "often" or "always" evaluating their patients
-  RSV is the "most serious and dangerous" illness for children under four
-  Barriers to access and denials from insurance companies **limit patients' ability to get preventive RSV treatment**



*But Parents are Unprepared.*

-  Only 18% know "a lot" about RSV
-  Only 22% consider themselves "very well" prepared to prevent RSV



### RSV EDUCATION & AWARENESS CAN HELP

After parents learned more about RSV, they were:



**NCJH** National Coalition for Infant Health  
 Promoting Access for Perinatal Infections through Age Two

Learn More about RSV at [www.infanthealth.org/RSV](http://www.infanthealth.org/RSV)

Online survey conducted September 2018. Included 174 specialty health care providers and 600 parents of children 4 and under.

## OPIOIDS and NAS

When reporting on mothers, babies, and substance use

## LANGUAGE MATTERS



### I am not an addict.

I was exposed to substances in utero. I am not addicted. Addiction is a set of behaviors associated with having a Substance Use Disorder (SUD).



### I was exposed to opioids.

While I was in the womb my mother and I shared a blood supply. I was exposed to the medications and substances she used. I may have become physiologically dependent on some of those substances.



### NAS is a temporary and treatable condition.

There are evidence-based pharmacological and non-pharmacological treatments for Neonatal Abstinence Syndrome.



### My mother may have a SUD.

She might be receiving Medication-Assisted Treatment (MAT). My NAS may be a side effect of her appropriate medical care. It is not evidence of abuse or mistreatment.

### My potential is limitless.

I am so much more than my NAS diagnosis. My drug exposure will not determine my long-term outcomes. But how you treat me will. When you invest in my family's health and wellbeing by supporting Medicaid and Early Childhood Education you can expect that I will do as well as any of my peers!



Learn more about Neonatal Abstinence Syndrome at [www.nationalperinatal.org](http://www.nationalperinatal.org)





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Learn more about the free online activity at <https://nichd.nih.gov/SafeSleepCE>.

The CE activity explains safe infant sleep recommendations from the American Academy of Pediatrics and is approved by the Maryland Nurses Association, an accredited approver of the American Nurses Credentialing Center's Commission on Accreditation.



Eunice Kennedy Shriver National Institute  
of Child Health and Human Development





# Medical News, Products & Information

Compiled and Reviewed by David Vasconcellos, MS IV

## Pfizer's COVID-19 vaccine for kids would require different doses, dilution, storage

October 08, 2021

**Editor's note:** For the latest news on COVID-19, visit <http://bit.ly/AAPNewsCOVID19>.

COVID-19 vaccines awaiting authorization for children ages 5-11 years will have different doses, dilution requirements and storage conditions than the vaccines currently available for adolescents and adults, according to Pfizer.

The [AAP has updated its materials](#) to help pediatricians prepare, and the American Medical Association (AMA) has released new Current Procedural Terminology (CPT) codes.

The COVID-19 vaccine manufactured by Pfizer and BioNTech is proposed to be given in two 10-microgram (mcg) doses administered 21 days apart. The dosage is one-third of the adolescent and adult dose.

The currently available vaccine product with a purple cap has not been studied in children under 12 and therefore should not be used for this age group. The vaccine vials for ages 5-11 years will have orange caps and borders to differentiate them.

Each vial will have 10 doses and will need 1.3 milliliters (mL) of diluent under Pfizer's preliminary plan. The vaccines would be stored for six months in an ultra-cold freezer or 10 weeks in a refrigerator, under Pfizer's proposal.

Investigators tested the lower-dose Pfizer-BioNTech vaccine in 2,268 children and [announced in late September](#) that their data demonstrate it is safe and produces a significant immune response.

The Food and Drug Administration's (FDA's) Vaccines and Related Biological Products Committee will meet Oct. 26 to discuss use of the Pfizer-BioNTech vaccine for this age group. The Centers for Disease Control and Prevention's (CDC's) Advisory Committee on Immunization Practices is expected to meet shortly after.

"We know from our vast experience with other pediatric vaccines that children are not small adults, and we will conduct a comprehensive evaluation of clinical trial data submitted in support of the safety and effectiveness of the vaccine used in a younger pediatric

population, which may need a different dosage or formulation from that used in an older pediatric population or adults," Acting FDA Commissioner Janet Woodcock, M.D., said in [a news release](#).

Nearly 5.9 million children have tested positive for COVID-19, according to [data from the AAP and the Children's Hospital Association](#). There have been nearly 850,000 new pediatric cases over the past four weeks.

About 45% of 12- to 17-year-olds in the U.S. are fully vaccinated, [according to an AAP report](#). Pediatricians can get more information on signing up to be a vaccinator at <https://bit.ly/2YwgcRN>. The AAP also has guidance for pediatricians on [preparing for authorization](#), [practice implementation](#) and [getting paid](#) and has posted a list of [frequently asked questions](#).

The AMA released [new CPT codes](#) related to COVID-19 vaccines for 5- to 11-year-olds.

### Vaccine product code:

91307 Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike protein, preservative free, 10 mcg/0.2 mL dosage, diluent reconstituted, tris-sucrose formulation, for intramuscular use

### Vaccine administration codes:

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In addition to the new vials for children ages 5-11 years, Pfizer hopes to roll out a new formulation for adolescents and adults that would not require dilution and would have the same storage requirements as vials for children. The formulation would need approval from the FDA.

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Melissa Jenco, News Content Editor

Contact information for AAP headquarters

American Academy of Pediatrics

345 Park Blvd, Itasca, IL 60143

New AAP main number: 630-626-6000

**NT**

## American Academy of Pediatrics, Section on Advancement in Therapeutics and Technology

Released: Thursday 12/13/2018 12:32 PM, updated Saturday 3/16/2019 08:38, Sunday 11/17/2019 and Friday 11/20/2020

The American Academy of Pediatrics' Section on Advances in Therapeutics and Technology (SOATT) invites you to join our ranks! SOATT creates a unique community of pediatric professionals who share a passion for optimizing the discovery, development and

approval of high quality, evidence-based medical and surgical breakthroughs that will improve the health of children. You will receive many important benefits:

- Connect with other AAP members who share your interests in improving effective drug therapies and devices in children.
- Receive the SOATT newsletter containing AAP and Section news.
- Access the Section's Website and Collaboration page – with current happenings and opportunities to get involved.
- Network with other pediatricians, pharmacists, and other health care providers to be stronger advocates for children.
- Invitation for special programming by the Section at the AAP's National Conference.
- Access to and ability to submit research abstracts related to advancing child health through innovations in pediatric drugs, devices, research, clinical trials and information technology; abstracts are published in Pediatrics.

AAP members can join SOATT for free. To

activate your SOATT membership as an AAP member, please complete a short application at <http://membership.aap.org/Application/AddSectionChapterCouncil>.

The Section also accepts affiliate members (those holding masters or doctoral degrees or the equivalent in pharmacy or other health science concentrations that contribute toward the discovery and advancement of pediatrics and who do not otherwise qualify for membership in the AAP). Membership application for affiliates: <http://shop.aap.org/aap-membership/> then click on "Other Allied Health Providers" at the bottom of the page.

Thank you for all that you do on behalf of children. If you have any questions, please feel free to contact:

Christopher Rizzo, MD, FAAP, Chair, [crizo624@gmail.com](mailto:crizo624@gmail.com)

Mitchell Goldstein, MD, FAAP, Immediate Past Chair, [MGoldstein@llu.edu](mailto:MGoldstein@llu.edu) and

Jackie Burke

Sections Manager

AAP Division of Pediatric Practice

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*The American Academy of Pediatrics is an organization of 67,000 primary care pediatricians, pediatric medical subspecialists and pediatric surgical specialists dedicated to the health, safety and well-being of infants, children, adolescents and young adults. For more information, visit [www.aap.org](http://www.aap.org). Reporters can access the meeting program and other relevant meeting information through the AAP meeting website at <http://www.aapexperience.org/>*

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## Baby-Wearing Products Lead to Higher Risk of Injury, Hospitalizations in Children under Age 1

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October 08, 2021

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"We know from our vast experience with other pediatric vaccines that children are not small adults, and we will conduct a comprehensive evaluation of clinical trial data submitted in support of the safety and effectiveness of the vaccine used in a younger pediatric population, which may need a different dosage or formulation from that used in an older pediatric population or adults," Acting FDA Commissioner Janet Woodcock, M.D., said in [a news release](#).

Nearly 5.9 million children have tested positive for COVID-19, according to [data from the AAP and the Children's Hospital Association](#). There have been nearly 850,000 new pediatric cases over the past four weeks.

About 45% of 12- to 17-year-olds in the U.S. are fully vaccinated, [according to an AAP report](#). Pediatricians can get more in-

formation on signing up to be a vaccinator at <https://bit.ly/2YwgcRN>. The AAP also has guidance for pediatricians on [preparing for authorization](#), [practice implementation](#) and [getting paid](#) and has posted a list of [frequently asked questions](#).

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In addition to the new vials for children ages 5-11 years, Pfizer hopes to roll out a new formulation for adolescents and adults that would not require dilution and would have the same storage requirements as vials for children. The formulation would need approval from the FDA.

Contact information for AAP headquarters

Melissa Jenco, News Content Editor

American Academy of Pediatrics

345 Park Blvd, Itasca, IL 60143

New AAP main number: 630-626-6000

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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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## FDA Approves Innovative Treatment for Pediatric Patients with Congenital Athymia

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For Immediate Release:

October 08, 2021

Today, the U.S. Food and Drug Administration approved Rethymic for the treatment of pediatric patients with congenital athymia, a rare immune disorder. Rethymic is the first thymus tissue product approved in the U.S.

“Today’s action marks the first FDA approval of a therapy to treat this very rare and devastating disease in children,” said Peter Marks, M.D., Ph.D., director of the FDA’s Center for Biologics Evaluation and Research. “We remain committed to helping advance the development of safe and effective medical products for patients affected by rare diseases – an area of such critical need.”

Congenital athymia is a rare immune disorder in which a child is born without a thymus – an organ that plays a critical role in helping the body learn to fight infections. Children impacted by this disease typically die within the first two years of life and may have repeated, often life-threatening infections because they lack adequate working T cells (a kind of infection-fighting white blood cell).

Rethymic is composed of human allogeneic (donor-derived) thymus tissue that is processed and cultured, and then implanted into patients to help reconstitute immunity (improve immune function) in patients who are athymic. Dosing is patient customized, determined by the surface area of the Rethymic slices and the body surface area of the patient. Rethymic is not indicated for the treatment of patients with severe combined immunodeficiency (SCID).

The safety and efficacy of Rethymic were established in clinical studies that included 105 patients, with ages from one month to 16 years, who each received a single



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administration of Rethymic, from 1993 – 2020. Rethymic improved survival of children with congenital athymia, and most children treated with this product survived at least two years. Children treated with Rethymic who survive past the first year generally survive long-term. Rethymic also reduced the frequency and severity of infections over time.

The most common adverse reactions in patients that received Rethymic include high blood pressure, cytokine release syndrome, low blood magnesium levels, rash, low platelets and graft versus host disease.

Because Rethymic is derived from human tissue, it carries a risk of transmitting infectious disease. Based on effective donor screening procedures and product manufacturing processes, the risk of infectious disease transmission is remote – but not completely eliminated.

It takes six months or longer to reconstitute the immune function in treated patients; therefore, it is important that until immune reconstitution occurs patients continue to take strict precautions to prevent infections

and healthcare providers should treat accordingly.

This application was granted a rare pediatric disease voucher by the FDA. A description of rare pediatric disease designation and voucher programs can be found in the [Guidance for Industry: Rare Pediatric Disease Priority Review Vouchers](#).

The FDA granted approval of Rethymic to Enzyvant Therapeutics, Inc.

Healthcare professionals should report all serious adverse events suspected to be associated with the use of any drug, biological product or device to FDA’s [Med-Watch Reporting System](#) or by calling 1-800-FDA-1088.

