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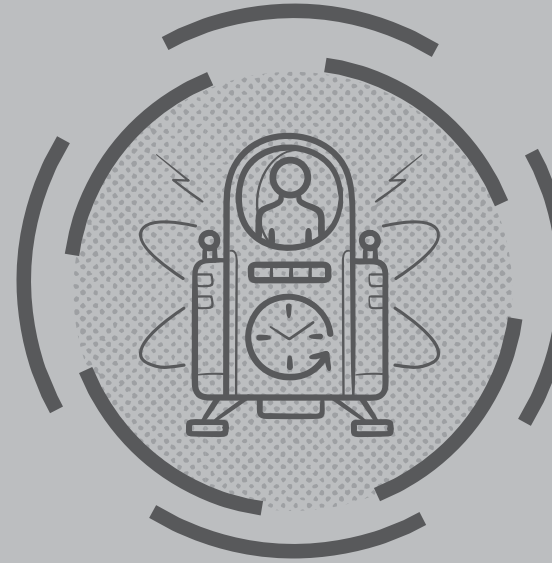
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The Predictive Power of Concurrent Pulse Oximetry Readings in the Detection of Congenital Heart Defects in Newborns of the Hospital of Specialties of Children and Woman in Queretaro, Mexico

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Abstract:

In Mexico, CHD incidence is estimated at 18,000-21,000 newborns per year, and at least 25% will have critical congenital heart disease. The mortality rates showed that 24% of the infant deaths in 2013 were attributable to CCHDs. Despite these, the CCHD screening is not performed in all hospitals. The general objective is to show the statistical relationships, compared with existing evidence of the power of repeat screenings on detection of CCHD, to better inform government recommendations for universal screening in Mexico. Three thousand seven pulse oximetry readings were performed on newborns (the 5th of February - the 1st of July of 2019). We aimed to perform the first screen on the subjects between 5-48 hrs of life. Some required a repeat reading due to a failure in the first. Screenings occurred between 6-69 hrs, with a mean time of 22hr post-delivery. Secondary readings were performed on 160, of which 29 were also given echocardiograms because they failed the secondary test. The average measurement on the foot was 93.8% and on the right hand was 93.5%. In the 29 subjects with repeated readings, seven were positive for CCHD; two were false positives.

The data and analysis show promise in the association between early readings and the detection of potential CCHD. There is a correlation between the concerning readings and detection of CCHD through an echocardiogram. More data is needed to ascertain other relationships, but the results thus far imply low pulse oximetry readings associated with CCHDs and other secondary conditions associated with hypoxemia.

Keywords: Pulse oximetry; Critical Congenital Heart Disease; Screening

1. Introduction

Congenital heart defects (CHDs) are the most common types of birth defects. (4) In the United States, 1% of newborns have congenital heart disease, and of these, at least a quarter will have a critical congenital heart disease (CCHD) that will be reflected by the need for early management or surgical intervention in the first weeks or months of life. (2,4). Such diseases are a primary cause

of death in the first year of life (25%) and the leading cause of acute cardiac failure in the neonatal period. (1) Among newborns with CCHD, 40% will have a significant defect who will require cardiologic treatment and possible surgical treatment.

Newborn screening for CCHD based on pulse-oximetry readings can help earlier detect otherwise asymptomatic critical and severe heart defects associated with hypoxemia (5). This tool's importance relies on the fact that when performed correctly, it can detect subclinical levels of hypoxemia that should raise suspicion for CCHD (5).

According to Thangaratinam et al. 2012 (8), they reviewed 552 studies and chose 13 to form a cohort study of 229,421 newborns in which it was determined that this screening performed within the first 24hrs of life had 76.5% sensitivity and 99.9% specificity. The study had a 0.14% false-positive rate. Pulse oximetry screening poses great specificity for detecting a CCHD with an acceptable sensitivity inside the criteria for Universal Screening programs.

“ Our focus here on this overall index rather than on the individual morbidity outcomes reflected an attempt to use the most statistically robust outcome for our present analysis.”

In Mexico, the congenital heart disease incidence in newborns is estimated at 18,000 to 21,000 live newborns. Mexico's mortality trends from (1998-2013) showed that 24% of the infant deaths in 2013 were attributable to congenital anomalies, and CHD represented 55% of total deaths from congenital anomalies among children under one year of age. (6) Additionally, at least 25% of CHD cases are being diagnosed after their hospital discharge. (3) Of these, 1,000 to 4,500 newborns will have critical congenital heart disease. In 2013, a total of 3,593 deaths from CHD occurred in Mexico: approximately 10% occurred on the first day of life. (6)

Pulse-oximetry screening protocols have been developed and implemented to avoid the delayed diagnosis of hypoxemia that often escapes the clinical eye. Screening is based on the reading of the oxygen saturation (SpO₂) in the pre and post-ductal limbs during a period after birth, but before hospital discharge - before the signs of congenital heart disease become present. (4) Despite

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the importance so far shown, in Queretaro, Mexico, there is still no strict and official regulation that makes it mandatory for all hospitals to use pulse oximetry screening. The only official recommendation exists for premature newborns. (12)

Objective: Based on the results of a screening program, the statistical relationships, and comparing them with the literature surrounding CCHD screening, we attempt to build upon the recommendation for the government to require newborn CCHD screening as a permanent program in the newborn nursery for all babies before discharge. This has been incorporated via screening of the right hand and either foot at one of the largest maternity hospitals in the state, Hospital of Specialties of Children and Woman in Queretaro, Mexico.

Specific objectives: (1) Evaluate the association between early pulse oximetry readings and the detection of potential cardiogenic defects. (2) Assess the feasibility of implementation of a CCHD screening program through pulse oximetry in the State of Queretaro

“When we re-analyzed the data for the mortality/morbidity index for the risk difference (RD), the chosen random-effects model provided a similar overall value for this as the fixed effect models (RD of 0.13 and 0.14 respectively) with similar significance.”

2. Materials and Methods

This research followed the CCHD screening algorithm utilized by the BORN Project (Birth Oximetry Routine for Newborns) from the Newborn Foundation. (9,11) This protocol is based on the algorithm endorsed by the AAP, AHA, ACC, and March of Dimes in the United States. (10,11) Interestingly, the BORN Project algorithm varied from the AAP protocol by using a single re-screen for those babies with a positive first screen. An expert panel recently updated its recommendations in alignment with this protocol. (13)

The equipment used was portable pulse-oximeters based on a cell phone app (Masimo iSpO2rx). This equipment is not yet FDA cleared for CCHD screening but is certified to measure SpO2 in movement and/or low perfusion conditions. The required app is free of charge, available for iOS and Android (Masimo Health). (11).

The algorithm was designed for use in the well-child newborn nursery. It indicates that screening should be performed at >24 hours of age or before discharge on the right hand and either foot (9,10,11). The procedure for performing the screen is divided into ten steps based on the Newborn Foundation Guidelines (11).

1) Assemble all equipment.

- 2) Connect the pulse oximeter and sensor cords together.
- 3) Place the YI sensor probes into the wrap.
- (4) On either of the baby's feet, position the two sensors opposite each other on the foot's outer aspect.
- 5) When the signal quality is strong and steady, record the SpO2 reading from the baby's foot.

- 6) Place the sensor on the baby's right hand and position the probes directly opposite each other on the fleshy outer aspect of the hand.
- 7) When the signal quality is strong and steady, record the SpO2 reading from the baby's right hand.
- 8) A passed screening requires a reading greater than or equal to 95% on both the hand and foot with a difference of no more than 3%.
- 9) A Reading on either the hand and foot between 90-94% or a difference greater than 3% between the two is considered failing and requires a second screening in 15 minutes. If the second screening yields similar results, the screening is considered failed, and a primary care physician must be notified.
- 10) Readings from either the hand or foot equal or less than 89% indicate a failed screening and require a primary care physician to be urgently notified.

The data was collected by hand on a spreadsheet by the nurses who performed the screen. The project team was retrieved the data from the hospital and uploaded it to a secure database in the cloud for analytical purposes. The sample gathered for this research included 3007 babies who were both asymptomatic and cared for by their mothers in their room between the 5th of February of 2019 and the 1st of July of 2019.

The protocols establish that an echocardiogram must be performed to determine the exact diagnosis after failing the first and second pulse oximetry readings. No echos were done after the first reading, only after the second.

The data were computed and analyzed through Stata Statistical Software.

3. Results

Simple linear regression analysis examined several relationships between first-round hand pulse oximetry readings and echocardiogram results, between second round pulse oximetry readings and echocardiogram results.

First and second round readings distributions were fairly normal. The dependent and independent variables had a somewhat linear relationship; residuals were linear and equally distributed.

Three thousand seven first-round pulse oximetry readings were performed on all subjects. Secondary pulse oximetry readings were performed on 160 of these, of which 29 also had an echocardiogram based on pulse oximetry readings (Table 1). The aim was to perform first-round screenings on the subjects between 5 hrs of life to 48 hrs; on the subjects that required a repeat pulse oximetry reading, screenings occurred between 6 and 69 hrs, with a mean time of 22hr post-delivery and a standard deviation of 11.5hr. No statistically or clinically significant correlation was evident between screening time and echocardiogram results. (Table 1)

The average pulse oximetry measurement on the foot was 93.8% (95% (CI)= 98%, 89.5%), in the right hand, it was 93.5% (95% (CI)= 98.5%, 87.5%). Regression models were created to compare the different groups in the study.

One hundred sixty babies required additional pulse oximetry testing, of which 29 did not pass and had to be re-screened a second time. These patients had an echocardiogram. The mean pulse oximetry reading in the second round of screening was 94.1% (95% (CI)= 98%, 88%). Out of the 29 with repeated pulse

Table 1. This table shows the distribution of echocardiogram results by gender, age, and pulse oximetry

Variable	observations	Mean	Std. Dev.	Min	Max	Variable
Gender (1)	29	.7241379	.4548588	0	1	29
Age	29	19.7931	8.570628	7	47	29
SpO2_round1_hand	29	.9337931	.0408319	.8	1	29
SpO2_round1_foot	29	.922069	.0353936	.84	.99	29
Echo(2)	29	.0689655	.2578807	0	1	29
SpO2_round2_hand	29	.9413793	.0341973	.85	1	29
SpO2_round2_foot	29	.9451724	.0311243	.85	.99	29

(1) 0 is female, 1 is male(2) 0 is a negative echo, 1 is a positive

oximetry readings, echocardiograms were performed, resulting in 7 positive results, of which 2 were false positives.