###

The FDA, an agency within the U.S. Department of Health and Human Services, protects the public health by assuring the safety, effectiveness, and security of human and veterinary drugs, vaccines and other biological products for human use, and medical devices. The agency also is responsible for the safety and security of





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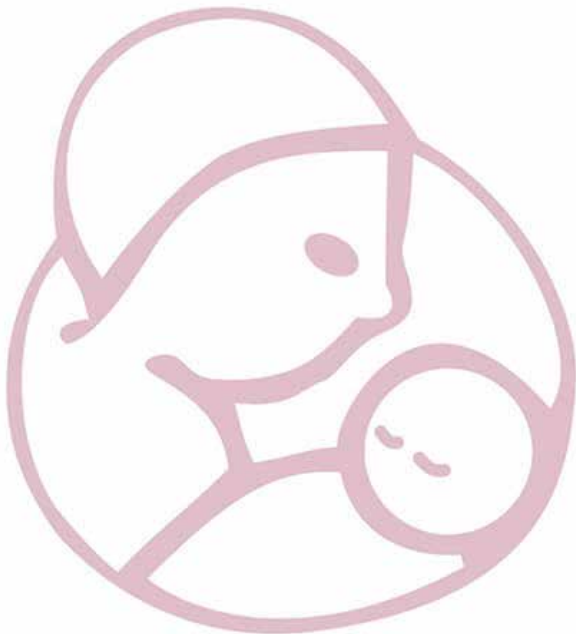
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## Inquiries

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[Veronika Pfaeffle](#)

301-310-2576

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# FDA to Hold Advisory Committee Meetings to Discuss Emergency Use Authorization for Booster Doses and COVID-19 Vaccines for Younger Children

## For Immediate Release:

October 01, 2021

Today, the U.S. Food and Drug Administration is announcing two upcoming meetings of its Vaccines and Related Biological Products Advisory Committee (VRBPAC) to discuss newly available data for the currently available COVID-19 vaccines.

### VRBPAC Meeting on Janssen and Moderna COVID-19 Vaccine Boosters

On Oct. 14 and 15, the advisory committee will meet to discuss the use of booster doses of the Moderna COVID-19 Vaccine and the Janssen COVID-19 Vaccine. Both vaccines are currently authorized for emergency use to prevent COVID-19 in individuals 18 years of age and older. The committee will also hear presentations and discuss the available data on the use of a booster of a different vaccine than the one used for the primary series of an authorized or approved COVID-19 vaccine (heterologous or "mix and match" booster).

**"Vaccines are one of the most important interventions for bringing an end to the ongoing pandemic. It's critical that as many eligible individuals as possible get vaccinated as soon as possible. Once vaccinated, we want to ensure that individuals continue to be protected against the adverse effects of COVID-19. The available data make clear that protection against symptomatic COVID-19 in certain populations begins to decrease over time, so it's important to evaluate the information on the use of booster doses in various populations,"** said Peter Marks, M.D., Ph.D., director of the FDA's Center for Biologics Evaluation and Research.

On Oct. 14, the committee will discuss an amendment to the emergency use authorization of the [Moderna COVID-19 Vaccine](#) for the administration of a booster dose, in individuals 18 years of age and older.

On Oct. 15, the VRBPAC will discuss amending the emergency use authorization of Johnson and Johnson's [Janssen COVID-19 Vaccine](#) for the administration of a booster dose, in individuals 18 years of age and older.

Additionally, on Oct. 15, the committee will hear a presentation from the National Institute of Health's National Institute of Allergy and Infectious Diseases on the heterologous use of booster doses following the primary series of the three currently authorized or approved COVID-19 vaccines. During the meeting, the committee will hear presentations from the companies on the data for their respective vaccines. The FDA will also present its own analyses of each of the manufacturers' data. There will be an open public hearing each day during which the public will be given an opportunity to provide comments.

### VRBPAC Meeting on Pfizer Data on Its COVID-19 Vaccine for Children 5-11

The FDA anticipates receiving a request from Pfizer to amend its emergency use authorization to allow the use of its COVID-19 vaccine in children 5 through 11 years of age. In anticipation of the request,

the FDA is moving forward with scheduling an advisory committee meeting on Oct. 26 to inform the agency's decision-making.

**"We know from our vast experience with other pediatric vaccines that children are not small adults, and we will conduct a comprehensive evaluation of clinical trial data submitted in support of the safety and effectiveness of the vaccine used in a younger pediatric population, which may need a different dosage or formulation from that used in an older pediatric population or adults,"** said Acting FDA Commissioner Janet Woodcock, M.D.

The FDA intends to make background materials for both VRBPAC meetings available to the public, including the meeting agendas and committee rosters, no later than two business days before each meeting.

The FDA intends to livestream the VRBPAC meetings on the agency's YouTube page ([Oct. 14 meeting link](#)[External Link Disclaimer](#); [Oct. 15 meeting link](#)[External Link Disclaimer](#); [Oct. 26 meeting link](#)[External Link Disclaimer](#)), which will be viewable on the agency's [Facebook](#)[External Link Disclaimer](#) and [Twitter](#)[External Link Disclaimer](#) channels; the meetings will also be webcast from the FDA website.

## Related Information

- [Vaccines and Related Biological Products Advisory Committee](#)
- [COVID-19 Vaccines](#)

The FDA, an agency within the U.S. Department of Health and Human Services, protects the public health by assuring the safety, effectiveness, and security of human and veterinary drugs, vaccines and other biological products for human use, and medical devices. The agency also is responsible for the safety and security of our nation's food supply, cosmetics, dietary supplements, products that give off electronic radiation, and for regulating tobacco products.

## Inquiries



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## More than 140,000 U.S. children lost a primary or secondary caregiver due to the COVID-19 pandemic

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*New study highlights stark disparities in caregiver deaths by race and ethnicity, calls for urgent public health response.*

Thursday, October 7, 2021

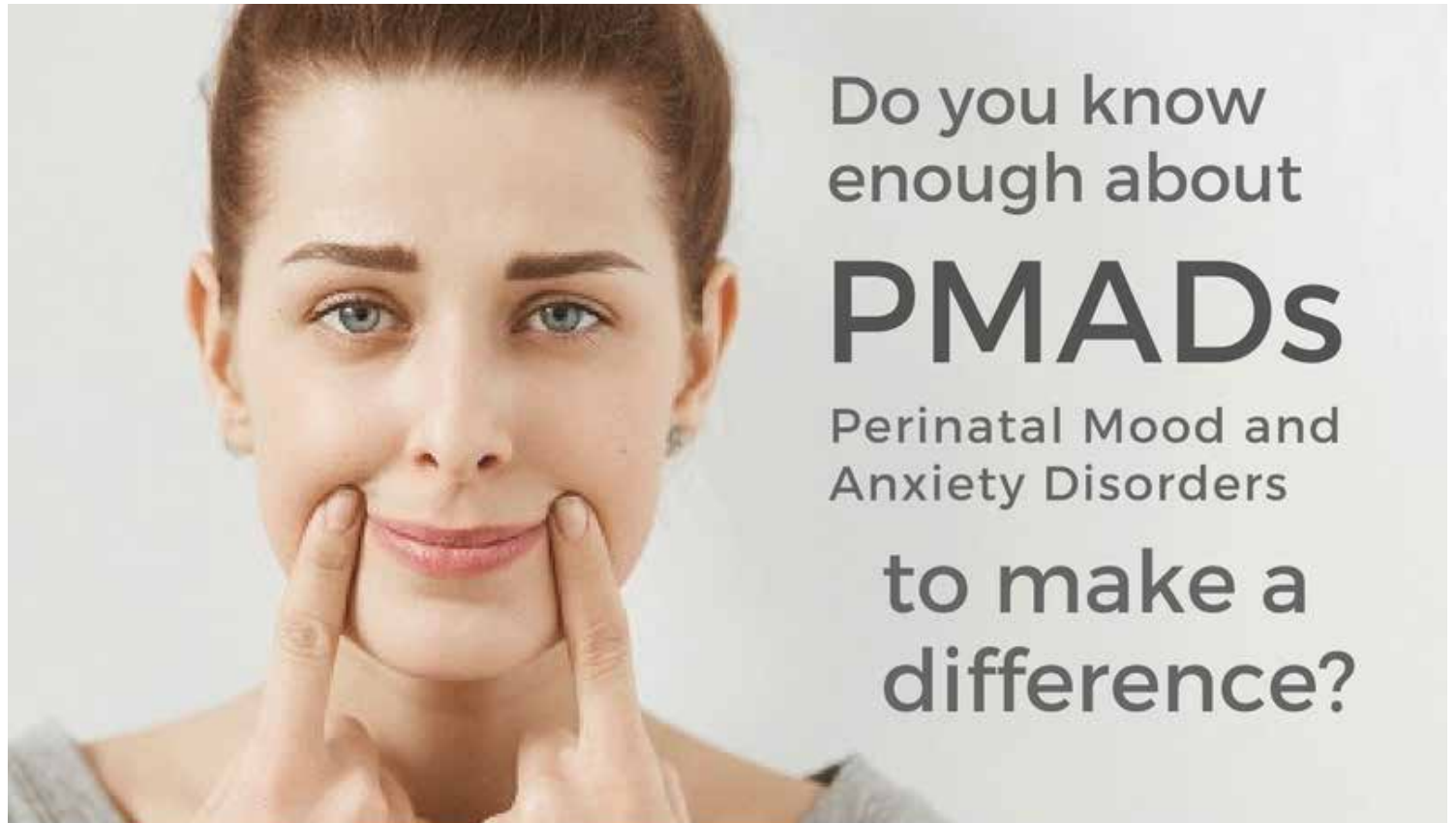
One U.S. child loses a parent or caregiver for every four COVID-19 deaths, a new modeling study published today in *Pediatrics* reveals. The findings illustrate orphanhood as a hidden and ongoing secondary tragedy caused by the COVID-19 pandemic and emphasizes that identifying and caring for these children throughout their development is a necessary and urgent part of the pandemic response – both for as long as the pandemic continues, as well as in the post-pandemic era.

From April 1, 2020 through June 30, 2021, data suggest that more than 140,000 children under age 18 in the United States lost a parent, custodial grandparent, or grandparent caregiver who provided the child's home and basic needs, including love, security, and daily care. Overall, the study shows that approximately 1 out of 500 children in the United States has experienced COVID-19-associated orphanhood or death of a grandparent caregiver. There were racial, ethnic, and geographic disparities in COVID-19-associated death of caregivers: children of racial and ethnic minorities accounted for 65% of those who lost a primary caregiver due to the pandemic.

Children's lives are permanently changed by the loss of a mother, father, or grandparent who provided their homes, basic needs, and care. Loss of a parent is among the adverse childhood experiences (ACEs) linked to mental health problems; shorter schooling; lower self-esteem; sexual risk behaviors; and increased risk of substance abuse, suicide, violence, sexual abuse, and exploitation.

"Children facing orphanhood as a result of COVID is a hidden, global pandemic that has sadly not spared the United States," said Susan Hillis, CDC researcher and lead author of the study. "All of us – especially our children – will feel the serious immediate and long-term impact of this problem for generations to come. Addressing the loss that these children have experienced – and continue to experience – must be one of our top priorities, and it must be woven into all aspects of our emergency response, both now and in the post-pandemic future."

The study was a collaboration between the Centers for Disease Control and Prevention (CDC), Imperial College London, Harvard University, Oxford University, and



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the University of Cape Town, South Africa. Published in the Oct. 7 issue of the journal *Pediatrics*, it was jointly led by CDC's COVID Response and Imperial College London, and partly funded by the National Institute on Drug Abuse (NIDA), part of the National Institutes of Health (NIH), as well as Imperial College London.

"The magnitude of young people affected is a sobering reminder of the devastating impact of the past 18 months," said Dr Alexandra Blenkinsop, co-lead researcher, Imperial College London. "These findings really highlight those children who have been left most vulnerable by the pandemic, and where additional resources should be directed."

The analysis used mortality, fertility, and census data to estimate COVID-19-associated orphanhood (death of one or both parents) and deaths of custodial and co-residing grandparents between April 1, 2020, and June 30, 2021, for the U.S. broadly, and for every state. "COVID-19-associated deaths" refers to the combination of deaths caused directly by COVID-19 and those caused indirectly by associated causes, such as lockdowns, restrictions on gatherings and movement, decreased access or quality of health care and of treatment for chronic diseases. The data were also separated and analyzed by race and ethnicity, including White, Black, Asian, and American Indian/Alaska Native populations, and Hispanic and non-Hispanic populations.

The study authors estimate that 120,630 children in the U.S. lost a primary caregiver, (a parent or grandparent responsible for providing housing, basic needs and care) due to COVID-19-associated death. In addition, 22,007 children experienced the death of a secondary caregiver (grandparents providing housing but not most basic needs). Overall, 142,637 children are estimated to have experienced the death of at least one parent, or a custodial or other co-residing grandparent caregiver.

"The death of a parental figure is an enormous loss that can reshape a child's life. We must work to ensure that all children have access to evidence-based prevention interventions that can help them navigate

this trauma, to support their future mental health and wellbeing," said NIDA Director Nora D. Volkow, MD. "At the same time, we must address the many underlying inequities and health disparities that put people of color at greater risk of getting COVID-19 and dying from COVID-19, which puts children of color at a greater risk of losing a parent or caregiver and related adverse effects on their development."

#### Racial and ethnic disparities in COVID-related caregiver loss

There were significant racial and ethnic disparities in caregiver deaths due to COVID-19. White people represent 61% of the total U.S. population and people of racial and ethnic minorities represent 39% of the total population. Yet, study results indicate that non-Hispanic White children account for 35% of those who lost a primary caregiver (51,381 children), while children of racial and ethnic minorities account for 65% of those who lost a primary caregiver (91,256 children).