Regression analysis was performed on numerous parameters, which showed statistical significance. However, the overall R-adjusted values indicated that, as significant as the observations were, there is potentially a variable of such strength that would better explain the observed correlation than the observed pulse oximetry readings. Results indicate that first-round pulse oximetry readings were positively correlated to second round pulse oximetry readings. ($b = 0.422$, $SEb = 0.200$, $\beta = 0.376$, $t = 2.11$ $p < .044$) (Table 2). The 95% confidence intervals around the regression coefficient were narrow (0.011, 0.834), indicating acceptable precision. The effect was relatively weak, with 10.9% of the variance in SpO2 readings in round two accounting for SpO2 readings from round 1.

“However, we were concerned that this analysis was not an accurate representation of the data. Our own analysis utilized the authors' data on individual morbidities to calculate the average number of adverse events per subject. There were 31 adverse events in 64 subjects fed HMDF (0.48 events per subject); yet, for CMDF there were 45 adverse events among 61 subjects (0.74 events per subject).”

This correlation coefficient above 0 allows the rejection of the hypothesis that the pulse oximetry readings in round 1 and round 2 are equal, suggesting a directional difference in the two readings.

The echocardiogram results were compared to the second round of screening SpO2 readings using a multivariate regression analysis. Results indicate that second round pulse oximetry readings were positively correlated to echocardiogram results (which were split into 0 for negative echocardiogram results, and 1 for positive echocardiogram results) (Table 4). ($b_1 = -3.78$, $SEb = 3.36$, $\beta = -0.313$, $t = -1.12$ $p < .271$), ($b_2 = -5.89$, $SEb = 3.69$, $\beta = -0.445$, $t = -1.60$ $p < .122$). The 95% confidence intervals around the regression coefficient (b_1 : -10.688, 3.127), (b_2 :-13.485, 1.695). The effect was relatively weak, though with 50.06% of the variance in SpO2 readings in the two round two tests accounted for echocardiogram results. Although there was a discernible effect size, the effect was statistically insignificant and highlights the study's need for more statistical power.

More interesting, is the weaker association between SpO2 readings from the first round of screening and echocardiogram positive results (table 3). ($b_1 = -3.819$, $SEb = 2.42$, $\beta = -0.355$, $t = -1.58$ $p < .127$), ($b_2 = -0.689$, $SEb = 2.95$, $\beta = -0.052$, $t = -0.23$ $p < .817$). The 95% confidence intervals around the regression coefficient (b_1 : -8.797, 1.15), (b_2 :-6.76, 5.386). The effect was relatively weak and with a low effect size, though, with 8.6% of the variance in SpO2 readings in round two accounted for echocardiogram results.

4. Discussion

Out of 3007 pulse oximetry readings, 160 required repeated screening readings, and finally, an echocardiogram (n=29). The results show an increased need for statistical power, as the positive echocardiogram results are quite a few.

Multivariate regression analysis showed small effect sizes and statistically insignificant associations. However, based on univariate analysis, particularly in the second-round screenings, the findings are more significant.

In modeling first-round hand pulse oximetry readings against echocardiogram results, there is a statistically significant difference that allows the rejection of the hypothesis that there is no association between oximetry readings and echocardiogram results. ($t = -2.18$, $p = 0.038$). This allows the position that the two variables are correlated, though weakly as suggested above. Such a conclusion cannot be said for the first round, SpO2 readings

obtained from the foot ($t = 1.43$, $p = 0.165$).

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Table 2. This table shows readings in subjects that received both the echocardiogram and second-round pulse oximetry

	Coeff	Standard error	T	P> t	95% confidence interval
SpO2 round 2 hand	0.422	0.200	2.11	0.044	0.012, 0.833
Constant	0.529	0.188	2.81	0.009	0.143, 0.916

R-squared= 0.1416
Adjusted R-squared= 0.110

Table 3. Multiple regression of the first-round hand and foot SpO2 readings and echo results

	Coeff	Standard error	T	P> t	95% Confidence interval
SpO2 round 1 hand	-3.820	2.422	-1.58	0.127	-8.797, 1.158
SpO2 round 1 foot	-0.689	2.96	-0.23	0.817	-6.765, 5.386
Constant	4.382	2.269	1.93	0.064	-0.281, 9.046

R-squared= 0.1515
Adjusted R-squared= 0.086

Table 4. Multiple regression of the second-round hand and foot SpO2 readings and echo results

	Coeff	Standard error	T	P> t	95% Confidence interval
SpO2 round 2 hand	-3.781	3.361	-1.12	0.271	-10.789, 3.127
SpO2 round 2 foot	-5.895	3.692	-1.60	-.122	-13.485, 1.6953
Constant	9.335	1.665	5.61	0.000	5.913, 12.757

R-squared= 0.542
Adjusted R-squared= 0.5066

Table 5. Regression model between first-round hand pulse oximetry reading and echocardiogram results

	Coeff	Standard error	T	P> t	beta
Echo	-0.036	0.0165	-2.18	0.038	-0.387

R-squared= 0.1497
Adjusted R-squared= 0.118

able 6. Regression model of round 1-foot pulse oximetry readings and echocardiogram results

	Coeff	Standard error	T	P> t	95% confidence interval
SpO2 round 1 foot	-3.477	2.43	-1.43	0.165	-8.470, 1.516
Constant	3.409	2.242	1.52	0.140	-1.192, 8.010

R-squared= 0.0703

Adjusted R-squared= 0.00359

Table 7. Regression model of round 2-foot pulse oximetry readings and echocardiogram results

	Coeff	Standard error	T	P> t	95% confidence interval
SpO2 round 2 foot	-9.547	1.767	-5.40	0.000	-13.17, -5.92
Constant	9.228	1.67	5.52	0.000	5.801, 12.65

R-squared= 0.520

Adjusted R-squared= 0.502

Table 8. Regression model of round 2 hand pulse oximetry readings and echocardiogram results

	Coeff	Standard error	T	P> t	Beta
Echo	-0.058	0.011	-5.16	0.000	-0.705
Constant	0.953	0.005	185.13	0.000	

R-squared= 0.497

Adjusted R-squared= 0.478

Table 9. Correlation between the right-hand readings in round 1 vs. round 2

Variable	observations	Mean	Std. Dev.	Min	Max	Variable
Gender (1)	29	.7241379	.4548588	0	1	29
Age	29	19.7931	8.570628	7	47	29
SpO2_round1_hand	29	.9337931	.0408319	.8	1	29
SpO2_round1_foot	29	.922069	.0353936	.84	.99	29
Echo(2)	29	.0689655	.2578807	0	1	29
SpO2_round2_hand	29	.9413793	.0341973	.85	1	29
SpO2_round2_foot	29	.9451724	.0311243	.85	.99	29

(1) 0 is female, 1 is male

(2) 0 is a negative echo, 1 is positive

Although there is a statistically significant difference between the second-round hand SpO₂ readings, they are highly correlated. ($t = -5.16$, $p = 0.000$). Nevertheless, as mentioned ($n = 29$), there is a need for increased statistical power. For the second-round foot readings, the results were again significant ($t = -5.4$, $p = 0.000$)

The model also shows that chance of a positive echocardiogram reading increases with every 5.44% decrease in the SpO₂ round 2 test reading.

Compared to first-round readings, which suggest that every 3.6% decrease in pulse oximetry readings increases the chance of a positive echo on more in-depth analysis, as the first-round reads accounted for 11.8% of observed variance, decreases in oxygenation are less correlated with an instance of CCHD.

As the newborns did not have echocardiograms after first-round readings, the results support the importance of two oxygenation screens before echocardiogram to reduce false positives and increase the true predictive power of pulse oximetry readings for CHD.

Only seven were positive in the babies subjected to repeated pulse oximetry readings ($n = 29$) and a subsequent echocardiogram. It was later ascertained that two were false positives. The results suggest a lack of correlation between initial pulse oximetry readings and a positive echo for CCHD. However, there is a correlation between the second round of pulse oximetry readings and possible CCHD, which suggests the need for a tiered pulse oximetry screening protocol. Univariate and multivariate logistic models give nonsignificant, near-0, odds ratios.

5. Conclusions

The data and analysis show promise in the association between early pulse oximetry readings and the detection of potential cardiogenic defects. There is a correlation between the concerning readings and detection of cardiogenic defects through an echocardiogram. More data is needed to ascertain other possible relationships, such as the timing of the pulse oximetry readings, gender associations. However, the results thus far imply that low pulse oximetry readings on the initial screen are correlated with potential CCHD.

A large sample is needed to ascertain why there is a univariate association between the second round SpO₂ readings and potential echo results, compared to first-round SpO₂ readings, which are statistically insignificant and boasting small effect sizes, alongside the multivariate relationships, which are also statistically insignificant.

The reported rates show that 1% of live newborns will have a CHD. (12) For this protocol, we fully screened 160 newborns and, from which 2 were FP; this suggests a rate of 5/160, which is higher than the reported rates. The implications of this are that perhaps, newborns are not screened well enough in general, or the rates in the studied city are above normal.

Either way, a calculation of statistical power is required for better ascertainment and efficacy evaluation. This study also suggests a need for additional studies with a defined statistical power and the inclusion of more parameters, including the timing of first and last round pulse oximetry readings to determine why the second-round readings were more closely associated with positive echocardiogram results.

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Human Donor Milk: How the Risks to Infants Have Changed

Mitchell Goldstein, MD

Introduction

Breastfeeding is proven to reduce the risk of a wide range of illnesses and conditions. Compared with formula-fed children, Children that receive breastmilk have a reduced risk of ear, skin, stomach, and respiratory infections, diarrhea, sudden infant death syndrome, and necrotizing enterocolitis. In the longer term, breastfed children have a reduced risk of obesity, diabetes, asthma, and childhood leukemia.(1-3) Premature infants benefit even more from human milk. Decreases in cardiovascular disease and hypertension have been seen in ex-premature infants not exposed to cow's milk in the first few weeks of life. (4-7)

For preterm infants born at less than 1,250 grams, the evidence of the benefits of an exclusive human milk diet, devoid of foreign protein (defined as mother's milk and/or pasteurized donor milk plus a human milk-based fortifier), is conclusive. Numerous studies (3, 6, 8-10) published in major journals examine the difference between feeding premature infants who receive cow milk versus human milk. The studies show a clear and direct relationship between exposure to cow milk-based nutrition and an increased risk of significant morbidities of prematurity.