When looking at both primary and secondary caregivers, the study found that findings varied greatly by race/ethnicity: 1 of every 168 American Indian/Alaska Native children, 1 of every 310 Black children, 1 of every 412 Hispanic children, 1 of every 612 Asian children, and 1 of every 753 White children experienced orphanhood or death of caregivers. Compared to white children, American Indian/Alaska Native children were 4.5 times more likely to lose a parent or grandparent caregiver, Black children were 2.4 times more likely, and Hispanic children were nearly 2 times (1.8) more likely.

Overall, the states with large populations – California, Texas, and New York – had the highest number of children facing COVID-19 associated death of primary caregivers. However, when analyzed by geography and race/ethnicity, the authors were able to map how these deaths and disparities varied at the state level.

In southern states along the U.S.-Mexico border, including New Mexico, Texas, and California, between 49% and 67% of chil-

dren who lost a primary caregiver were of Hispanic ethnicity. In the southeast, across Alabama, Louisiana, and Mississippi, between 45% to 57% of children who lost a primary caregiver were Black. And American Indian/Alaska Native children who lost a primary caregiver were more frequently represented in South Dakota (55%), New Mexico (39%), Montana (38%), Oklahoma (23%), and Arizona (18%).

The current study follows closely in line with a [similar study](#) published in *The Lancet* in July 2021, which found more than 1.5 million children around the world lost a primary or secondary caregiver during the first 14 months of the COVID-19 pandemic. In both the global and US studies, researchers used the UNICEF definition of orphanhood, as including the death of one or both parents<sup>6</sup>. The definition includes children losing one parent, because they have increased risks of mental health problems, abuse, unstable housing, and household poverty. For children raised by single parents, the COVID-19-associated death of that parent may represent loss of the person primarily responsible for providing love, security, and daily care.

"We often think of the impact of COVID-19 in terms of the number of lives claimed by the disease, but as this study shows, it is critical to also address the broader impact – both in terms of those who have died, and those who have been left behind," said study co-author [Charles A. Nelson III, PhD](#), who studies the effects of adversity on brain and behavioral development at Boston Children's Hospital. "We must ensure children who have lost a parent or caregiver have access to the support services they need, and that this additional impact of the COVID-19 pandemic is comprehensively addressed in both our rapid response and our overall public health response."

There are evidence-based responses that can improve outcomes for children who experience the COVID-associated death of their caregivers:

- Maintaining children in their families is a priority. This means families

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bereaved by the pandemic must be supported, and those needing kinship or foster care must rapidly receive services.

- Child resilience can be bolstered via programs and policies that promote stable, nurturing relationships and address childhood adversity. Key strategies include:
  - Strengthening economic supports to families.
  - Quality childcare and educational support.
  - Evidence-based programs to improve parenting skills and family relationships.
- All strategies must be age specific for children and must be sensitive to racial disparities and structural inequalities. They must reach the children who need them most.

In the closing words of the paper, “Effective action to reduce health disparities and protect children from direct and secondary harms from COVID-19 is a public health and moral imperative.”

[U.S. Department of Health and Human Services\(link is external\)](#)

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causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit [www.nih.gov](http://www.nih.gov).

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#### References

S Hillis, et al. [Covid-19-Associated Orphanhood and Caregiver Death in the United States\(link is external\)](#). *Pediatrics*. DOI: 10.1542/peds.2021-053760 (2021).

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## Perinatal COVID: More Answers Needed on Preterm Birth, Maternal Mortality

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— Evolving questions about new moms and infants during the pandemic

*Researchers are keeping an eye on a signal for preterm birth and excess maternal mortality in SARS-CoV-2-infected mothers, according to a discussion at the [American Academy of Pediatrics \(AAP\) virtual meeting](#).*

*At the start of the pandemic, the main focus had been on whether newborns could get infected via vertical or horizontal transmission. The AAP’s [National Registry for Surveillance and Epidemiology of Perinatal COVID-19 Infection](#) currently shows that the rate of newborn positivity among COVID-positive mothers is low, at [approximately 2%](#).*

*However, newborn positivity rates can vary locally, with one center in Philadelphia reporting a 5.5% rate among newborns from April 2020 through September 2021. All but one of these neonates were asymptomatic, with one baby born with a cough,*

*according to Karen Puopolo, MD, PhD, of Children’s Hospital of Philadelphia and the University of Pennsylvania.*

*The evidence does not suggest greater likelihood of transmission when the mother rooms in with the baby and breastfeeds; instead, breast milk can harbor [IgG and IgM antibodies](#) that provide protection from SARS-CoV-2 infection, said Mark Hudak, MD, of the University of Florida College of Medicine in Jacksonville, during the AAP session.*

*He acknowledged that it remains to be seen what the natural history of perinatal COVID looks like with longer outpatient follow-up. For now, it appears that symptomatic neonatal SARS-CoV-2 is rare, and multisystem inflammatory syndrome in children (MIS-C) in neonates is even rarer, he said.*

*In contrast, a notable finding of immediate consequence has been the approximate 15% incidence of preterm birth (before 37 weeks of gestation) among infected mothers in the perinatal COVID registry compared with a 10% incidence in 2019.*

*Of preterm births to infected mothers during the pandemic, 42% represented delivery by induction or C-section due to concerns about the effects of SARS-CoV-2 on mother or fetus. The remainder may suggest secondary effects of the virus in stimulating preterm labor or causing fetal hypoxia requiring operative delivery, Hudak suggested.*

*“Continued data acquisition and trend analysis is needed to sort out possible causes of observed increase in preterm births,” he said.*

*Hudak reported that [maternal mortality](#) is also in excess among pregnant women testing positive at or around the day of delivery, reaching about an order-of-magnitude higher than expected rates in registry data.*

*At his institution, there were six maternal deaths with COVID since June of this year -- corresponding with the spread of the Delta variant -- whereas there hadn’t been any in the prior 12 months. However, the data are inconclusive regarding the Delta variant’s contribution to the morbidity and mortality of perinatal COVID-19. The published literature likely has not included many infected mothers, Hudak said.*

*Puopolo noted that her institution saw an increase in the [number and acuteness of](#)*



[COVID infections](#) among women in the delivery rooms in August and September, when Delta was in circulation.

“At our center we see a lot of positive mothers, but I don’t know if our rate of positive babies is any higher” with the variant, Hudak noted. He said other centers have shared mixed experiences anecdotally: some see more infected babies than before, while others have said they haven’t seen any difference at all.

Delta was cited as one reason why the CDC started recommending COVID vaccination to pregnant people [in August](#).

Puopolo presented data showing that maternal antibodies to SARS-CoV-2 appear to be lowest in asymptomatic infected individuals and those with mild-to-moderate illness, reaching at least 10 times higher in those receiving the Pfizer or Moderna vaccines.

Some vaccinated women had antibody levels so high that “our technician thought the assay had gone bad. But that was the response,” she emphasized.

On the other hand, [transplacental transfer ratios](#) were roughly the same for illness as for vaccination, she said.

In Philadelphia, serology studies of pregnant women had shown an 11.5% seropositivity for IgG and/or IgM antibodies as of February. By now, an estimated 25% of women presenting for delivery are seropositive whether by infection or vaccination, according to Puopolo.

Contact information for AAP headquarters by [Nicole Lou](#), Staff Writer, MedPage Today October 11, 2021

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## Perinatal COVID: More Answers Needed on Preterm Birth, Maternal Mortality

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—Mother’s own milk is optimum nutrition for very low birthweight infants: AAP

Margaret G. Parker, M.D., M.P.H., FAAP

October 11, 2021

A new AAP clinical report highlights the importance of promoting breastfeeding in neonatal intensive care units (NICUs) for very low birth weight (VLBW) infants (1,500 grams or less).

The report reaffirms previous policy statements that strongly support a mother’s own milk as the optimal nutrition source and provision of pasteurized human donor milk when her milk is unavailable.

The report *Promoting Human Milk and Breastfeeding for the Very Low Birth Weight Infant* is from the Section on Breastfeeding, Committee on Nutrition and Committee on Fetus and Newborn. It is available at <https://doi.org/10.1542/peds.2021-054272> and will be published in the November issue of *Pediatrics*.

### Benefits, challenges

Key observational studies and randomized, controlled trials summarized in the report demonstrate the robust benefits of mother’s own milk. They also highlight the continued social inequities in breastfeeding outcomes and support within the VLBW population.

Research shows that many mothers of VLBW infants do not reach their personal lactation goals. This population faces unique challenges, including a high risk of maternal morbidities that impact lactation; prolonged mother-infant separation; pump dependence to maintain milk production; and competing demands on time that impede frequent milk expression and NICU visitation.

### Supportive strategies

The report reviews evidenced-based strategies that can support maternal lactation. For example, mothers of VLBW infants need double electric breast pumps — often called “hospital-grade” pumps — to maintain lactation in the hospital and home. Mothers should be trained in use of these pumps prior to their discharge home. Optimally, they should receive the breast pump intended for home use *prior* to discharge to prevent any disruption in frequent milk expression.

Milk expression should begin as soon as possible after birth, ideally within six to eight hours and continuing every three to four hours. Frequent milk expression is important throughout lactation but is especially important in the first days and weeks after birth, when milk supply is being established.

Skin-to-skin care is an evidenced-based

practice to support lactation among mothers of VLBW infants. It also promotes other positive health outcomes. The statement reaffirms what has been expressed in previous AAP statements regarding skin-to-skin care. It can be performed safely with securely placed umbilical lines and intubated infants or infants on continuous positive airway pressure in many NICUs in the U.S. Family members should be encouraged to participate in skin-to-skin care as much as possible and for as long as desired.

Transition to direct breastfeeding is an important practice that is associated with longer duration of lactation. Barriers include prolonged immature coordination, mother-infant separation and the need for all VLBW infants to have fortification during the NICU hospitalization to optimize growth. Oral feeding at the breast is possible as soon as the infant shows feeding cues and respiratory support allows for feeding. Many studies have shown that this happens as early as 31 to 33 weeks. More frequent episodes of direct breastfeeding can lead to longer duration of lactation.

Mothers’ lactation goals should be assessed and supported at all stages of the NICU hospitalization and particularly as part of the discharge process.

The report also provides an account of macronutrient differences between mother’s own milk and pasteurized donor milk over time. Pasteurized milk has a substantially lower energy content than a mother’s own milk, demonstrating the importance of maximally supporting mothers in their own milk production.

Finally, the report provides guidance on postnatally acquired cytomegalovirus (CMV) infection. While this vulnerable population is at risk of CMV-acquired infection through mother’s own milk, the benefits of her milk are thought to outweigh the risk. NICU providers should consider CMV as a source when VLBW infants present with symptoms of late-onset sepsis.


*Dr. Parker is a lead author of the clinical report and a chair of a Section on Breastfeeding subcommittee on the report.*

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# Keeping Your Baby Safe

during the COVID-19 pandemic

## How to protect your little one from germs and viruses

Even though there are some things we don't know about COVID-19 yet, there are many more things that we do know. We know that there are proven protective measures that we can take to stay healthy.

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### 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. Protecting your baby from flu and pertussis lowers their risks for complications from coronavirus.

**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.



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flu

coronavirus

pertussis

RSV



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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.

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# Atypical Williams Syndrome in a Child who Presented with Aortic Stenosis and Coarctation and a Positive Family History

Ashleigh Hansen, BSc, MSc, LCGC, CCGC, Lily Radanovich, BA, Robin Dawn Clark, MD

## Case Summary:

A 6-day old male was referred for a genetics consultation for prenatally diagnosed aortic stenosis and a positive maternal history of aortic stenosis. He was born at 37 weeks 6 days gestation to a 34-year-old G4SAb3 mother with chronic hypertension and superimposed preeclampsia. A fetal echocardiogram at 33 weeks 6 days gestation showed moderate left ventricular hypertrophy, normal aortic root, mild mitral regurgitation, possible bicuspid aortic valve, and mild aortic stenosis. His birth weight was 3.51 kg with APGAR scores of 8<sup>1</sup> and 8<sup>5</sup>.

*“His physical exam was notable for mild periorbital puffiness, micrognathia, thin upper lip, long philtrum, milia on the nose, and dimples on both knees (Figure 1). His palate was high arched. He had mild tachypnea, subcostal retractions, and perioral cyanosis.”*

His physical exam was notable for mild periorbital puffiness, micrognathia, thin upper lip, long philtrum, milia on the nose, and dimples on both knees (Figure 1). His palate was high arched. He had mild tachypnea, subcostal retractions, and perioral cyanosis. At one day of age, an echocardiogram showed a diffusely small aortic arch with an isthmus of 2.1 mm, transverse arch of 3 mm, and ascending aorta of 6 mm. There was mild coarctation with a peak velocity of 2.7 m/s. The aortic valve was mildly hypoplastic and bicuspid with a fusion of the right and non-coronary cusps. The calcium value was normal. Chromosome microarray revealed 2 deletions: one within and one near to the Williams syndrome

critical region on chromosome 7q: arr[hg19] 7q11.23(73,156,045-73,810,341)x1,7q11.23(74,350,950-75,294,796)x1.