These studies demonstrate the following benefits for infants receiving an exclusive human diet compared to those exposed to cow milk-based products: (5-7, 9-18)

- Significant reductions in the incidence of necrotizing enterocolitis (NEC)
- Decreased length of hospital stays
- Reduction of the number of total parenteral nutrition (TPN) days
- Reduced feeding intolerance
- Improved weight and length velocity with the proper feeding protocol and the use of a human milk-based fortifier
- Lower mortality
- Reduced incidence of late-onset sepsis
- Reduced incidence of retinopathy of prematurity
- Reduced incidence of bronchopulmonary dysplasia (BPD)

In recent years, the use of donor human milk and human milk-derived products has dramatically increased. With a mountain of growing evidence that human milk is best for all babies – and especially critical for premature infants spending time in the Neonatal Intensive Care Unit (NICU) - demand for donor human milk has grown year after year. The Human Milk Banking Association of North America (HMBANA), the largest distributor of pasteurized donor human milk, published in their annual report that the distribution of pasteurized donor milk has increased sevenfold since 2000. HMBANA distributed less than half a million ounces in 2000; In 2019, close to 7.4 million ounces were distributed. (19) Donor human milk is a standard of care in approximately 90% of the level 3 and 4 NICUs across the country. (20) This is an undoubtedly positive trend, with dozens of studies showing the benefits of keeping premature infants on a diet of strictly human milk and not risking exposure to foreign proteins. This trend has saved countless lives and reduced the cost of care for these

vulnerable infants while sending them home to their families even sooner. (12, 13, 21) One study demonstrated a \$15,750 savings per day, and 9 fewer days on TPN.(12, 13)

Incremental costs in these fragile infants can substantially increase the cost of NICU hospitalization.

Aggregate (of co-morbidities and interventions) costs include:

- Surgical NEC \$198,040
- Medical NEC \$74,004
- Late onset sepsis \$10,055
- BPD \$31,565
- ROP requiring surgery \$35,749
- PDA \$49,457

However, one critical component has received very little attention with this growing trend: the safety of donor human milk and human milk-derived products and the milk banks that sell them. Unless the milk is processed under intense scrutiny, human milk is at risk of viral and bacterial contamination. What every parent and/or provider needs to know, especially as donor human milk becomes a more common standard of care, is that at present, there is no uniform, minimum set of safety standards, quality protections, or oversight for these products, regardless of from what milk bank they originate.

“With a mountain of growing evidence that human milk is best for all babies – and especially critical for premature infants spending time in the Neonatal Intensive Care Unit (NICU) - demand for donor human milk has grown year after year.”

We have long studied and worked to eliminate the transmission of viruses, bacteria, and drugs that can be passed through the transfer of human tissue. Newly identified pathogens like SARS-CoV-2, coupled with the opioid crisis, recent increases in vaping of nicotine and other substances, and the legalization of marijuana have contributed to increased risks when any human tissue is used anywhere, particularly in the NICU. The effect of these potentially harmful contaminants on breastmilk is difficult to ascertain or quantify because of an inability to gauge the level of exposure transmitted through milk. What we do know, however, is that exposure to even minute doses of many of these substances can lead to severe and life-long negative consequences for ill and fragile premature newborns. (22, 23) Moreover, because of the long-term consequences of exposure to these contaminants, evidence of exposure may not even present until long after birth or hospital discharge. Claims of safety and a paucity of traceable pathology notwithstanding, there is no credible way of assessing human donor milk because of the inconsistency inherent in these exposures. The lack of consistent regulation and oversight of this vital medical tissue, human milk, places infants at unnecessary risk.

What Are the Risks?

Milk is both a tissue and a biologic fluid derived from a human, like blood and plasma. Despite the best technology available and a mature understanding of the risks inherent in blood donation practices, clinicians in the 1980s found themselves deficient in recognizing the harbinger of the encroaching Acquired Immunodeficiency Syndrome (AIDS) epidemic. Technology had progressed to the point where threats to the blood supply, including hepatitis and bacterial infection, could be reliably identified and mitigated. Intravenous (IV) drug users were discouraged from giving blood because of these risks. Blood shelf stability had been established, and a uniform reporting mechanism had been set in place to guard against unexpected outcomes. However, in the end, all of these practices were insufficient to deal with Human Immunodeficiency Virus (HIV) because the virus responsible for the challenge was not a previously identified pathogen and was not on the test panel. At-risk behaviors, defined conditions, and factors responsible for the disease's continued spread were yet to be discovered. An entire generation of people living with hemophilia, dependent on plasma from multiple donors, were practically wiped out by screening practices that were insufficient to recognize the risk. (24)

Moreover, victims of trauma, those with chronic anemia, and even pregnancy complications were exposed to tainted blood. By the time the risks were known, it was too late. Millions of people worldwide were ultimately affected, and HIV continues to represent a challenge to communities worldwide.

Nevertheless, there was a yet crueler truth to HIV infection, one we never saw coming. Vertical transmission of HIV infection was not only possible through direct transmission of the virus through pregnancy, but also through breastmilk. Between one-third and one-half of infants born to an HIV-positive mother subsequently went on to develop HIV infection and full-blown (AIDS). (25, 26) The tragedy was not fully elucidated until years after identifying the initial risk groups. Without the devoted efforts of a mother affected by this calamity and the concerted efforts of her public supporters, AIDS may have been remained relegated to its assigned position as a disease of moral failure as opposed to a severe health concern for all of us, including breastfeeding infants. (27)

“Nevertheless, there was a yet crueler truth to HIV infection, one we never saw coming. Vertical transmission of HIV infection was not only possible through direct transmission of the virus through pregnancy, but also through breastmilk.”

We learned many lessons from the HIV epidemic of the 1980s, including that enhanced vigilance must be enforced to recognize ongoing threats proactively. We must learn from this. When considering human donor milk and human donor milk-derived products, we must adopt a more vigilant approach, particularly when milk is delivered to preterm and medically fragile infants in the NICU. Many of these threats can be mitigated by pasteurization and other processes, assuming they are conducted appropriately. However, other contaminants cannot be resolved by pasteurization alone. Given the current trend towards increased demand for human donor milk and the emergence of new milk banks entering the field, we must act now to mitigate the risk.

These threats include:

- Bacterial contamination
- Viral transmission
- Nicotine, marijuana, homeopathic remedies, recreational drugs, and other substances that mothers may not realize pass readily through the breastmilk
- Over-the-counter medications (e.g., Sudafed), opioids, and other prescription pain medications for c-section, dental work, chronic pain, or depression
- Breastmilk from unqualified donors
- Milk from other sources, including bovine, ovine, soy, and oat milk

By way of example, we know that infants' exposure to nicotine results in myriad issues, including liver and lung damage, the potential of an increased susceptibility to diabetes owing to a reduction in pancreatic beta cell production, and, most notably, significant differences in infant sleep-wake cycle. Extensive exposure to nicotine *in utero* has been associated with withdrawal. (28) These effects may be exacerbated in the preterm infant. (28-32) What is more, approximately 85% of women who quit smoking during pregnancy resume smoking following the delivery of their babies, often within the first 2-8 weeks postpartum. (33) Milk banks that test incoming milk find that nicotine and its metabolites are the most common contaminant in donated human milk. It is important to note that the infants in these studies were term infants. Because of the small population and ethics involved, randomized control trials of preterm infants' exposure to nicotine are not available. However, several studies focusing on risk identification and conventional wisdom dictate that any effects on a term infant may be magnified in a smaller preterm infant. (32, 34, 35)

Cannabis exposure is increasing, as many states legalize marijuana for both medicinal and recreational use. Despite laws proscribing harsh penalties for the furnishing of any cannabis to minors, even in breastmilk (36), the consequence of de-emphasizing the risk in the adult population heightens the concern for newborns. THC, a principal constituent of marijuana, was measurable in most breast milk samples up to 6 days after maternal marijuana use. (37, 38) The enhanced potency of marijuana is concerning since the only study on long term neurodevelopmental outcomes was conducted when THC concentrations in marijuana were estimated to be one-third of today's levels. (37) As THC enters the bloodstream one hour after use and persists for up to six days, it may not be possible to use cannabis and avoid infant exposure. There is building evidence that this exposure may result in cognitive, social, and motor defects. (36-38)

“Despite laws proscribing harsh penalties for the furnishing of any cannabis to minors, even in breastmilk (36), the consequence of de-emphasizing the risk in the adult population heightens the concern for newborns. ”

Why Are the Risks Greater Today Than Ten Years Ago?

Human milk is medicine for sick and premature newborns.

Beyond the apparent nutritional benefit, a humoral component includes substances that provide a level of immunoprotection not attainable through other sources. It provides health benefits for all newborn infants but is of critical importance for these high-risk infants. Human milk provides significant mitigation of the excess risk for those at risk of growth failure and developmental delay.

The increased use of donor human milk and donor human milk-derived products has saved countless lives and improved NICU care around the country and the world. Statistically significant increases in weight, length, and head circumference growth have been noted. (Huston 2018) Decreased risk of necrotizing enterocolitis (NEC), growth failure, and infection have been documented extensively. Furthermore, because of the increased use of donor human milk, there has been significant growth in the number of human milk banks that collect, process, and sell donor human milk – both for- and not-for-profits. It has become increasingly important to recognize the increase in risk associated with this growth. HMBANA, for example, has nearly doubled the number of milk banks they operate on the continent. In that same period, we have seen several for-profits and other commercial entities enter the scene. Over 30% of hospitals with advanced services used donor milk in the NICU in 2013; this percentage has increased dramatically since that time, as evidenced by the increase in the demand for donor breast milk and the proliferation of human milk banks. By 2017, the number of level 3 and 4 NICU's with access to donor human milk was 88%. (39, 40)

Due to the increased demand in the market and a steady stream of new organizations entering the market to meet that demand, it is critically important to not only have an understanding of the types of practices that are in place but to have minimum safety standards for managing the risks and reporting deviations from accepted practice that could adversely affect the milk supply. Furthermore, if issues do arise, it is especially critical to track and trace the source of the issue. (5, 10)

“Due to the increased demand in the market and a steady stream of new organizations entering the market to meet that demand, it is critically important to not only have an understanding of the types of practices that are in place but to have minimum safety standards for managing the risks and reporting deviations from accepted practice that could adversely affect the milk supply.”

How Do We Mitigate the Risk?

Few if any of the milk banks that sell human donor milk have governmental regulations outside of registering with the US Food and Drug Administration (FDA) as a food manufacturer. Some milk banks have voluntary, self-enforced guidelines. Most human milk banks rely on self-generated screening, production, safety, and quality guidelines that are neither publicly nor independently audited or enforced. Although some of these banks operate as not for profit, this designation does not mitigate safety and truth in marketing. Further, this laissez-faire honor system does not recognize the inherent risk of collecting, processing,

and distributing a human biologic fluid, which is why all other biologics are regulated by the government. The only exceptions are milk banks operating in California, Maryland, and New York, where the milk banks must obtain a tissue bank license. Still, these tissue bank licenses do not even begin to address what is necessary to regulate and administer the full scope of breast milk supplementation. This requirement may be why the American Academy of Pediatrics stated that “federal or state guidelines are needed regarding the preparation, handling, and transfer of human milk as well as the operation of donor human milk banks...”. (8) These guidelines may be insufficient. Where safety is paramount, strict regulations and policies not dissimilar to the blood and plasma industry must be put into place.

For products derived from human milk that go beyond strictly pasteurized donor human milk, regulations vary, with fortifiers more strictly regulated by the FDA as an exempt infant formula. However, even here, improvement in the guidance and recognition of a uniform reporting requirement similar to the plasma industry would enhance consumer protection, and ensure as a safer product for the most vulnerable babies.

It should be noted that the difference between registering as a food manufacturer and being regulated as exempt infant formula is significant. A different branch of the FDA regulates food manufacturers. Regulations are mainly concerned with outward-facing risks inherent to the manufacturing process. Because food product variation is accepted, precise guidance dosing, treatment, and spoilage reporting occur at a different level of significance. Audits, inspections, and adverse event reporting do not have the same level of significance or consequence if they take place at all. The vast majority of human milk banks are regulated as ordinary food products and thus not subject to rigorous or frequent inspection or oversight. (41)

Breastmilk and its derivatives are inherently different from the typical food item or even infant formula. For example, the current guidance does not require testing the donor milk for the viruses, bacteria, drugs, and adulterants outlined above. The veracity of donor self-reporting is critical to the success of this system. At best, in some cases, non-profit milk banks are “self-regulated,” with voluntary guidelines but no uniformity or requirements for testing, safety, and quality protocols beyond pasteurization. Further, there is neither a standardized metric for safety nor post hoc analysis required should a problem with the accepted local protocol arise.

Do we know if there have been any infants negatively impacted? Harm cannot be monitored effectively under the current system. What is more, there is no absolute requirement to report adverse events. Individualized sample quality control is non-existent. Randomized testing standard in the food manufacturing industry precludes the best practice to test every batch of donor milk before and after it has been pasteurized, processed, and packaged.

Screening for breaches or variations in practices is dependent on the prevalence of the breach or variation. If one percent of the samples are affected, a screening process checking one out of 100 samples would only be predicted to find the deviation after screening 100 intervals of 100 or after 10,000 samples had passed through the manufacturing process. Significant risk cannot be avoided when significant components of the manufacturing process involving the production, expression, and collection of breastmilk are out of the manufacturer's direct control. (11)

A more rigorous testing system is required. Screening may be appropriate for food items with generally accepted safety profiles and where these items are destined for adult consumption. However, where variations are less well tolerated and potential risks greater, screening protocols must give way to enhanced

testing designed to accommodate the individualized risk and need for batch identification and recall if indicated, particularly when that product is being fed to premature and medically fragile infants. (7, 8)

How Do These Risks Impact the Babies?

In November 2019, three premature infants died due to bacterial contamination of the equipment used to measure and mix donor milk at Geisinger Medical Center in Danville, PA. (42) The scrutiny involved in the maintenance, preparation, and quality assurance was insufficient to prevent excess morbidity and mortality. Proactive anticipation of the next deviation and progressive quality improvement of existing processes are crucial in preventing system failures and their devastating effects on our most at-risk patients.

Evidence also points to both short and long-term health issues of preemies exposed to many exogenous substances with no place in breastmilk. Neonatal Abstinence Syndrome (NAS) has increased dramatically and continues to impact healthcare. The long-term implications of exposure to nicotine, cannabinoid, and other newer substances on neurodevelopment, respiratory conditions, and growth parameters cannot be fathomed. Screening for these practices on a haphazard basis fails to acknowledge the risk. The responsible approach to acknowledging these practices is enhanced testing of threats, both known and anticipated, with efforts dedicated to risk reduction.

“Given the extremely fragile nature of the very low birth weight premature infants, all organizations, for or not for profit, who manufacture and distribute or sell human milk products must join in developing a standard of care methodology for the expression, storage, testing, and proper safety regulations of this vital resource.”

Conclusion:

The *status quo* of self-regulated, voluntary guidelines in human donor milk is antiquated and insufficient, given the growth of the use of human donor milk in the NICU. The risk of bacterial and viral infection, coupled with continually changing pathogens and adulterants, must not be discounted. Safety measures should not be interpreted as a monopoly or “competitive advantage” they must compel a deeper level of understanding and collaboration, a responsibility that we must all share. It can no longer be acceptable for a doctor to reach for a human milk product that does not meet these rigorous, yet common sense, safety standards simply because it is what is available. As testing equipment for these potential concerns is widely available, no entity should be granted a pass on compliance. The lack of strong governance relating to the use of best available guidance on safe practices does not excuse a lack of vigilance.

Given the extremely fragile nature of the very low birth weight premature infants, all organizations, for or not for profit, who manufacture and distribute or sell human milk products must join in developing a standard of care methodology for the expression, storage, testing, and proper safety regulations of this vital resource. Although regulations are in place for regulating food products,

medications, biologics, and the blood and plasma industry, human milk and its derivatives are clearly distinct from other classes. Albeit a food product, human milk is clearly a biologic and medication as well. The risks inherent in these products are not dissimilar to those in the blood and plasma industry. At this point, too much time has gone by, and too many lives have been placed at risk for this issue to be relegated to an area that is betwixt and between. There is no excuse for the lack of strong guidance and regulatory enforcement. The government must oversee this industry.

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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**EEL PARTICIPATION
- H**ELP EXPLORE OPTIONS
- A**SSASS 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.



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Outstanding BC/BE Neonatologist Opportunities in Florida's Palm Beach County

Nicklaus Children's Health System and Nicklaus Children's Pediatric Specialists (NCPS), the health system's physician-led multispecialty group practice, have two exceptional opportunities for board-certified or board-eligible (BC/BE) fellowship-trained neonatologists with a minimum of three years of experience (preferred) for a new Level II NICU located on Florida's Treasure Coast in Palm Beach County.

Both positions will be part of a comprehensive perinatal and neonatal program for babies in a new Level II NICU. These roles present a unique and exciting opportunity for motivated candidates to flourish in a burgeoning market. Applicants should possess a passion for advocacy and improving care for all children. The BC/BE neonatologists will be responsible for attending deliveries, providing prenatal consultations to high-risk babies, resuscitating and stabilizing newborns in the delivery room, rounding on well babies, as well as provide leadership, oversight and supervision in the Level II nursery. Candidates should be proficient in newborn resuscitation, including neonatal intubation, umbilical line placement and peripheral cannulation, lumbar punctures, etc. Both roles offer salaries that are competitive and commensurate with experience. One of the two positions will have the additional responsibility of being the site director to provide leadership and direct quality and safety oversight of the program.

Nicklaus Children's neonatology program is consecutively ranked among the best in the nation by *U.S. News & World Report*. It was the first of its kind in South Florida and receives referrals of the most critically ill neonates from hospitals throughout Florida, Latin America and the Caribbean. The Level II NICU will be a part of the NCPS Section of Neonatology and the neonatologists will have access to the educational and professional development resources of Nicklaus Children's Health System.

Founded in 1950, the rebranded Nicklaus Children's Hospital, a 309-bed freestanding children's hospital and Level I trauma center, is renowned for excellence in all aspects of pediatric medicine and has numerous subspecialty programs that are routinely ranked among the best in the nation. It is also home to the largest pediatric teaching program in the southeastern U.S. Many of our physicians have trained or worked at other leading medical institutions. Join a phenomenal team that brings lifelong health and hope to children and their families through innovative and compassionate care.

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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



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

KEEPING MOTHERS + INFANTS TOGETHER

Means balancing...



Risk of horizontal infection

Risks of separation and trauma



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COVID-19 Response: Safety for ROP Screening in Neonatal Intensive Care Unit

Candice D. Frazier

Abstract:

Background: This publication demonstrates how utilizing a telemedicine-based evaluation for Retinopathy of Prematurity is a secure and safe solution for screening during the global COVID-19 pandemic. The purpose of this publication is to provide current users and potential users with an understanding of how telemedicine-based evaluations can minimize potential outside exposure risks induced by bedside binocular indirect ophthalmoscopy examinations.

Methods: The publication compares the current workflow of bedside binocular indirect ophthalmoscopy exams and their potential to outside exposures to telemedicine-led screening programs housed in the hospital facility. Also discussed are the methods for high-level disinfecting medical devices and the importance of these protocols in the current pandemic state.

Findings: Results reveal that experts tend to support discussions surrounding telemedicine's accuracy and reading images for the diagnosis and monitoring of Retinopathy of Prematurity.

Discussion: Telemedicine based evaluations with ultra-widefield imaging devices allows hospital organizations to control their screening process in-house, with crucial high-level disinfection procedures in place.

Implications for Practice: The publication will be educational to neonatal intensive care staff members for creating best practices in screening for Retinopathy of Prematurity to protect patients from unnecessary virus exposure.

Implications for Research: The research in this publication discusses the overall support of a telemedicine approach for screening of Retinopathy of Prematurity. More research is needed to update specific guidelines and policy statements to promote this workflow through neonatal intensive care units.

Keywords: COVID-19, Retinopathy of Prematurity, Ultra-wide Field Imaging, Telemedicine

Understanding what we know about COVID-19

COVID-19 was officially named by the World Health Organization (WHO) on February 11, 2020. The abbreviation COVID-19 is noted to mean CO for 'corona,' VI for 'virus,' D for 'disease,' and the year 2019. The new, or novel, coronavirus is a new disease that had not been seen in humans until recently. COVID-19 is believed to spread in ways similar to the common cold—such as through coughs, sneezes, or handshakes. A person who has caught the virus may not show symptoms for between 5-14 days.