He underwent aortic arch reconstruction with resection of aortic isthmus and coarctation at 23 days of life. Post-surgical echocardiogram at 29 days of age showed no residual coarctation of the aorta but a 4 mm hypoplastic descending aorta. There was moderate supravalvar aortic stenosis, narrowing to 4.3 mm with an increased velocity of 3.7 m/s. There was severe right and moderate left branch pulmonary artery stenosis, moderate hypertrophy of the left and right ventricles. Moderate mid-cavitary dynamic obstruction was noted.



**Figure 1** The patient's facial features at about 25 days of age are partially obscured by tape. He has a depressed nasal bridge and mild micrognathia, but he lacks other facial features of Williams syndrome, including thick lips and an open mouth.

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**Figure 2** The patient's mother has upslanting palpebral fissures, a bulbous nasal tip, and a thin upper lip. However, she lacks many typical facial features of Williams syndrome, including anteverted nares, patulous, prominent lips, and enamel hypoplasia.

#### Family History:

The patient's mother, a 34-year-old woman of African American and Caucasian descent, is an articulate and competent historian. She is obese and chronically hypertensive (Figure 2). She has aortic stenosis that has not required surgery. Her echocardiogram during this gestation revealed moderate concentric left ventricular hypertrophy, normal-sized aortic root, mild mitral regurgitation, possibly bicuspid aortic valve, elevated velocity across descending aorta at 2.5 m/sec, no clear Doppler signal of coarctation, and mild aortic stenosis. She reported mild learning disabilities and self-diagnosed ADHD. She denied hyperacusis and reported that she has good drawing skills. She does not have an overly friendly or chatty personality.

The patient's mother has had three previous spontaneous abortions. Her conventional metaphase chromosome analysis was normal. The patient's father is a 29-year-old male of African American and Caucasian descent. Consanguinity was denied. No one else in the family has congenital cardiac anomalies.

#### Discussion:

This child and his mother have aortic stenosis/hypoplasia that has been transmitted in an autosomal dominant pattern (OMIM 185500). (1) Microarray testing in the infant revealed two deletions at 7q11.23, in and near the region associated with Williams syndrome (WS), highlighted on the gene map in Figure 3. Targeted FISH studies for both of these deletions are in progress for the mother.

The smaller, pathogenic deletion at 7q11.23 (654 kb) encompasses 12 genes within the Williams syndrome critical region from *CLDN3* to *CLIP2*, including *ELN*, the gene that encodes elastin (OMIM 130160). Elastin is a key component in arterial development. Lack of elastin causes obstructive arterial disease by increasing subendothelial production of smooth muscle. Deletion of *ELN* causes aortic hypoplasia, one of the characteristic features of Williams syndrome. (1) Heterozygous loss of *ELN* can also affect the renal, mesenteric, and coronary arteries leading to hypertension, abdominal pain, cardiac hypoperfusion with ST-elevation, or sudden death. (2) Elastin deficiency explains the cardiac anomalies in both mother and child and likely contributes to the mother's hypertension. The more distal and larger deletion at 7q11.23 (944 kb) is of uncertain significance. It lies outside the region associated with Williams syndrome. This deletion encompasses 33 genes from *RCC1L* to *HIP1*.

---

***“The more distal and larger deletion at 7q11.23 (944 kb) is of uncertain significance. It lies outside the region associated with Williams syndrome. This deletion encompasses 33 genes from *RCC1L* to *HIP1*.”***

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The classic deletion associated with Williams syndrome (WS) is 1.55-1.8 Mb in size, spanning 26-28 genes, on chromosome 7q11.23. (1) Atypical deletions account for 2-5% of reported cases. (3) Our patient's pathogenic deletion is nested within this region, but it is much smaller. Recurrent deletions are the result of non-allelic homologous recombination events within chromosome pairs during meiosis. Unequal exchanges between homologous chromosomes in a chromosome pair cause *de novo* copy number variation, (2) both deletions and duplications. Regions of DNA with a high density of repetitive elements, such as chromosome 7q11.23, are more susceptible to unequal recombination events. See Figure 3 for a map of low copy repeats in this region of chromosome 7q. Our patient's deletions, which are discontinuous and are not bordered by low copy repeats, may have a different etiology.



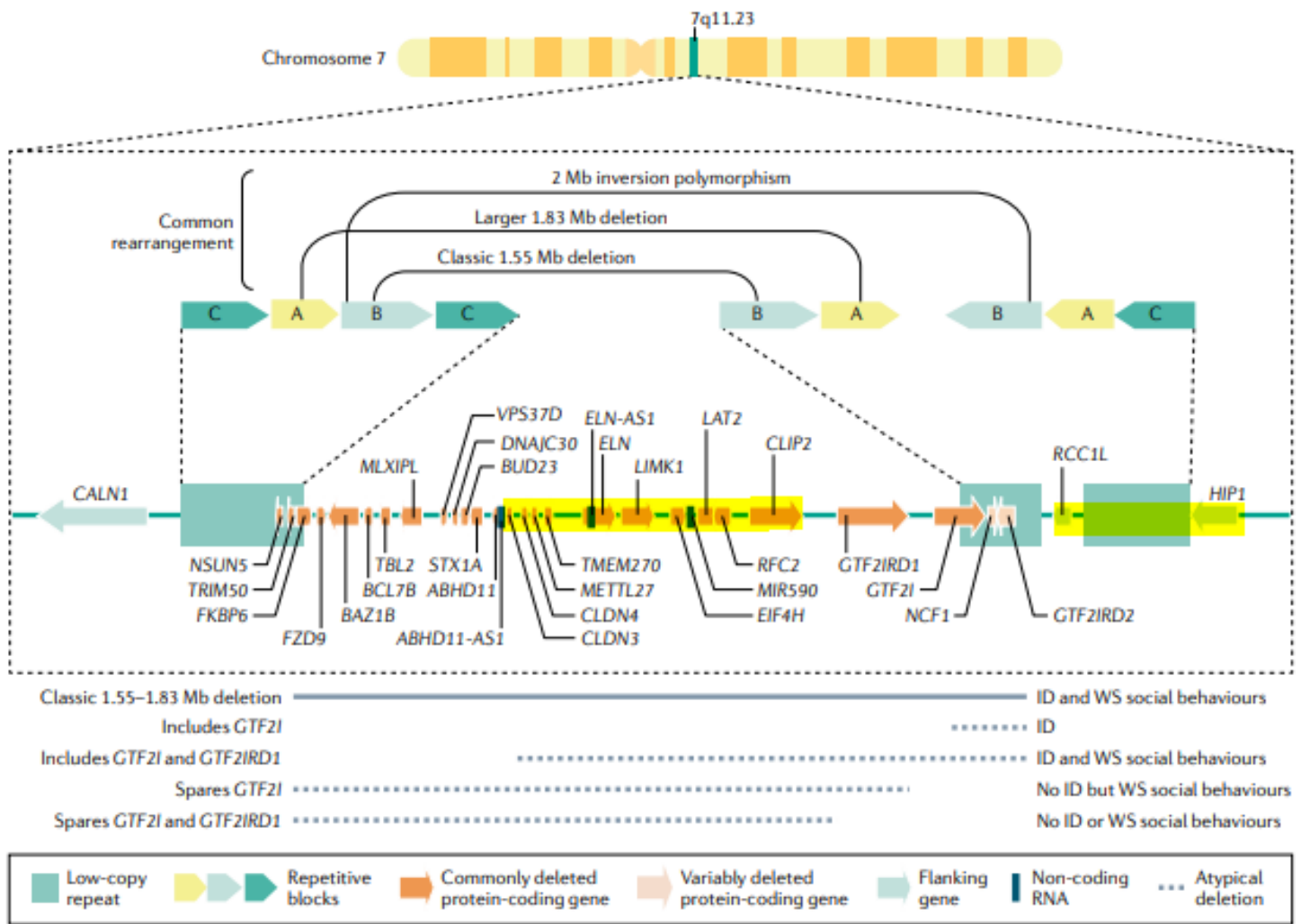
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**Figure 3:** (adapted from Kozel et al. 2021). (1) The regions highlighted in yellow are deleted in this patient. The smaller deletion is within the Williams Syndrome Critical Region, and it includes *ELN*, the gene that encodes elastin. The patient's deletion does not include *GTF2IRD1* and *GTF2I* (the unhighlighted region between the two deletions), which have been implicated in the etiology of intellectual disability in individuals with classic Williams syndrome.

***“It is unclear if our patient will express the neurocognitive and behavioral phenotypes associated with WS, but there is reason to expect that he will not. Evidence suggests that *GTF2IRD1*, *GTF2IRD2*, *GTF2I* have important roles in developing cognitive and visual-spatial abilities.”***

Our patient's smaller deletion explains why he does not have the classic phenotype associated with WS. Specifically, he lacks the expected facial features and hypercalcemia. Individuals with WS exhibit a combination of high sociability and empathy for others with high anxiety. They exhibit relative strengths in socialization and communication skills and weakness in daily living skills. Indi-

viduals with WS typical have hyperacusis, visual-spatial disabilities (inability to draw), a “cocktail party” personality, and intellectual disability.

It is unclear if our patient will express the neurocognitive and behavioral phenotypes associated with WS, but there is reason to expect that he will not. Evidence suggests that *GTF2IRD1*, *GTF2IRD2*, *GTF2I* have important roles in developing cognitive and visual-spatial abilities. Battista Ferrero et al. reported a male child with mild WS physical features, average intelligence with normal IQ, and only some features of the expected neuropsychological WS profile. (4) He carried a smaller atypical deletion of ~1 Mb that did not include *GTF2IRD1* and *GTF2I* and only partially included *BAZ1B*. Their report supports the hypothesis that *GTF2IRD1* and *GTF2I* hemizygosity are associated with WS-specific motor and cognitive deficits. Because of this, we are cautiously optimistic that our patient may be spared intellectual disability because his deletion does not include *GTF2IRD1* and *GTF2I*. However, other genes that are deleted in our patient may affect his neurocognitive ability. (2) The loss of *LIMK1* is associated with visual processing defects and other neurocognitive aspects of the WS phenotype including anxiety, depression, and attention deficit. (5)

The typical craniofacial features of WS are also absent in our pa-



tient, probably due to the preservation of *GTF2IRD1*. Alesi *et al.* suggest that lack of *CLIP2*, *GTF2IRD1*, and *GTF2I* are associated with the visual-spatial deficit, cognitive and behavioral profile of WS, and they implicate haploinsufficiency for *GTF2IRD1* in the facial dysmorphology. (6) Deletion of *GTF2IRD2* may play a role in the dental anomalies seen in WS, such as hypoplastic enamel. (7) Preservation of *NCF1* may pose an increased risk for hypertension in this patient. Individuals with WS who have a deletion of *NCF1* have a decreased risk for hypertension and have protection from vascular stiffness. (8, 9) Our patient may also be spared from hypercalcemia as this has been linked to a loss of *BAZ1B*, which is retained in our patient. (4, 10)

The second, larger, and more distal 944 kb deletion is considered a variant of uncertain significance. However, some patients with an overlapping deletion have had an intellectual disability, epilepsy, and behavioral problems. Deletions distal to the WS critical region that include *HIP1* and *YWHAG* have been associated with autistic traits, epilepsy, and intellectual disability (10,11) and may also be associated with inattention, hyperactivity, impulsivity, and aggression. (11)

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**“The second, larger, and more distal 944 kb deletion is considered a variant of uncertain significance. However, some patients with an overlapping deletion have had an intellectual disability, epilepsy, and behavioral problems.”**

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#### Practical Applications:

1. Order a chromosome microarray in infants with aortic stenosis, even when they do not have the typical facial features or other characteristics of a syndrome such as Williams syndrome. Recall that atypical deletions cause 2-5% of Williams syndrome.
2. Test parents for microarray abnormalities identified in their child. In this case, genetic testing in the mother, who also has aortic stenosis, may inform this child's prognosis for intellectual and learning abilities.
3. Take a careful family history whenever an infant has a congenital anomaly. The diagnosis of atypical Williams syndrome in this patient may lead to the same diagnosis in his mother, which could affect the management of her cardiac defect and chronic hypertension.
4. In children and adults with congenital heart defects, atypical deletions in the Williams syndrome critical region are likely to be underdiagnosed in part due to the absence of other expected features.