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This interval is called the incubation period. The person can spread the virus during this time. (1)

Although the transmission to a person from surfaces that have been potentially contaminated is still not well documented, there are immediate concerns regarding the need to follow stringent disinfection measures on all surfaces and medical devices. The CDC has raised concerns that the virus may live on non-disinfected surfaces for up to 9 days. More studies have shown that the novel coronavirus is likely spread through respiratory droplets. It is possible that by touching an infected surface or persons, the virus can then be spread if one touches their own mouth, nose, and eyes. (2)

“Since these initial findings, the coronavirus outbreak has significantly impacted local and global health and related economies. It also raises concerns for Ophthalmology and hospital facilities regarding the future of care related to screening for Retinopathy of Prematurity (ROP).”

The first concerns surrounding COVID-19 were reported to WHO on December 31 of 2019.(3) These initial findings are thought to be discovered by a practicing ophthalmologist showing concern for an increasing number of patients presenting with pneumonia-like symptoms.(4) Since these initial findings, the coronavirus outbreak has significantly impacted local and global health and related economies. It also raises concerns for Ophthalmology and hospital facilities regarding the future of care related to screening for Retinopathy of Prematurity (ROP).

Understanding what is known about Retinopathy of Prematurity

Retinopathy of prematurity is a disease process that affects babies who are born prematurely. ROP remains a significant threat to vision health, especially in extremely premature and underweight infants. According to the National Eye Institute (NEI), between 14,000 and 16,000 infants in the United States are affected with some degree of ROP each year. Each year, 400 to 600 of those infants will become legally blind from ROP. (5)

There are five stages classified in ROP, ranging from mild to severe. Most infants who develop ROP will have mild stages I or II. Those infants who may develop rapidly advancing ROP are at risk for permanent visual loss. (5)

In ROP, abnormal blood vessels can grow and spread through layers of the retina, causing scarring or detaching. Several complex issues may cause ROP. In the stages of development, the retina will begin to vascularize from the optic nerve out into the periphery. When an infant is born prematurely, before the retina has fully vascularized, normal blood vessel growth will be affected. (5)

The relation between ROP and COVID-19 is still being researched. Studies are currently underway to determine how COVID-19 may affect fetal distress and respiratory distress in preterm infants. Increases in stressors and premature birth may lead to increases in risks for infants developing ROP. (6)

Current workflows in ROP screening management

According to the American Academy of Pediatrics, the current workflow for screening for retinopathy of prematurity is supported with bedside binocular indirect ophthalmoscopy performed by an off-site physician. These exams require physicians who specialize in retinal ophthalmology to enter the NICU to perform exams with scleral depression and a high magnification lens, and then confirm ocular findings with a hand-drawn image. The AAP has currently acknowledged the need for support of telemedicine programs and has suggested workflow options to create a successful imaging and telemedicine program.(7)

As we see the COVID-19 pandemic develop, hospital facilities will likely implement procedural changes related to how off-site contract physicians access the premises and patient care areas. Telemedicine for the evaluation of retinopathy of prematurity allows for the off-site ophthalmologist to diagnose and follow ROP diagnosis, avoiding repeated exposure in the NICU environment appropriately and safely

“ A digital image is not subject to the predictable inaccuracies associated with the current practice of viewing a structure and subsequently making handwritten notes and/or paper sketches or drawings in an attempt to record what was seen. (9)”

Studies have been performed to support discussions surrounding telemedicine's accuracy and reading images for the diagnosis and monitoring of ROP. These studies have found that sensitivity of 100% and specificity of 97% when detecting the diagnosis of pre-threshold or worse ROP. Some studies have even found that ultra-widefield imaging can capture photo documentation of mild ROP in cases ophthalmoscopy may have missed. (8)

The role of ultra-widefield imaging to improve patient care, especially in times of pandemic and disease control

Ultra-wide field imaging (RetCam® 3, RetCam Shuttle, or RetCam Portable; Natus Medical Incorporated, Pleasanton, CA) facilities create a permanent, still or video, digital image of the retina, cornea, and/or external structures of the eye. The original images cannot be altered. A digital image is not subject to the predictable inaccuracies associated with the current practice of viewing a structure and subsequently making handwritten notes and/or paper sketches or drawings in an attempt to record what was seen. (9)

Digital images are readily available for direct comparisons over time. As the images are captured at various intervals, they can be displayed side-by-side on a screen, allowing the physician to track disease progression and determine the need for any intervention. These permanent images can become a part of the patient's medical record. (9)

Telemedicine and ultra-widefield imaging can help hospitals and NICU's facilitate well-coordinated ROP programs and limit not only outside exposure to infants and parents but also NICU staff, physicians, and patients throughout the hospital. These solutions provide continuity of care and offer a high level of expertise to each child evaluated.

Along with protection provided to hospital staff and patients, these telemedicine solutions protect off-site physicians from having to enter a hospital facility. While ophthalmologists may have heavy clinic flows in their practices, the addition of remote viewing allows them to review images quickly and in the comfort of their office. Ultra-wide field imaging allows for closer scrutiny of diagnosis and treatment, along with the ability to request second opinions when needed.

Understanding the importance of device reprocessing to minimize possible exposure

It is important to understand the importance of disinfection and reprocessing of reusable medical devices. With the onset of COVID-19 and the potential for future exposure to these viruses, the need for medical devices with thorough reprocessing instructions will be an immediate requirement for hospital facilities worldwide.

According to the Food and Drug Administration (FDA), when reusable medical devices are put into service on patients, the devices can become soiled and contaminated with microorganisms. Any reusable medical device must undergo what is known as reprocessing to minimize the risk of spreading infection by a contaminated device. The FDA defines reprocessing as "a detailed, multistep process to clean and then disinfect or sterilize" medical devices. (10)

As related to the COVID-19 response, the risks involved with exposure are directly related to the virus's transmission through respiratory droplets spread from person or surface to another. This is a direct concern in the instance of Retinopathy of Prematurity exams that involve touching areas around the eyes and the nose and mouth of small infants who may have compromised immune systems.

“As related to the COVID-19 response, the risks involved with exposure are directly related to the virus's transmission through respiratory droplets spread from person or surface to another. This is a direct concern in the instance of Retinopathy of Prematurity exams that involve touching areas around the eyes and the nose and mouth of small infants who may have compromised immune systems. ”

Both the FDA and many medical device manufacturers can agree that adequate reprocessing of reusable medical devices is vital to protecting patient safety. Taking steps to review and advance current reprocessing protocols will help protect patients in the immediate need and the future. (10)

Summary of Recommendations for Practice and Research

What we know:

- COVID-19 is believed to spread in ways similar to the common cold—such as through coughs, sneezes, or handshakes.
- It is possible that by touching an infected surface or persons, the virus can then be spread if one touches their mouth, nose, and eyes.
- According to the National Eye Institute (NEI), between 14,000 and 16,000 infants in the United States are affected with some degree of ROP each year.
- According to the American Academy of Pediatrics, the current workflow for screening for retinopathy of prematurity is supported with bedside binocular indirect ophthalmoscopy performed by an off-site physician.

What needs to be studied?

- Procedural changes are related to how off-site contract physicians access the premises and patient care areas.
- Accuracy of telemedicine and reading images for the diagnosis and monitoring of ROP should be reviewed.

What we can do today:

- Telemedicine for the evaluation of retinopathy of prematurity allows for the off-site ophthalmologist to appropriately and safely diagnose and follow ROP diagnosis, avoiding repeated exposure in the NICU environment
- New policies can go into place to address the adherence of best internal practices from an infection control standpoint and minimize exposure from outside contact.
- An ultra-widefield imaging device's placement can eliminate the transmission of disease or bacteria from an exposed off-site ophthalmologist to the NICU patients and staff. This option also decreases the exposure risks for those ophthalmologists who may be entering hospital facilities frequently.

The role of reprocessing in screening for Retinopathy of Prematurity

When considering the need for reprocessing related to screening for Retinopathy of Prematurity, it is important to understand the medical instruments and medical devices used.

Lid Speculums: a lid speculum is a medical instrument used that is used to retract the eyelids. In the case of ROP screening, a speculum is used to hold the lids open during the retina examination. Speculums are typically made of stainless steel and should be autoclaved. Once lid speculums are properly sterilized, they should be packaged for single patient use. Disposable lid speculum packages should be checked for any damage and only used for a single patient. Care should be taken to review all medical safety data regarding proper sterilization as directed by

the manufacturer and hospital guidelines.

Scleral Depressors: a scleral depressor is a medical instrument used between the globe and the orbit that displaces the retina inward. For ROP screening, a scleral depressor is used to create an elevation by pushing the retina inward during examination allowing physicians to see the far periphery. Scleral depressors are typically made of stainless steel and should be autoclaved. Once scleral depressors are properly sterilized, they should be packaged for single patient use. Disposable scleral depressor packages should be checked for any damage and only used for a single patient. Care should be taken to review all medical safety data regarding proper sterilization as directed by the manufacturer and hospital guidelines.

Ultra-Wide Field Retinal Imaging Devices: a retinal imaging device

is a medical device for photo documentation of the retina and other ocular structures. For ROP screening, a retinal imaging device is used to examine the retina and allows the ophthalmologist to review the documented photos remotely. In the RetCam devices (RetCam 3, RetCam Shuttle, or RetCam Portable; Natus Medical Incorporated, Pleasanton, CA), the detachable lens tip is made of stainless steel and should be disinfected following the up-to-date guidelines. The disinfection of the lens piece should be completed between each patient. The detachable lenses on the RetCam device allow a rotation in lenses for reprocessing. Care should be taken to review all medical safety data regarding proper disinfection as directed by the device manufacturer and hospital guidelines.

The future of Retinopathy of Prematurity care

With the onset of COVID-19, the world has begun to assess the impacts on the healthcare industry. Changes will be implemented worldwide to provide the best possible care while protecting staff and patients' health. New policies will go into place to address the adherence of best internal practices from an infection control standpoint and minimize exposure from outside contact.

As we look over the current processes for screening for Retinopathy of Prematurity, the future may hold a greater, if not complete, telemedicine led program. With the addition of a RetCam ultra-widefield retinal imaging device, hospitals can create permanent, still, or digital video images of the retina, cornea, and external structures. The original images cannot be altered. A digital image is not subject to the predictable inaccuracies associated with the current practice of viewing a structure and subsequently making handwritten notes and/or hand-drawn sketches/drawings in an attempt to record what was observed.