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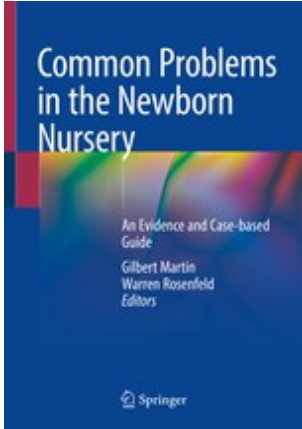
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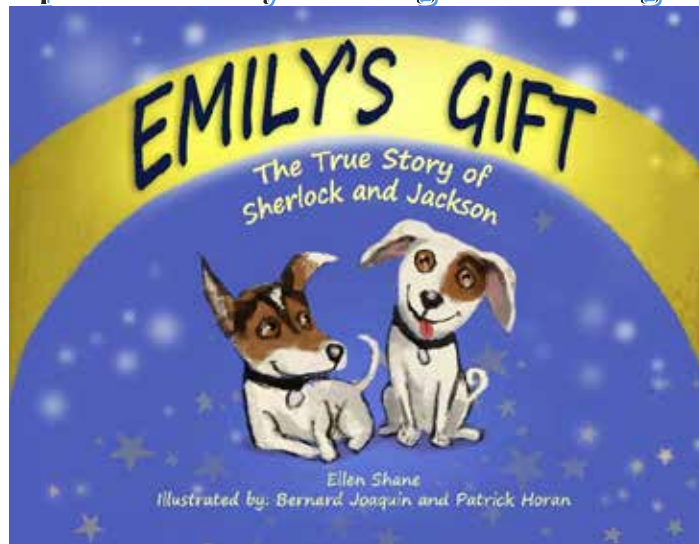
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## Parents: RSV is Still Around, Trust Me

Gloria Wai Chung Li, MD



*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.*

In June of this year, at age two, my daughter, Aria, was sent home from daycare with a high fever. Her pediatrician was concerned and prescribed an antibiotic for bacterial pneumonia. A COVID-19 swab was obtained – negative. Yet after a few days, she still wasn't getting better. In fact, she was getting worse.

Her breathing was getting more labored with audible wheezing. She became exhausted as every ounce of energy was used to maintain her breath. My husband commented that Aria was acting like her older brother did when he had Respiratory Syncytial Virus, commonly known as RSV, at ten months old.

I brought her back to her pediatrician, then urgently to the hospital. In the emergency room, she was immediately put on oxygen and was swabbed for COVID-19 and RSV. Her COVID-19 test was negative. Her RSV test, however, was positive.

By the time it came back, she was already in intensive care. We had been here before. In fact, Aria was born prematurely at 24 weeks and spent her first five months in the NICU, so we knew the chaos of alarms and flashing monitors.

The hardest part was seeing her struggle, but she was older this time, more aware that she was ill, more aware of her surroundings, and more easily scared. Watching your child struggle to fight a viral infection that no one – including myself – initially suspected was defeating as a parent.

Her doctors explained RSV in the summer is unusual. They hardly look for it during warmer months. This past winter was particularly unusual as RSV cases were at an all-time low. This is a result of the precautions taken for COVID-19.

I'm thankful Aria got better with high flow oxygen and that she





turned around before needing ventilator support.

But for countless other children out there like her, I'd like to see RSV testing become more immediate. We could have avoided a lot of pain and frustration had she been tested for RSV the first time she was presented with a high fever.

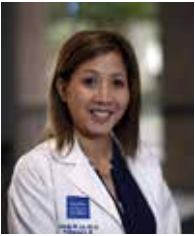
I would also like to see more children have the chance to ward off RSV before it starts. RSV is dangerous but treatable, even preventable, through a medication known as palivizumab. Aria was too old to qualify for it the year she landed in the hospital, but it's easy to see how she may have benefitted. Other kids like Aria deserve more protection, too.

So, as RSV season sets in, parents and health care providers should be vigilant about testing for RSV. It's a simple swab that could save your child and family from unnecessary suffering.

*Disclosure: No relevant disclosures noted*

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### 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.

**Equality.** 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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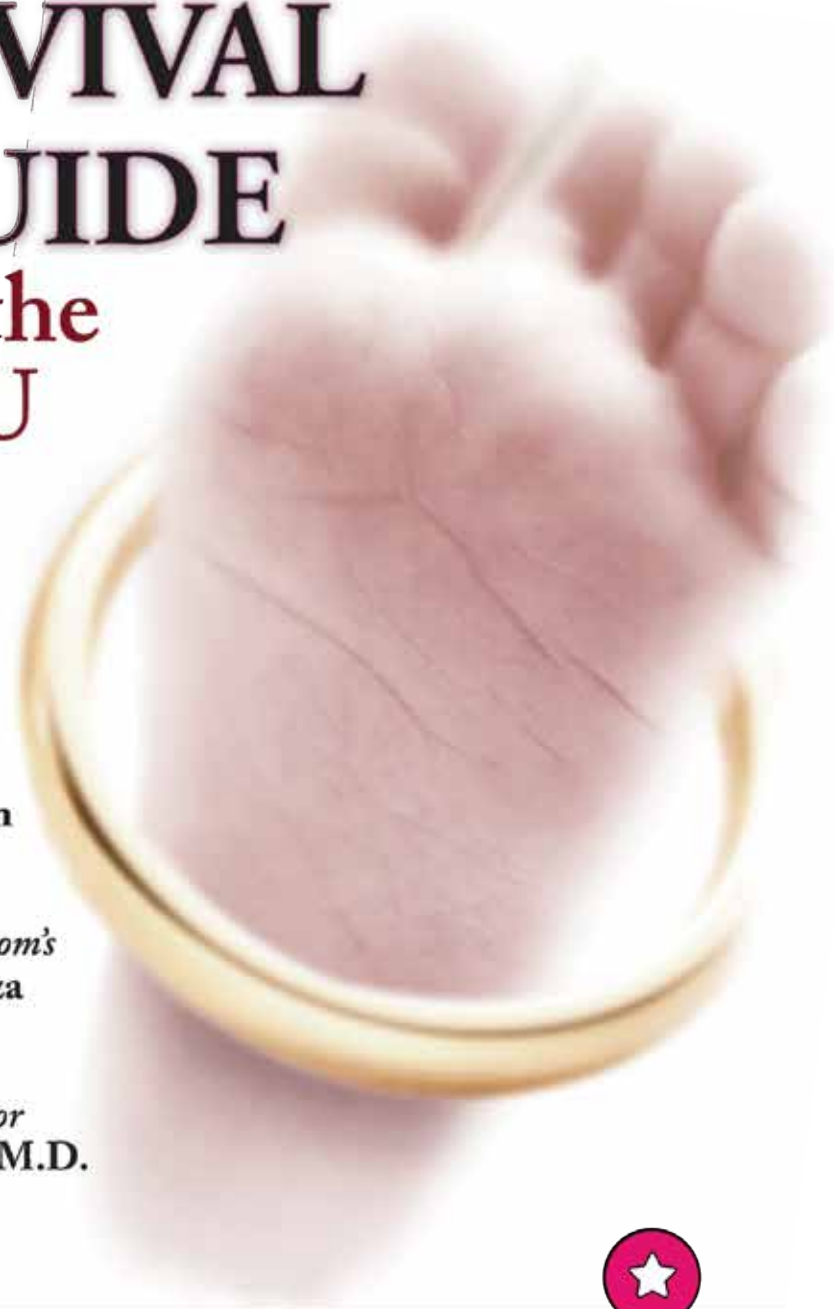
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# National Statistics

## Respiratory Syncytial Virus



### About Respiratory Syncytial Virus

Respiratory syncytial virus, or RSV, is a contagious seasonal respiratory virus that can cause bronchiolitis and pneumonia. It is also the leading cause of hospitalization in babies less than one year old.<sup>1</sup> RSV can be deadly for premature infants and at-risk infants with congenital heart disease or chronic lung disease.

Preventive treatment called palivizumab can protect infants from RSV, but national claims data shows certain babies aren't getting access to this FDA-indicated therapy.

### National Health Plan Coverage & Access

A national data supplier provided palivizumab claims for Medicaid and commercial health plans across the nation from January 2019 through December 2019.



#### "Gap" Babies

Commercial Plans Denied

**40%**

Medicaid: **25%**

Health plans deny 40% of palivizumab prescriptions for premature infants born between 29 and 36 weeks gestation.



#### "In-Guidance" Babies

Commercial Plans Denied

**25%**

Medicaid: **14%**

One in every four prescriptions is denied for infants who should qualify for coverage under standard insurance policies.

This includes severely premature infants born before 29 weeks gestation, babies born before 32 weeks gestation who have chronic lung disease, and babies born with congenital heart disease.



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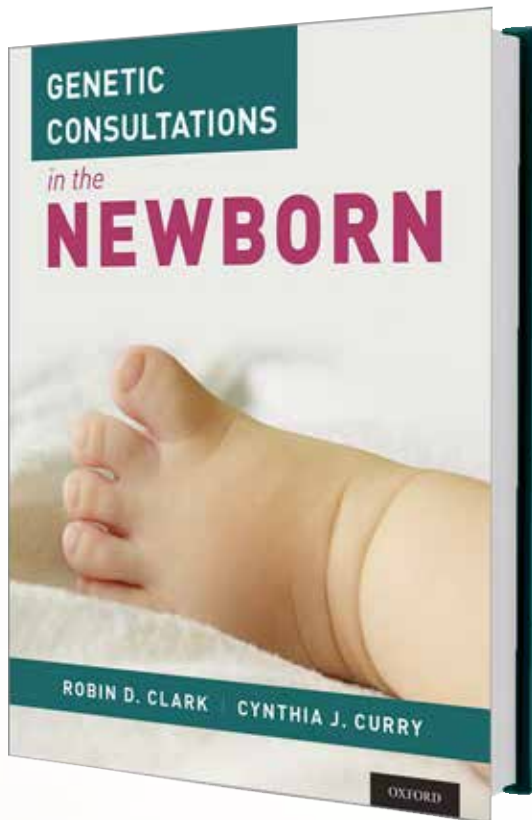
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# RSV AWARENESS:

## *A National Poll of Parents & Health Care Providers*

Respiratory syncytial virus, or RSV, is far from the common cold. It can lead to hospitalization, lifelong health complications or even death for infants and young children. **In fact, it is the leading cause of hospitalization in children younger than one.**

Yet a national poll of parents and specialty health care providers reveals a startling divide in attitudes toward the virus. While both groups acknowledge RSV as a significant concern, the two populations vary widely in their reported ability to meet RSV's threat head-on. Health care providers vigilantly

monitor for the virus, which they report seeing regularly in their practices. Parents, however, feel unequipped to protect their young children.

Meanwhile, specialty health care providers overwhelmingly report that health plan rules and insurance denials block vulnerable infants' access to preventive RSV treatment. Such barriers can put unprepared parents at a double disadvantage. The survey does suggest, however, that education can embolden parents to seek more information about RSV and take steps to protect their children.

## KEY FINDINGS

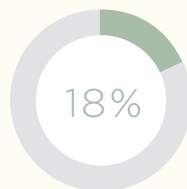
### *Preparedness*

Parents of children age four and under report that understanding of RSV is lacking. That leaves them less than fully prepared to prevent their young children from catching the virus.

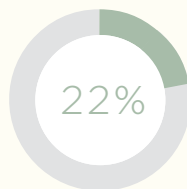
Specialty health care providers reiterated these concerns; 70% agreed that parents of their patients have a low awareness of RSV. Meanwhile, specialty health care providers themselves actively monitor for RSV. They reported that:

#### PARENTS

**Only 18% said parents know “a lot” about RSV,** reflecting an awareness level that’s roughly half that of the flu

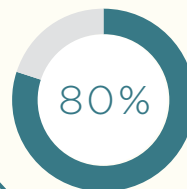


**Only 22% of parents consider themselves “very well prepared” to prevent RSV.**

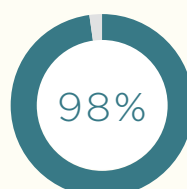


#### SPECIALTY HEALTH CARE PROVIDERS

**They treat RSV as a priority,** “often” or “always” evaluating their patients (80% doctors; 78% nurses)



**During RSV season, they are especially vigilant** about monitoring patients for symptoms or risk factors for RSV (98%).





# Clinical Pearl: Words Matter: A Call for Re-Thinking SIDS

Melanie Wielicka, MD, PhD, Joseph R. Hageman, MD

***“It appears, however, that since 1999, the incidence has remained fairly stable, with the most recent available data reporting 90.1 cases per 100,000. It is still estimated that about 3,400 infants die unexpectedly every year without an apparent cause [2].”***

It has been over 50 years since Sudden Infant Death Syndrome (SIDS) was first described in 1969. It was initially defined simply as *“the sudden death of any infant or young child, which is unexpected by history, and in which a thorough post mortem examination fails to demonstrate an adequate cause for death”* [1]. Many studies have investigated the potential risk factors in an attempt to help establish ways to help decrease the incidence of unexplained infant death, and in fact, with the initiation of the American Academy of Pediatrics (AAP) safe sleep recommendations in 1992 (most recently updated in 2016) and the initiation of the Back To Sleep campaign in 1994, we observed a significant decline in SIDS cases all through the 90s [2, 3]. It appears, however, that since 1999, the incidence has remained fairly stable, with the most recent available data reporting 90.1 cases per 100,000. It is still estimated that about 3,400 infants die unexpectedly every year without an apparent cause [2].