Digital images are readily available for direct comparisons over time. As the images are captured at various intervals, they can be displayed side-by-side on a screen, allowing the physician to track disease progression and determine the need for any intervention. These permanent images can become a part of the patient's medical record.

The placement of an ultra-widefield imaging device can eliminate the transmission of disease or bacteria from an exposed off-site ophthalmologist to the NICU patients and staff. This option also decreases the exposure risks for those ophthalmologists who may be entering hospital facilities frequently. RetCam systems allow for the disinfection of detachable lenses in an effort to minimize exposure risks and slowdowns in the workflow. One lens can be set aside for controlled reprocessing while the previously disinfected lens is used.

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August 9, 1996 - April 3, 2010



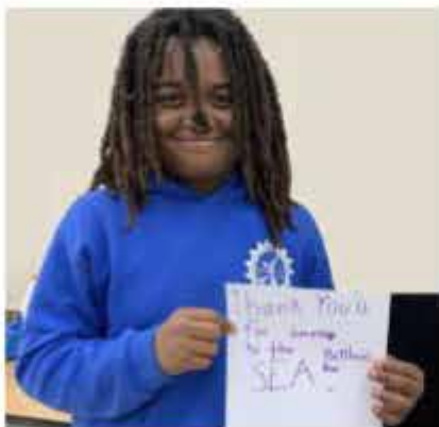
Each year, the Emily Shane Foundation SEA(Successful Educational Achievement) Program provides academic and mentoring support to over 100 disadvantaged middle school students who risk failure and have no other recourse. We have served over 700 children across Los Angeles since our inception in the spring of 2012. Due to the COVID-19 outbreak, our work is in jeopardy, and the need for our work is greatly increased. The media has highlighted the dire impact online learning has caused for the very population we serve; those less fortunate. **We need your help now more than ever to ensure another child is not left behind.**

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1 week _____	\$30
1 month_____	\$120
1 semester_____	\$540
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.

An Unexpected Use of the Shiny Package for R

Fu-Sheng Chou, MD, PhD

History

The R statistical language has been around since 1995. Ross Ihaka and Robert Gentleman first developed it in 1991 at the University of Auckland in New Zealand. The project became publicized in 1993. R is open-source software under the GNU General Public License. This is probably why academicians and statisticians widely use R for data mining, analysis, and research communication. The powerful engine for graphics rendering in R distinguishes itself from other commonly used software packages such as Microsoft® Excel in data plotting and graphic annotation. The most recent stable update at the time of this article is version 4.0.3 and is available for download from multiple Comprehensive R Archive Network (CRAN) mirror sites. (1)

RStudio® was founded by J. J. Allaire in 2009, with a mission to create free and open-source software for data science, scientific research, and technical communication. As of 2019, RStudio® has become a Public Benefit Corporation. RStudio® produced its first integrative development environment (IDE) for R in 2011. The open-source edition of the RStudio IDE is licensed under AGPL v3 and is freely available to anyone. The most recent stable release of RStudio IDE at the time of this article is version 1.3. (2)

“The open-source edition of the RStudio IDE is licensed under AGPL v3 and is freely available to anyone. The most recent stable release of RStudio IDE at the time of this article is version 1.3. (2)”

R packages

There are now over 16,000 packages for R that are freely available for download to facilitate specific areas of workflow, analysis, statistical modeling, plotting, and result distribution.(3) In addition to developing IDE, RStudio® is also heavily involved in R package development to improve user experience. One area of their focus is research communication. RStudio® has created three packages in this regard, namely, *Shiny*, *rmarkdown*, and *flexdashboard*, all with a unifying mission to facilitate information distribution and communication.(4) *Shiny* and *rmarkdown* are two critical packages developed by RStudio® that were used to develop the new Neonatology Today website (or you can call it a web application, or a webApp). *Shiny* lets developers build webApps that are intrinsically interactive using R syntax.(5) These interactive *Shiny* webApps allow researchers to communicate the full spectrum of their results with the audience based on the audience’s input. On the other hand, *rmarkdown* allows the audience to generate final reports in a variety of formats (PDF, HTML, Word file, etc.).(6)

Structure of the Neonatology Today webApp

The new Neonatology Today webApp is built natively in R and Rstudio® IDE using the *Shiny* package and others. Figure 1 outlines the structure of the Neonatology Today webApp. The webApp

consists of two parts: 1) content presentation and 2) user data entry, including the Online Manuscript Submission System and the Online Manuscript Review System. Notably, additional webApps were developed, allowing the management team to update the content and control the flow of the submitted manuscripts.

“Notably, additional webApps were developed, allowing the management team to update the content and control the flow of the submitted manuscripts.”

Content presentation

The webApp allows the readers to access the journal content in both PDF or HTML formats. The PDFs are available for articles from January 2019 to current, and HTML formats are available for selected articles from July 2020. The webApp also contains a search function for articles in the HTML format. The search function provides a great example of the reactivity of a *Shiny* webApp.

Besides journal articles, additional features were created to enrich reader experience, including a running Announcement carousel, an Events box, and a New & Views box accessible from the main page. The well-appreciated author artwork in the original PDF format is also available to the readers in a carousel, alongside the editors’ information.

The front page is designed with mobile device access in mind. The content display should be equally visually satisfying when viewed using major mobile browsers on mobile devices.

Online Manuscript Submission System

The Online Manuscript Submission System was developed with a goal in mind to allow authors to create, save, and submit manuscripts directly within the webApp. The interactive nature of webApps developed using the *Shiny* package made it an ideal tool for such tasks. With the combined use of the *rmarkdown* package, the authors can fully concentrate on their manuscripts’ content without the need to spend time typesetting their manuscripts before submission.

Figures and tables to be uploaded to the Online Manuscript Submission System are preferably prepared in PDF format, a popular format built into modern operating systems (the Print as PDF function), making the conversion effortless. The PDFs store information such as text, font type, vectorized graphs, and pixelated images in one file. This is different from other manuscript submission systems, where different file formats are requested for different figure types, and image resolution was always a concern after image file type conversion.

Before submission, the compiled manuscript and cover letter files are downloaded as PDFs thanks to the *rmarkdown* package for review. Once approved by the authors, the manuscript and the cover letter may be ready for submission.

“A more sophisticated webApp can be created to guide the clinical decision, provided the background statistical model has a good predictive value. Shiny webApp developers may be concerned about HIPAA compliance, but there are ways to avoid violating the regulations.”

Online Manuscript Review System

Like the Online Manuscript Submission System, the Online Manuscript Review System allows the reviewers to interact with the webApp to enter their comments and feedback. The System will record the comments. Once the comments are submitted, the System will generate a certificate for the reviewer, thanks to the *rmarkdown* package.

With the abundant amount of available packages for developers to use “behind the scene,” the potential of a Shiny webApp is enormous. Imagine having a Shiny webApp with a user interface for parameter entry and a machine learning-based model on the server-side to

Neonatology Today webApp

Content Access

- PDF for the whole issue
- PDF for each article
- HTML for each article
- Search function - *Keyword, Title, Abstract, Full text, Authors*
- News & Views
Highlights of interesting papers from peer journals in Neonatal-Perinatal Medicine
- Announcement & Events

Manuscript Process

- Submission
- Reviewers’ feedback

Ancillary Functions

- Subscription
- Artwork display
- Leaderboard Ad management

calculate clinical outcome prediction. The machine learning-based model hiding in the background may have been developed natively in R using the famous ranger random forests modeling package. The newly entered parameter data is stored in a SQL database using the odbc package and is called periodically for use to re-train the model. The R statistical language does it all, seamlessly, using the same syntax. Most importantly, the syntax is intuitive to people like me who have no computer language experience and do not know how computers work inside metal cases.

In my opinion, simple Shiny webApps can be created for routine clinical data collection and reporting, standardized scoring system development, clinical protocol reminders, real-time quality

Neonatology Today's Digital Presence

Neonatology Today's now has a digital presence. Although officially still in beta, the site is operational now and defines the future look of our digital web presence. By clicking on this <https://www.neonatologytoday.org/web/>, researchers can download individual manuscripts both in digital format and as part of the original PDF (print journal). While the PDF version of Neonatology Today will continue in its present form, we envision that the entire website will be migrated to this format in the next several months. We encourage you to take a look, "kick the wheels," and let us know where we still need to improve.. We are working towards making the website more functional for subscribers, reviewers, authors and anyone else. Although we have not yet applied for inclusion in the National Library of Medicine Database (Pub-Med), this new format meets several of the important metrics for this ultimate goal.

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. Please see the next page for details

Please find a preview of our new interface just to the left of this column.

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

fu-sheng.chou@neonatologytoday.net

improvement project reporting. A more sophisticated webApp can be created to guide the clinical decision, provided the background statistical model has a good predictive value. Shiny webApp developers may be concerned about HIPAA compliance, but there are ways to avoid violating the regulations. Data used for analysis in R are stored in the random-access memory (RAM), which means that, unless you ask R to write the data object into a file on a disk or a flash drive, the data will not be stored permanently. In other words, as long as the private health information is not directly written into a file, there should be minimal concerns for HIPAA violation. A local institutional review board should always be consulted to determine compliance at the institute level.

I would like to thank Dr. Goldstein again for creating this Data Science column for me to share my stories about learning coding in R and developing shiny webApps. Starting next month, I would like to introduce you to some simple R syntax and show you how to develop simple webApps that may assist you with some of your routine workflows in the NICU. I plan to show you how to create a modified Finnegan scoring webApp to assess the severity of neonatal abstinence syndrome and opioid withdrawal.

More to come. Thanks for reading this post!

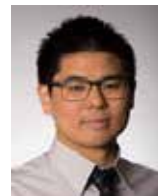
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The Village Son



A Life's Journey

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

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Fellow Column: COVID-19: The Latest TORCH Infection?

Sarin Pakhdikian, OMS III

The placenta is the primary site of nutrient and gas exchange between the mother and fetus. The two components, fetal and maternal, are made of parts that confer growth and resilience. Cytotrophoblasts are the inner layer of the chorionic villi that make up the cells, while the syncytiotrophoblasts are the outer layer responsible for synthesizing and secreting hormones (such as beta-human chorionic gonadotrophin). It lacks MHC-I expression, which decreases the chance of attack by the maternal immune system. (1) The decidua basalis makes up the maternal component, derived from the endometrium, and stores maternal blood in the lacunae.