Since its original definition, several attempts have been made to characterize better and categorize what is known as sudden infant death syndrome. SIDS has remained the term most widely used by physicians. However, medical examiners and coroners have shifted away from using this term on death certificates, oftentimes replacing it with others, such as sudden unexplained infant death, death due to indeterminate cause, accidental suffocation, or strangulation in bed, or asphyxia [4, 5]. Over the past years, it appears that one of the biggest controversies with regards to terminology has been related to the use of the word “syndrome.” As this term refers to a group of symptoms occurring together or a medical condition encompassing a group of symptoms, many argue that it should not be used in reference to previously healthy infants with no alarming symptoms who died of an unexplained cause [5]. This debate and the resulting shift in diagnosis reporting can significantly affect epidemiological data through seemingly lower reported SIDS rates [4].

In a recently released clinical report, “Half Century Since SIDS: A Reappraisal of Terminology,” the American Academy of Pediatrics calls for a consensus in nomenclature when describing those deaths [4]. The AAP points out the discrepancies can negatively impact the development of public health policies to prevent unexplained infant death. A lack of consistency in terminology when re-

porting deaths affects research that relies on appropriately coded diagnoses for gathering data. It also makes it challenging to monitor mortality trends [4, 5] closely.

The report also describes in detail the history of terminology and classification related to unexpected infant death. It pays particular attention to the most recent definition from the 2017 National Association of Medical Examiners Panel on Sudden Infant Death in Pediatrics (NAME Panel), which included forensic pathologists representing NAME, pediatricians from the AAP, and federal liaisons from the CDC and NIH. They recommended using the term “unexplained sudden death,” defined as “infant less than one year of age in apparent good health that dies suddenly and unexpectedly.” They also suggested that deaths can then be further classified based on whether intrinsic (such as prematurity, febrile seizures) or extrinsic (non-lethal injuries or injuries of unknown significance) risk factors have been identified. There is also an additional set of criteria for accidental suffocation resulting in sleep-related deaths.

***“They also suggested that deaths can then be further classified based on whether intrinsic (such as prematurity, febrile seizures) or extrinsic (non-lethal injuries or injuries of unknown significance) risk factors have been identified. There is also an additional set of criteria for accidental suffocation resulting in sleep-related deaths.”***

A year later, a panel of physicians, forensic pathologists, epidemiologists, researchers, and parents, including some of the same experts included in the NAME panel, have met to discuss terminology related to sudden infant deaths, making recommendations to the World Health Organization for International Statistical Classification of Diseases and Related Health Problems, 11th revision. The current ICD coding includes three primary coding diagnoses: SIDS, unknown or unspecified cause, and accidental suffocation and strangulation in bed, all of which are included in a larger category of SUID (sudden unexplained infant death). The participants of the Radcliffe Congress recommended that sudden unexplained death in infancy and SIDS be classified under the same code. This recommendation was supported in the NAME Panel’s publication in 2019, although the Panel did recommend using the term unexplained sudden death instead of SIDS [4].

Another concern with lack of consistency in terminology is how it could potentially affect communication with families [4, 6]. A wide range of terminology describing the same diagnosis can confuse families, lead to a more difficult bereavement process, and potentially lead to mistrust towards the medical system. A study that looked at the perception of diagnosis by parents of infants who

died unexpectedly reported that families expressed dissatisfaction when they received inconsistent information from different healthcare professionals and frustration when a specific cause of death was not named [6]. In their report, the AAP emphasizes the importance of empathy and sensitivity when discussing sudden infant death with families. They also suggest that medical examiners develop a formal reporting mechanism to the primary care physicians, which could, in turn, discuss the investigation findings with the family. This mechanism could help facilitate an open discussion and help the physician provide appropriate referrals for specialists or mental health care. We should also remember that known risk factors for sudden infant death, such as smoking, unsafe sleeping environment, or prenatal exposure, are all public health issues. Per AAP recommendations, the presence of these risk factors alone should not lead to pressing legal charges against the family if child abuse has been eliminated [4].

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***“In addition to being helpful from a health policy standpoint, this more consistent terminology will facilitate communication with families more effectively and objectively, creating better relationships and allowing us as physicians to better support grieving families.”***

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In their report, the AAP strongly supports the adaptation of the NAME Panel’s terminology. They argue that it is clear and definitive, which will aid in gathering future epidemiological data and help guide future research on preventative measures. They also advocate changing the ICD classification and coding to that proposed by the Radcliffe Congress in 2018. In addition to being helpful from a health policy standpoint, this more consistent terminology will facilitate communication with families more effectively and objectively, creating better relationships and allowing us as physicians to better support grieving families.

As a personal note from someone who has worked in this area as an “apnea doc” and who has been an active member of the American Association of SIDS Prevention Physicians (AASPP) since its inception 30 years ago, I think SUID or SIDS still includes a heterogeneous group of etiologies for the sudden death of infants in the first year of life which, as we continue to search and find a new etiology, this group of infants will continue to get smaller. However, until we find all of the etiologies, we will need a code with a definition to categorize these infants and explain to their families and primary care physicians what we know and do not know about why each of these infants died. (Personal communication: JR Hageman, 10/8/2021).

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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.

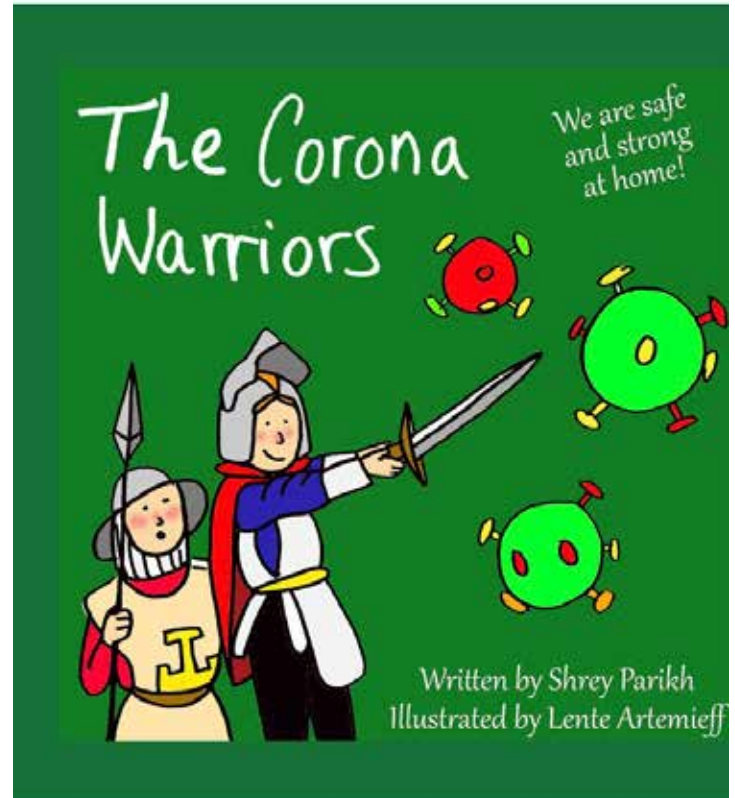
But risk factors associated with RSV don't touch all infants equally.\*

\*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 guidelines limit their access to RSV preventative treatment, increasing these babies' risk.



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## OPIOIDS and NAS

When reporting on mothers, babies, and substance use

# LANGUAGE MATTERS



### I am not an addict.

I was exposed to substances in utero. I am not addicted. Addiction is a set of behaviors associated with having a Substance Use Disorder (SUD).



### I was exposed to opioids.

While I was in the womb my mother and I shared a blood supply. I was exposed to the medications and substances she used. I may have become physiologically dependent on some of those substances.



### NAS is a temporary and treatable condition.

There are evidence-based pharmacological and non-pharmacological treatments for Neonatal Abstinence Syndrome.



### My mother may have a SUD.

She might be receiving Medication-Assisted Treatment (MAT). My NAS may be a side effect of her appropriate medical care. It is not evidence of abuse or mistreatment.

### My potential is limitless.

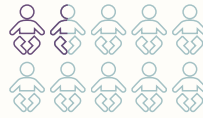
I am so much more than my NAS diagnosis. My drug exposure will not determine my long-term outcomes. But how you treat me will. When you invest in my family's health and wellbeing by supporting Medicaid and Early Childhood Education you can expect that I will do as well as any of my peers!



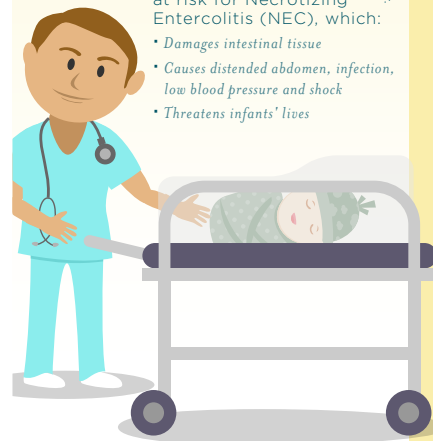
Learn more about Neonatal Abstinence Syndrome at [www.nationalperinatal.org](http://www.nationalperinatal.org)



## Why PREMATURE INFANTS Need Access to an EXCLUSIVE HUMAN MILK DIET



In the United States, more than **1 IN 10 BABIES ARE BORN PREMATURE**. Micro preemies are born severely premature, weighing less than 1,250 grams.

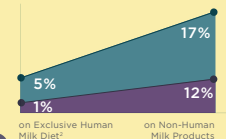


**MICRO PREMIES** are at risk for Necrotizing Enterocolitis (NEC), which:

- Damages intestinal tissue
- Causes distended abdomen, infection, low blood pressure and shock
- Threatens infants' lives

NEC occurrence increases when a preemie consumes non-human milk products.

When that happens:



Micro preemies who get NEC  
Micro preemies requiring surgery to treat NEC

30% of micro preemies needing surgery will die from NEC†

## HOW TO HELP PREVENT NEC: EXCLUSIVE HUMAN MILK DIET

What is an Exclusive Human Milk Diet?



NO cow's milk

NO sheep's milk

NO goat's milk

NO formula

- ✓ mother's milk
- ✓ human donor milk
- ✓ human milk-based fortifier

### Why Is An Exclusive Human Milk Diet Important?

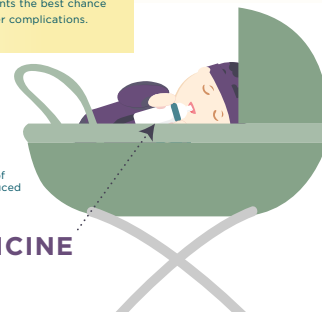
An Exclusive Human Milk Diet gives vulnerable infants the best chance to be healthy and reduces the risk of NEC and other complications.

### When a micro preemie can access an EXCLUSIVE HUMAN MILK DIET:

Mortality is reduced by **75%**\*

Feeding intolerance decreases\*

Chances of NEC are reduced by **77%**†



## HUMAN MILK = MEDICINE

LEARN MORE ▶



\* Hair AB, et al. "Beyond Necrotizing Enterocolitis Prevention: Improving Outcomes with an Exclusive Human Milk-Based Diet." *Breastfeeding Medicine* 2015; 10:108-116. DOI: 10.1089/bfm.2015.0124

† Abrams SA, et al. "Greater Mortality and Morbidity in Extremely Premature Infants Fed a Diet Containing Cow Milk Protein Products." *Breastfeeding Medicine* July/August 2014; 9(6): 281-285

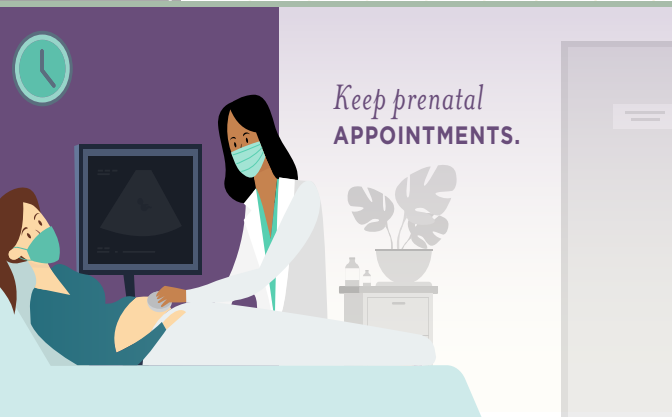
‡ Hall SA, et al. "Mortality and Management of Surgical Necrotizing Enterocolitis in Very Low Birth Weight neonates: a prospective cohort study." *J Am Coll Surg* 2014; 218(5): 1148-55.