Select microbes are notorious for bypassing the protective barriers from mother to fetus via transplacental transmission or during delivery. *Toxoplasma gondii* poses the threat of chorioretinitis, hydrocephalus, and intracranial calcifications. Rubella can lead to cataracts, deafness, and congenital heart disease (i.e., patient ductus arteriosus), while cytomegalovirus can cause hearing loss, seizures, petechial rash, and periventricular calcifications. Human immunodeficiency virus, which can be well managed during pregnancy, may give rise to chronic infections and diarrhea in the infant. Herpes simplex virus-2 may result in meningoencephalitis or herpetic vesicular lesions. Syphilis can cause stillbirth and hydrops fetalis.

“Select microbes are notorious for bypassing the protective barriers from mother to fetus via transplacental transmission or during delivery.”

It is now important for us to consider where this leaves COVID-19 infections.

In a review by Karimi-Zarchi, et al. (2020), the authors speak to the vertical transmission of coronavirus from infected mothers to neonates. In the case of 31 infected mothers with COVID, there was no indication of COVID-19 nucleic acid detected in the placentas or neonatal throat swabs by RT-PCR. (2) There were no specific recommendations, however, to pregnant women regarding the evaluation or management of COVID, which is important considering that the transmission of the virus via respiratory droplets during breastfeeding has been documented. Two mothers had died of COVID related respiratory issues after delivery. Their clinical characteristics were similar to non-pregnant women with the infection. Maternal pneumonia was related to adverse obstetrical outcomes such as preterm rupture of membranes, preterm labor, intrauterine fetal demise, intrauterine growth restriction.

The clinical characteristics of coronavirus disease in newborns, infants, and children were discussed by Hong et al. (2020). The first critically ill patient reported at Wuhan Children’s Hospital was a 1-year old male. He presented with intermittent diarrhea and vomiting for six days, fever, and shortness of breath. Pneumonia

was evident in the right lung on the day of admission. The patient did not test positive for the virus until day eight and was weaned off the ventilator by day 10, fully recovering from the virus. Pediatric cases were caused mainly by family clusters. These infections were epidemiologically linked to adult patients, with at least one infected family member in the household. (3) The youngest case for a neonatal infection was noted 30 hours after birth with no evidence of vertical transmission.

“These infections were epidemiologically linked to adult patients, with at least one infected family member in the household. (3) The youngest case for a neonatal infection was noted 30 hours after birth with no evidence of vertical transmission.”

There has been a debate on whether SARS-COV-2 is the newest spark in the TORCH infections. Muldoon et al. (2020) discuss infections during pregnancy are increasingly being described, but the frequency and severity of infections in newborns are incompletely defined. In a sample of infected fetal mice during all three trimesters of pregnancy, no fetal infection was noted, along with a variation among different strains of mice. Infection of cats with the coronavirus feline infectious peritonitis virus resulted in newborn kittens becoming carriers of the virus. There was no conclusive evidence of transplacental transfer of SARS-COV-2 from mothers with COVID-19 disease. Signs and symptoms of the illness in infants and infected mothers were noted as shortness of breath, fever, thrombocytopenia, abnormal liver function, tachycardia, vomiting, and pneumothorax. In a case series of six women with mild COVID-19 disease, the authors discuss the multiples measures taken to perform a Caesarean section, including isolation of their infants following delivery, no delay in cord clamping, and reduced infant to breast directly after delivery. (4) Two of these six infants had IgM antibodies to SARS-COV-2 present, although neither had symptoms. All of these infants repeatedly tested negative when tested for viral RNA upon subsequent testing. Another analysis of 33 neonates born to mothers with COVID-19 identified three neonates with SARS-COV-2 infection. Positive IgM serology was found in a neonate born by Cesarean section to a mother with SARS-COV-2 pneumonia. Current data suggest that IgM antibodies against the virus develop in the circulation after the first week of infection, while IgG antibodies become detectable sometimes beyond 14 days of infection. As a result, the detection of specific antibodies (IgM, IgG, or both) would suggest that a person has been infected with the virus at some point in time.

In a recent case report by Sisman et al. (2020), a woman experienced a complicated pregnancy due to maternal diabetes and obesity, late-latent syphilis, and preterm premature rupture of membranes. The infant was born at 34 weeks’ gestation, large for gestational age, and admitted to the NICU. The problem list included prematurity, glucose monitoring, and SARS-CoV-2 exposure. Within 24 hours, the infant experienced fevers and

respiratory distress, testing positive at 24 and 48 hours of life for the virus. Interventions began with ampicillin, gentamicin, and acyclovir. The patient was weaned to room air by day five, although still testing positive on day 14. Upon discharge, on day 21, the infant tested negative and had fully recovered. The most prominent finding, in this case, was the presence of cytoplasmic staining for the SARS-CoV-2 nucleocapsid protein by immunohistochemistry and demonstration of viral particles by electron microscopy in the syncytiotrophoblastic cells, strongly suggesting in utero transmission. (5)

“It is important to explore how transmission of this virus may occur due to ascending infection with premature rupture of membranes and primary involvement of the maternal gastrointestinal tract, or by hematogenous spread if the mother was viremic during her initial infectious period.”

It is important to explore how transmission of this virus may occur due to ascending infection with premature rupture of membranes and primary involvement of the maternal gastrointestinal tract, or by hematogenous spread if the mother was viremic during her initial infectious period. Further case studies and reviews are needed to determine the risks of vaginal delivery of mothers with SARS-CoV-2. More robust pre and postpartum prevention guidelines should also be established to test amniotic fluid, breastmilk, PCR techniques, as well as cord blood antibody testing.

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- Topics may include Perinatology, Neonatology, and Younger Pediatric patients.
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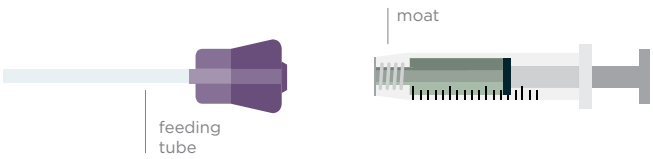
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SAFETY IN THE NICU
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- The moat design can increase risk for infection if residual breast milk or formula remains in the moat and transfers to the feeding tube.

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- Increased nursing workflow is seen with additional steps for clearing syringe moats, cleaning tube hubs, and using multiple connectors.

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Holidays, Travel, and Infant Safety During this Pandemic Time

Barb Himes, IBCLC



Saving babies. Supporting families.

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

“These guidelines range from allowing extra time for airport security clearance to using an FAA-approved car safety seat if possible instead of lap-seating, as well as steps to counter ear pain.”

We are approaching the time of year when parents of infants may be considering holiday travel, even during the COVID-19 pandemic. We know some families may be assessing and discussing whether they will travel to be with family, and what extra risks they should be aware of, and precautions they should take.

Traveling with infants has always required a degree of planning, but now, that degree is even higher, and clinicians and other health care providers may be in a position to help families decide

on a course of action. Weighing how essential the trip may be and if it can be postponed until safer times (or if the infant has underlying health conditions that make any travel inadvisable) is a necessary first step. It is ultimately the family's decision, but looking at the additional planning and precautions required may be helpful to them.

Initial issues to examine include the levels of COVID-19 spread where the family lives and the levels at their destination. If quarantine restrictions are in place where they are going or imposed when they return, it may make the effort too burdensome. The family should also review the health risk for itself and those who are being visited, including individual age brackets and any underlying conditions that could increase the potential for morbidity or death from the virus.

More Planning and Preparation

Government health agencies and maternal and infant health-related outlets have been providing information based on what is currently known in this changing environment. The American Academy of Pediatrics offers guidelines for car and air travel (1) in general, which are still relevant during the pandemic.

These guidelines range from allowing extra time for airport security clearance to using an FAA-approved car safety seat if possible instead of lap-seating, as well as steps to counter ear pain. Families should now add to this the need to clean car seats and their surroundings, mask, and social distance as much as possible. Airlines have instituted various pre-flight precautions, including ongoing touchpoints cleaning, temperature checks, and increased in-flight HEPA filtration, and families should check with individual carriers to learn what regimen they have put in place.

If families do not plan to use a car safety seat, some airlines also offer bassinets that fasten to the wall in front of bulkhead seats. They cannot be used during landing and take-off or during turbulence, but if they are available may nonetheless provide a change-up from lap-seating. Parents may also choose to “wear their babies” during the flight but should be careful to position the infant's head, so breathing is not obstructed.

Travel by car traditionally begins with planning ahead on what to bring, such as a car seat and a play yard, and planning the route and anticipated stops. It now must include cleaning the vehicle interior, disinfecting where possible and washing where not (e.g., avoiding corrosive disinfectants on car or booster seats and seat belts), and carrying disinfectants that can be used on surroundings



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in rest stops, motels, hotels, and Airbnbs.

In addition, if families cannot bring a crib of their own they should try to ensure that the hotel or motel they are driving or flying to will have one and be prepared if it does not or fails to provide one upon their arrival. Even when traveling, it is important to provide a safe sleep environment for infants as a precaution against Sudden Unexplained Infant Death (SUID), which includes Sudden Infant Death Syndrome (SIDS) and Accidental Suffocation and Strangulation in Bed (ASSB) and is the leading cause of U.S. infant death from one month through the first year of life.

The surface must be firm and flat, with no extraneous bedding materials. Possible substitutes include a dresser drawer, a laundry basket, or even a cardboard box. Still, they do not include bed-sharing with parents or overnight sleep in a car seat, both of which increase the risk of impaired breathing (if baby's head tilts forward in the seat) or suffocation. The baby's clothing should be layered to avoid using blankets.

“As of October 2020, under the Friendly Airports for Mothers (FAM) Act, the Federal Aviation Administration requires large- and medium-sized airports to provide separate (restrooms do not count), sterile private facilities where mothers can express milk.”

Breastfeeding and Travel

Breastfeeding carries with it a number of maternal and infant benefits ranging from natural inoculation to bonding and has been associated with a reduction in SIDS deaths. (2) During air travel, nursing can also help alleviate cabin pressure-induced ear pain in babies. If families plan to travel with expressed milk, in the U.S., it is exempt from the Transportation Security Administration limits on liquids. As of October 2020, under the Friendly Airports for Mothers (FAM) Act, the Federal Aviation Administration requires large- and medium-sized airports to provide separate (restrooms do not count), sterile private facilities where mothers can express milk. Families should also consider the equipment and cooler needs for traveling with expressed milk and what they plan to do with it when they reach their destination.