§ Assad M, Elliott MJ and Abraham JH. "Decreased cost and improved feeding tolerance in VLBW infants fed an exclusive human milk diet." *Journal of Perinatology* advance online publication 12 November 2015; DOI: 10.1097/JP.0000000000000118

## The PREGNANT MOM'S Guide To Staying SAFE DURING COVID-19



Maintain at least **A 30-DAY SUPPLY OF YOUR MEDICATIONS.**



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

## 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



[nicuparentnetwork.org](http://nicuparentnetwork.org)  
[nationalperinatal.org/skin-to-skin](http://nationalperinatal.org/skin-to-skin)



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### Preventing Retinopathy of Prematurity

1.0 credit hour

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Clinical Professor of Pediatrics  
University of Washington  
School of Medicine  
Seattle, WA



**Dan L. Stewart, MD**

Professor of Pediatrics & International Pediatrics  
University of Louisville School of Medicine  
Co-Director of NICU & ECMO  
Norton Children's Hospital  
Louisville, KY



**Jonathan R. Swanson, MD, MSc**

Associate Professor of Pediatrics  
University of Virginia  
Children's Hospital  
Charlottesville, VA



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## Meet Our Faculty



+ Jenné Johns, MPH  
Once Upon A Premie Academy



+ Deidre McDaniel, MSW, LCSW  
Health Equity Resources and Strategies



+ Dawn Godbolt, Ph.D.  
National Birth Equity Collaborative



+ Dalia Feltman, MD, MA, FAAP  
Univ. of Chicago Pritzker School of Medicine



+ Chavis A. Patterson, Ph.D.  
Children's Hospital of Philadelphia



+ Terri Major- Kincade, MD, MPH  
Pediatrician and Neonatologist



+ Shanté Nixon  
Connect2NICU



+ Ashley Randolph  
Glo Premies



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The first and only virtual training academy focused on delivering health and racial equity educational programs for perinatal and neonatal healthcare professionals. Our purpose is to raise awareness and offer real-time solutions for addressing health and racial equity.

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## SKIN-TO-SKIN CARE DURING COVID-19



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work with your medical  
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### GET CLEAN WASH YOUR HANDS, ARMS, and CHEST

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### PUT ON FRESH CLOTHES

change into a clean  
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### IF COVID-19 + WEAR A MASK

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



[nicuawareness.org](http://nicuawareness.org)  
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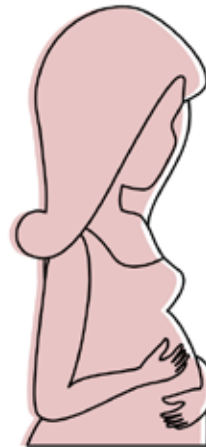
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## NATIONAL PERINATAL ASSOCIATION

### Update: CORONAVIRUS COVID-19



According to data  
published in The Lancet

Pregnancy  
and the risk of  
VERTICAL  
TRANSMISSION

# LOW



[www.nationalperinatal.org](http://www.nationalperinatal.org)

## Time is precious, just like your patients.





## Why Pregnant and Nursing Women Need Clear Guidance on THE NET BENEFITS OF EATING FISH

**2 to 3** servings per week of properly cooked fish can provide health benefits for pregnant women and babies alike:



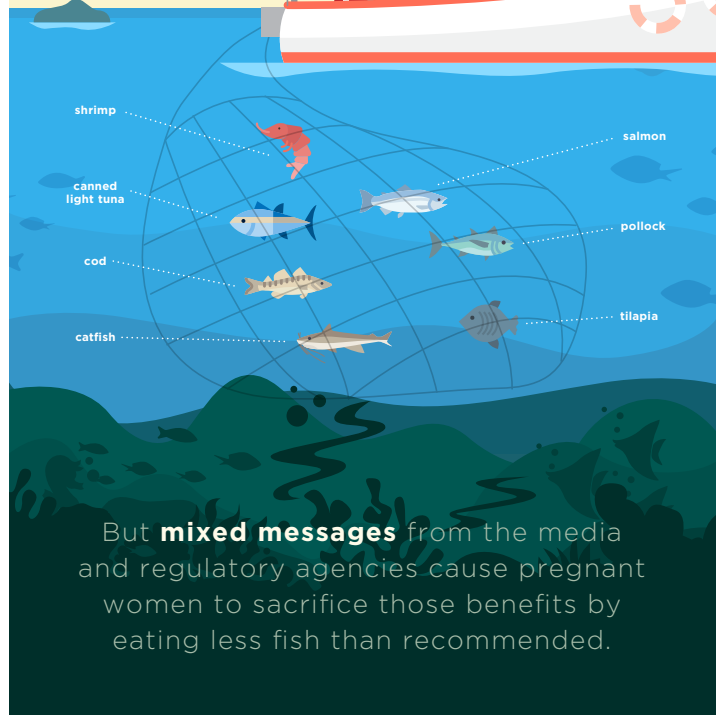
Iron



Omega 3 fatty acids



Earlier Milestones for Babies



But **mixed messages** from the media and regulatory agencies cause pregnant women to sacrifice those benefits by eating less fish than recommended.



Did you know that  
**PMAD**  
related suicides  
account for

**20%**

of Postpartum  
Maternal Deaths?

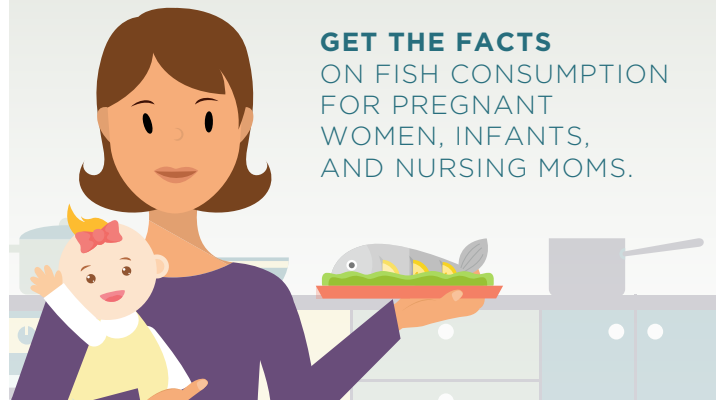
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**Support the  
Open Letter**



**Breastfeeding  
Innovations  
Team**



**GET THE FACTS**  
ON FISH CONSUMPTION  
FOR PREGNANT  
WOMEN, INFANTS,  
AND NURSING MOMS.

**NCfIH** National Coalition  
for Infant Health

Protecting Access for Premature Infants through Age Two

**LEARN MORE** ▶



## Letters to the Editor

### Is Length of Stay a Quality Indicator in Chronic Ventilated Neonate?

#### Letter to the Editor

As a fourth-year medical student going through my Newborn Intensive Care Unit (NICU) rotation, I am required to learn about systems-based practice. I found an interesting case of a preterm infant who suffered a traumatic birth at home. The gestational age was estimated to be 30-32 weeks by Ballard scoring. It was a precipitous breech delivery by a mother with a history of drug abuse. She was unaware of the pregnancy and received no prenatal care. At the scene, the infant was resuscitated by Emergency Medical Services (EMS) and brought to the emergency room (ER). Per EMS, the patient received 45 minutes of resuscitation, including cardiac compression, intubation, intraosseous line placement in the femur, and multiple doses of epinephrine. At the ER, the infant was re-intubated and umbilical lines were placed. Initial blood gas at ~ 75 minutes of life was pH 6.9/ pCO<sub>2</sub> 30/PO<sub>2</sub> 145/HCO<sub>3</sub> 8/ Base excess - 22.4, lactate 20. The infant was then admitted to the NICU for further directed care and later placed on a ventilator. Throughout this infant's prolonged stay in the NICU, the following problems were addressed: Hypoxic-Ischemic encephalopathy, severe metabolic acidosis, seizures, decreased cardiac function, respiratory failure, transaminitis, and suspected lower extremities vascular injury.

The infant's social situation included the involvement of CPS delaying the end-of-life decision. As the infant continued to require respiratory and nutritional support, tracheostomy and gastrostomy placement were needed. Finally, a DNR decision was obtained. At the time of this report, the infant is awaiting placement to a medical facility, foster services, or hospice care that can provide continuous care.

The length of stay (LOS) in the NICU could depend upon many factors. (1) With regards to this case and in the light of system-based practice, I pose the question; should the length of stay (LOS) be viewed as a quality indicator in chronically ventilated neonates? If yes, what could be the financial impact on the health-care system?

#### Reference:

1. Seaton SE, Barker L, Jenkins D, Draper ES, Abrams KR, Manktelow BN. What factors predict length of stay in a neonatal unit: a systematic review. *BMJ Open*.

Ashley Deville<sup>1</sup>

Shabih Manzar, MD<sup>2</sup>

<sup>1</sup>4<sup>th</sup> year Medical Student, Louisiana State University Health Sciences Center.

<sup>2</sup>Attending, Department of Pediatrics, Louisiana State University Health Shreveport

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Dear Student Physician Deville,

Your question is a very apt summation of the frustration that embodies the standard metrics when applied to the exceptional. Length of stay as a predictor of quality is only valid for identical patients in identical circumstances where only the mode of treatment or staff providing care differ. Oftentimes, the same physician can have very different results with "similar" patients because of crucial differences in the patient profile that are not captured by the quality tool.

The prospective payment system or PPS describes several methods by which remuneration is predicted based on the acuity or intensity of the service provided to the patient. These generate predetermined "prices" based on actuarial tables of what these patients "should cost." Staying within the length of stay (LOS) guidance for a particular diagnosis-related group (DRG) for inpatient care defines this metric. Regardless of the number of complications noted, unless another DRG with a higher LOS can be invoked by a change in diagnosis or change in the patient's status not related to an iatrogenic cause, the original DRG anticipated LOS determines the performance indicator.

Updates to the expected length of stay based on "new" technology or enhanced resuscitation are often delayed by decades. Patients affected by Hypoxic Ischemic Encephalopathy have improved survivability because of cooling, ECMO, and other extreme measures. The quality matrix does not recognize improved survival as a valid outcome measure if it is associated with a longer length of stay. The predicted and often anticipated death preserves outcome measures but does not sit well with families expecting modern medical science to deliver a miracle. A "timely" death results in a compliant LOS but may not adequately represent quality care. A 23-week gestation neonate who survives to term with minimal residua from extreme prematurity who goes home without oxygen or a GTT is considered a failure based solely on the length of stay and non-compliance to a DRG that may not even recognize that a 23-week gestation neonate has an "expected" NICU stay of 17

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weeks (to reach term equivalent).


The dilemma is worsened by new or innovative care, social delays in discharge, placement issues, and now COVID-19 related shortages of discharge equipment and sub-acute care facilities. Long COVID-related complications and MIS-C syndrome are forcing many facilities to restrict or delay access to our compromised NICU graduates, thus further increasing the LOS.

Worse, there is no obvious solution in sight. Unfortunately, it will take a failure of the remuneration system resulting in "loss of access" to drive improvement. However, closing non-profitable areas of the hospital and, in fact, hospitals themselves can potentially worsen disparity and access for our most vulnerable patients. Until length of stay is replaced by "quality" of stay, the benchmark will continue to punish those providing exceptional care and reward those who expediently dispatch their "non-performing" patients through forced discharge or expedited transition to celestial care.

**References:**

1. <https://www.cms.gov/medicare/medicare-fee-for-service-payment/prospmedicarefeesvcpmtgen?redirect=/prosp-medicarefeesvcpmtgen/>
2. Carter, E.M., Potts, H.W. Predicting length of stay from an electronic patient record system: a primary total knee replacement example. *BMC Med Inform Decis Mak* 14, 26 (2014). <https://doi.org/10.1186/1472-6947-14-26>
3. Faddy, Malcolm, Graves, Nicholas, & Pettitt, Tony (2009) Modeling length of stay in hospital and other right skewed data: Comparison of Phase-type, gamma and log-normal distributions. *Value in Health*, 12(2), pp. 309-314.
4. Gonçalves-Bradley DC, Lannin NA, Clemson LM, Cameron ID, Sheppard S. Discharge planning from hospital. *Cochrane Database Syst Rev*. 2016 Jan 27;2016(1):CD000313. doi: 10.1002/14651858.CD000313.pub5. PMID: 26816297; PMCID: PMC7073416.
5. Sheehy LM. Considerations for Postacute Rehabilitation for Survivors of COVID-19. *JMIR Public Health Surveill* 2020;6(2):e19462. doi: 10.2196/19462. PMID: 32369030. PMCID: 7212817

Sincerely,



Mitchell Goldstein, MD, MBA, CML

Editor in Chief



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c/o Mitchell Goldstein, MD

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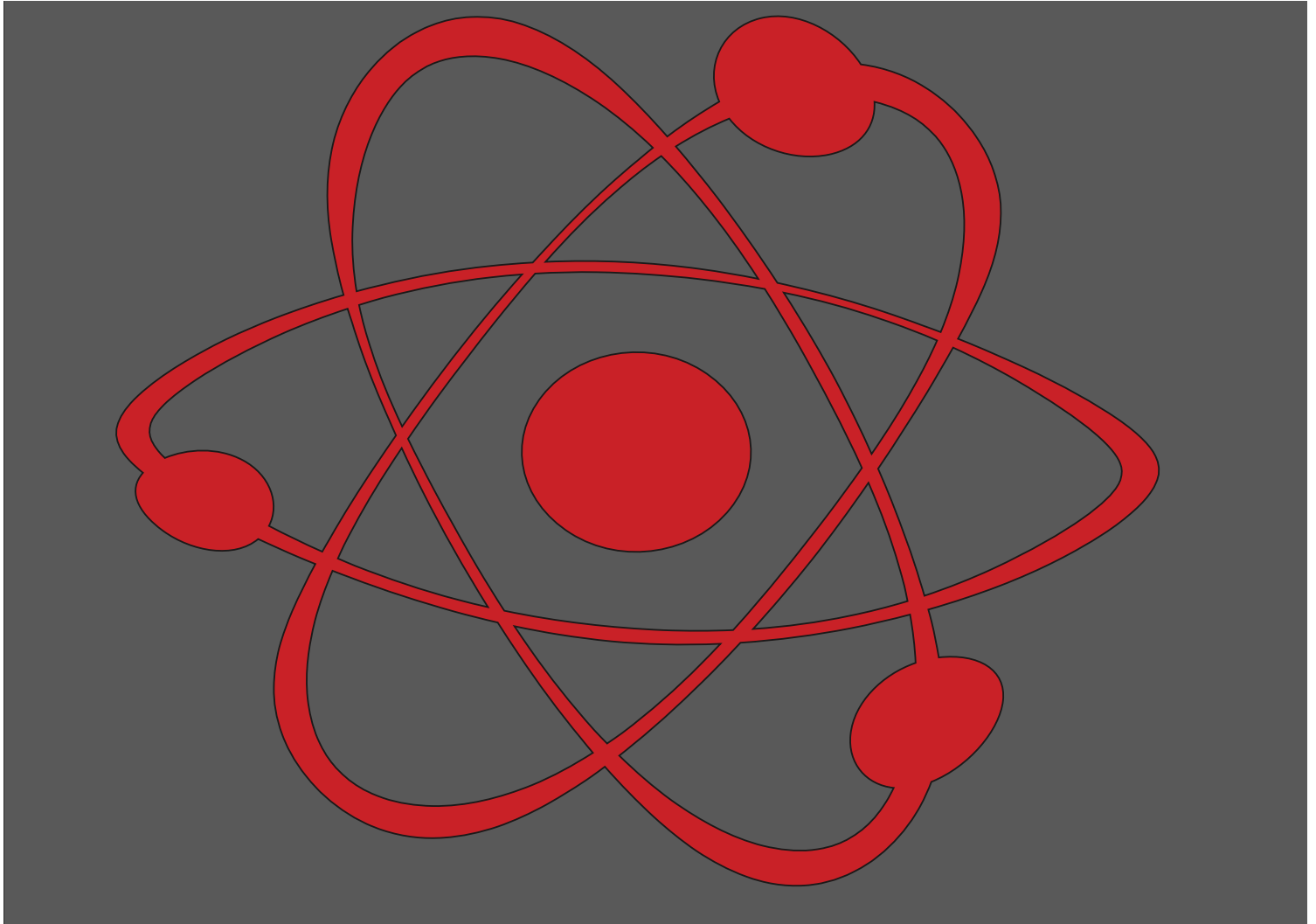
**Erratum (Neonatology Today September 2021)**

*Neonatology Today is not aware of any erratum affecting the September, 2021 edition.*

Corrections can be sent directly to [LomaLindaPublishingCompany@gmail.com](mailto:LomaLindaPublishingCompany@gmail.com). The most recent edition of *Neonatology Today* including any previously identified erratum may be downloaded from [www.neonatologytoday.net](http://www.neonatologytoday.net).

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Will your **PRETERM INFANT** need **EARLY INTERVENTION** services?

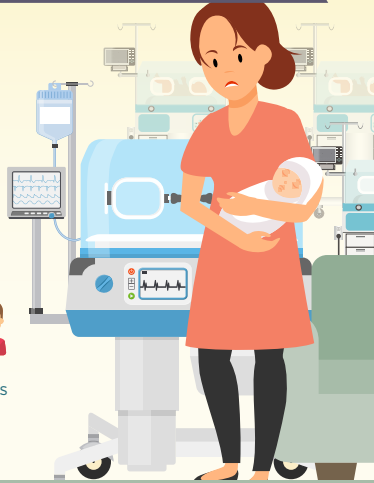
Preterm infants are:

**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



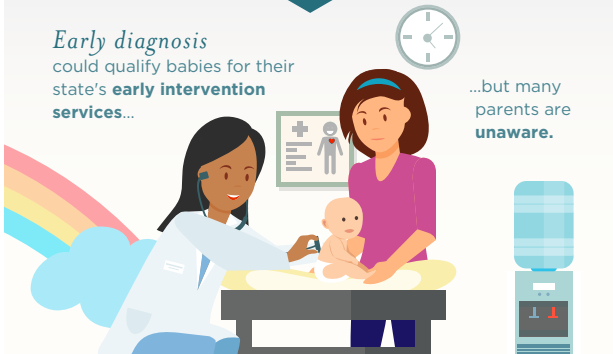
Address physical challenges



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](http://www.infanthealth.org)

Visit [CDC.gov](http://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 POSTPARTO**



**1 DE CADA 7** MADRES AFRONTA LA DEPRESIÓN POSTPARTO, *experimentando*



Sin embargo, sólo el **15%** recibe tratamiento!

LA DEPRESIÓN POSTPARTO **NO TRATADA PUEDE AFECTAR:**

El sueño, la alimentación y el comportamiento del bebé a medida que crece?



La salud de la madre  
La capacidad para cuidar de un bebé y sus hermanos

PARA AYUDAR A LAS MADRES A ENFRENTAR LA DEPRESIÓN POSTPARTO



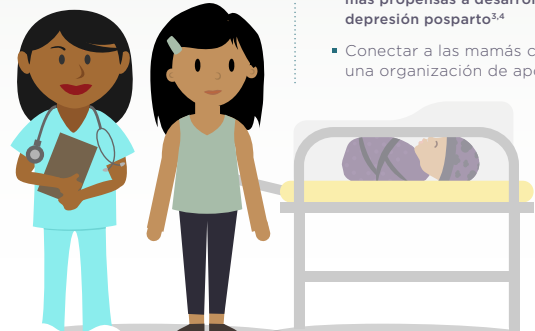
**LOS ENCARGADOS DE FORMULAR POLÍTICAS PUEDEN:**

- Financiar los esfuerzos de despistaje y diagnóstico
- 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 postparto**<sup>3,4</sup>
- Conectar a las mamás con una organización de apoyo



**NCFIH** National Coalition for Infant Health  
Protecting Access for Premature Infants through Age Two  
[www.infanthealth.org](http://www.infanthealth.org)

<sup>1</sup> American Psychological Association. Accessed on: <http://www.apa.org/women/resources/reports/postpartum-depression.aspx>

<sup>2</sup> National Institute of Mental Health. Accessed on: <https://www.nimh.nih.gov/health/publications/postpartum-depression-facts/index.shtml>

<sup>3</sup> Journal of Perinatology (2019) 35, 529–536. doi:10.1097/JP.0000000000000147

<sup>4</sup> Prevalence and risk factors for postpartum depression among women with problem and low-birth-weight infants: a systematic review. Vigod SN, Vilijanen L, Olenin D, Ross LE B, 2010. Age: 11/7/19 1540-50.

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at the Intersection

of Health Equity

and Social Justice

early bird rate

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**\$500** non-member

**\$150** parents + students

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 National  
Perinatal  
Association

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Going Deeper In Health and Racial Equity in the NICU- Part 1

October 28, 2021; 1-2PM EST

Register Here:

[www.onceuponapremieacademy.com](http://www.onceuponapremieacademy.com)

### Once Upon A Premie Academy Live Training:

Going Deeper In Health and Racial Equity in the NICU- Part 2

November 22, 2021; 1-2PM EST

Register Here:

[www.onceuponapremieacademy.com](http://www.onceuponapremieacademy.com)

### 2021 National Perinatal Association

Perinatology at the Intersection of Health Equity and Social Justice

Hyatt Regency Aurora-Denver

Denver, CO

December 1-3, 2021

[www.NPAconference.org](http://www.NPAconference.org)

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Phase 2:

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NAPNAP

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2021

# HEALTH AND RACIAL EQUITY IN THE NICU

## TRAINING

**THURS, OCT. 28, 1 - 2 PM EST**

### Addressing Health and Racial Equity in Neonatal Care

- + Impact of COVID-19, civil unrest, and RSV on black NICU families
- + Trends in NICU admissions during COVID-19
- + Opportunities to reduce implicit bias for black NICU families



**Valencia Walker, MD**  
Associate Chief Diversity  
Health Equity Officer  
Nationwide Children's Hospital



**Jenné Johns, MPH**  
Micropreemie Mom and Founder  
Once Upon A Premie Academy

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2021

# HEALTH AND RACIAL EQUITY IN THE NICU

## TRAINING

**MON, NOV. 22, 1 - 2 PM EST**

### Addressing Structural Racism and the Impact on Neonatal Care and Health Disparities

- + Defining and dismantling racism and what it looks like in the NICU
- + Patient-Centered Care Opportunities to support Black NICU Families
- + Personal journey and experiences with structural racism in the NICU



**Tamorah Lewis, MD**  
Neonatologist and Researcher  
Children's Mercy Hospital



**Jenné Johns, MPH**  
Micropreemie Mom and Founder  
Once Upon A Premie Academy

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## Neonatal Nurse Practitioner

- Collaborative work environment
- Care of high acuity NICU patients
- State of the art technology
- 24/7 coverage provided by NNP team and Fellows



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At Loma Linda University Health, we combine the healing power of faith with the practices of modern medicine. We consist of a University, a Medical Center with four hospitals, and a Physicians Group. These resources have helped us become one of the best health systems in the nation.

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RSV



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Ask about protective  
injections for RSV.



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Sneeze and cough  
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**USE AN  
ALCOHOL-BASED  
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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 feature artistic works created by our readers on one page as well as photographs of birds on another. This month's original artwork is "Flowers in a Vase" provided by Paula Whiteman, MD. Our bird of the month is "Blue Feet Bobby" contributed by Larry Tinsley, MD.

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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. Abbreviations which are commonplace in neonatology or in the lay literature may be used.

8. References should be included in standard "NLM" format (APA 7<sup>th</sup> may also be used). Bibliography Software should be used to facilitate formatting and to ensure that the correct formatting and abbreviations are used for references.

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.

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# NICU BABY'S Bill of Rights

## 1- THE RIGHT TO ADVOCACY

My parents know me well. They are my voice and my best advocates. They need to be knowledgeable about my progress, medical records, and prognosis, so they celebrate my achievements and support me when things get challenging.

## 2- THE RIGHT TO MY PARENTS' CARE

In order to meet my unique needs, my parents need to learn about my developmental needs. Be patient with them and teach them well. Make sure hospital policies and protocols, including visiting hours and rounding, are as inclusive as possible.

## 3- THE RIGHT TO BOND WITH MY FAMILY

Bonding is crucial for my sleep and neuroprotection. Encourage my parents to practice skin-to-skin contact as soon as and as often as possible and to read, sing, and talk to me each time they visit.

## 4- THE RIGHT TO NEUROPROTECTIVE CARE

Protect me from things that startle, stress, or overwhelm me and my brain. 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 am cared for today will help my brain when I grow up. Connect me with my parents for the best opportunities to help my brain develop.

## 5- THE RIGHT TO BE NOURISHED

Encourage my parents to feed me at the breast or by bottle, whichever way works for us both. Also, let my parents know that donor milk may be an option for me.

## 6- THE RIGHT TO PERSONHOOD

Address me by my name when possible, communicate with me before touching me, and if I or one of my siblings pass away while in the NICU, continue referring to us as multiples (twin/triplets/quads, and more). It is important to acknowledge our lives.

## 7- THE RIGHT TO CONFIDENT AND COMPETENT CARE GIVING

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 educate them about my unique needs, development, diagnoses, and more.

## 8- THE RIGHT TO FAMILY-CENTERED CARE

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

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 parents about resources such as peer-to-peer support programs, support groups, and counseling, which can help reduce PMAD, PPD, PTSD, anxiety and depression, and more.

## 10- THE RIGHT TO INCLUSION AND BELONGING

Celebrate my family's diversity and mine; including our religion, race, and culture. Ensure that my parents, grandparents, and siblings feel accepted and welcomed in the NICU, and respected and valued in all forms of engagement and communication.

Presented by:



## NICU Parent Network

NICU PARENT NETWORK

Visit [nicuparentnetwork.org](http://nicuparentnetwork.org) to identify national, state, and local NICU family support programs.

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