Another consideration is the infant's sleep habits and maintaining a sleep plan during travel. Among the rituals incorporated into a sleep plan, which may include baths and cuddling and lullabies, is timing and creating a habit for the infant, and this will naturally be disrupted during travel. Families should discuss with their health care providers what their current sleep plans are, how to make adjustments for travel, and how to resume the routine when they return.

We know these are trying times, and there may be occasions when the need to be with family overrides the risks involved in

getting there and back. If parents are encouraged to seek advice from their health care providers, map out detailed planning in advance and allow for the extra time, equipment and effort that will be required and consider testing to monitor their status, there may be hope for a successful outcome.

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Disclosure: *The author is the Director of Education and Bereavement Services of First Candle, Inc., a Connecticut not for profit 501c3 corporation.*

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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-surveillance.html

www.nationalperinatal.org

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 and 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

www.nationalperinatal.org/NICU_Awareness



Raising Global Awareness of RSV

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

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

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



High-Frequency Ventilation: Rescue Me from Rescue

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.

I recently spent some time teaching new jet ventilator users. During the discussion after my talk, one of the physicians commented that "HFO is for rescue." Given that I have used high-frequency ventilation (HFV) as first intention for approximately 15 years, I had to take issue with the comment.

"There is a saying in the information technology sector: "GIGO," meaning "garbage in, garbage out." One could use this expression when it comes to "rescue" ventilation modes; the worse a baby is before being offered the "rescue" therapy, the less successful the therapy is likely to be."

There is a saying in the information technology sector: "GIGO," meaning "garbage in, garbage out." One could use this expression when it comes to "rescue" ventilation modes; the worse a baby is before being offered the "rescue" therapy, the less successful the therapy is likely to be. Indeed, it is a testament to the efficacy of HFV that it would be considered a rescue mode in the first place.

When the unit I practice in received its first second-generation oscillators (in our case, the Babylog® 8000 plus), I observed that most of our micro-preemies started on conventional ventilation (CV) ended up being oscillated. The thought came to mind "why not just start them on HFV"? That is what ended up happening over a few years of practice with the new machines, and we have never looked back; our chronic lung disease (CLD) rates improved and are to this day world-class. When we first started using the Bunnell LifePulse® 203 ventilator, it too was used as a rescue device. Not surprisingly, a number of babies did not survive, to the point of us having a theme song for "the jet," sung to the tune of

Peter, Paul and Mary's "Leaving on a jet plane." I leave it to the reader to fill in the blanks.

Eventually, using high-frequency jet ventilation (HFJV), we saved a baby that was not expected to survive. This progressed to using the jet more frequently and earlier in a baby's course. Today we selectively use the jet as the first intention for a list of pathologies and antenatal histories. Again, our CLD rates remained low and actually improved.

Today, our practice offers HFO and/or HFJV to babies as the first intention, and very few babies are managed with CV. For example, our 2016 ventilation hours were 14664 hours of HFO, 22584 hours of HFJV, and only 816 hours of CV. These numbers hardly represent HFV use as a rescue. Most notably, our CLD rate in 2015 was 8.1%.

"The history of HFV is full of controversy. Early studies, notably the dreadful "HIFI" study of the early '80s, did not favour HFV; indeed, quite the opposite was the case. Later analysis suggested the problem was not in the mode, but rather the practice: mean airway pressures were too low, and an "open lung" strategy was not employed."

The history of HFV is full of controversy. Early studies, notably the dreadful "HIFI" study of the early '80s, did not favour HFV; indeed, quite the opposite was the case. Later analysis suggested the problem was not in the mode, but rather the practice: mean airway pressures were too low, and an "open lung" strategy was not employed. When the "HIFI" results were excluded from meta-analysis, outcomes were similar between HFO and CV.(1)

Attending the annual "Snowbird" conference on high-frequency ventilation of infants and children was eye-opening. Studies were presented that showed that, at the very least, HFV was both safe and effective, at least as much as CV. Many didn't reach statistical significance, but all came close. A large study by Durand et al. out of Oakland Children's was the first I saw to establish the safety of HFO (2) definitively. Later studies confirmed the relative safety of HFO. (3) More recent studies suggest better neurodevelopmental outcomes with HFO than CV(4) and better pulmonary outcomes

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at age 11-14 in babies managed with HFO c.f. CV.(5)

Many of the more studies favouring HFO are from Great Britain or Europe where they use 2(nd) and 3(rd) generation machines such as the SLE and SLE 6000®, a ventilator with a piston-driven HFO option, the now obsolete Drager Babylog®()8000 plus, and the Drager VN-500® which also gives the option of volume targeted HFO. The latter two machines are pneumatically driven oscillators. American investigators have been limited to using the Sensormedics 3100a®. One cannot compare the latter machine, a first-generation stand-alone oscillator, with the second and third-generation multi-function ventilators. It is speculative; however, the difference in the devices may account for more favourable outcomes with newer, more sophisticated devices. Certainly, the ability to monitor and target HFO volumes should facilitate gentler, more lung-protective ventilation. These newer machines also provide the option of providing recruitment breaths to reverse atelectasis as they incorporate a CV ventilator.

“Certainly, the ability to monitor and target HFO volumes should facilitate gentler, more lung-protective ventilation. These newer machines also provide the option of providing recruitment breaths to reverse atelectasis as they incorporate a CV ventilator.”

An early study comparing HFJV with CV in the early treatment of respiratory distress syndrome showed a significant increase in adverse outcomes, namely cystic periventricular leukomalacia (PVL). It showed no correlation between hypocarbia and PVL.(6) There was no mention of the rapidity of changes in PaCO₂, which, in my mind, are more deleterious than hypocarbia itself. A study by Kezler also showed significantly better outcomes with HFJV than CV.(6) It is important to note the Kezler study utilized an open lung strategy and showed no difference in the incidence of PVL or IVH with HFJV. When combined with the HIFI trial outcomes, it is clear that an open lung approach to ventilation is more important when bleeds are concerned than the mode of ventilation itself. The use of HFV was still in its infancy when these trials were conducted, and I suspect variations in practice and strategy were responsible for adverse outcomes and not the modes themselves. As clinicians increasingly understand the importance of open-lung ventilation, it is my opinion; the evidence will continue to support HFV's safety.

In addition to published data, experience in the unit in which I practice does not support an increased risk of brain bleeds or PVL using HFO or HFJV; our numbers are in line with our comparators. Given the large number of micro-preemies seen in our unit, I can say this with confidence.

It is unlikely further studies on HFJV will be done if such studies withhold the modality. Those who use the jet well have little or no equipoise and are unlikely to participate, although studies comparing HFO with HFJV would be useful; a Cochrane search for said modalities will come up empty. (7)

Several units with very good outcomes use HFV as the first intention for those babies requiring invasive support, my own included. While not empirical evidence, the sum of the parts surely

gives a picture of the whole.

Given the current state of evidence, I submit it is high time to stop considering HFV as rescue therapy and utilize it more often and earlier in a baby's clinical course. When doing so, the importance of using adequate mean airway pressure/PEEP cannot be understated. We need to stop placing infants in a position wherein they require "rescue."

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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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Middle School_____	\$3,240

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Color Blind: Shedding Light on the Mental Health of LGBTQ People of Color

Kristan Scott, MD, Vincent C. Smith, MD, 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.



“ Their full support – including around mental health issues – can make a huge difference for families. This is especially true for communities of color and LGBTQ (Lesbian, Gay, Bisexual, Transgender, Questioning/Queer)-headed families.”

It is a frightening, isolating moment to be a new parent. And those supporting new parents right now – from medical providers and social workers to home visitors -- are critical front-line workers. Their full support – including around mental health issues – can make a huge difference for families. This is especially true for communities of color and LGBTQ (Lesbian, Gay, Bisexual, Transgender, Questioning/Queer)-headed families.

“ With the rise of the Black Lives Matter movement and threats against transgender employment rights and health protections, 2020 has been marked by significant social distress for communities of color and the LGBTQ community.”

With the rise of the Black Lives Matter movement and threats against transgender employment rights and health protections, 2020 has been marked by significant social distress for communities of color and the LGBTQ community. Unfortunately, it is now well known that among the many consequences of social oppression, there are significant negative effects on the mental health of the oppressed populations. As healthcare providers in a time when more LGBTQ-identifying youth are entering pediatric practices, and the traditional American family structure is changing with an increase in LGBTQ-headed families, we must reflect on the health of this population, especially as it intersects with communities of color. As neonatal providers, it is vital that we also be aware these families will be carrying additional stresses, magnifying the already taxing experience of the NICU. This can lead to some skepticism related to medical practice and some heightened sensitivity to mistreatment.

According to the National Institute of Mental Health (NIMH), mental illnesses are common, with nearly one in five adults in America living with a serious mental

illness. An estimated 17.3 million adults in the United States had at least one major depressive episode. An estimated 31.1% of adults will experience an anxiety disorder at some time in their lives. Notably, LGBTQ people are more than twice as likely to face a mental health problem in their lifetime compared to their heterosexual counterparts(1). More strikingly, LGBTQ youth are over two times as likely to attempt suicide than their straight peers(2). The majority of mental illness develops by a person's mid-20s, which can ultimately have significant implications in areas such as work productivity in adulthood. (3,4) Unfortunately, studies suggest that there is a significantly higher prevalence of mental health issues such as depression, anxiety, eating disorders, self-injury, and suicidality among LGBTQ college and graduate students, who are in this aforementioned age range. (5,6) The data for mental health prevalence among racial minority populations varies; however, some studies suggest a significant burden of mental health problems among racial/ethnic minority students in addition to limited use of mental health services. (7,8)

The disproportionate presence of mental health problems for the LGBTQ community and communities of color is explained by the theory of minority stress. (9) It outlines how the stigma, prejudice and discrimination associated with a person's minority status (i.e., race, sexuality, gender) creates a negative social environment that results in mental health problems. Major discriminatory events like observing or experiencing differential treatment by medical providers that often go unmentioned to staff are certainly contributors to minority stress. Furthermore, microaggressions like providing inadvertently exclusionary handouts that say “mother” and “father” to a same-sex couple in the NICU certainly add to this stress. (10)

Intersectionality describes how social identities and social inequality based on race and sexual orientation are interdependent, not mutually exclusive. (11) As such, the way in which LGBTQ people of color experience the world is unique as they hold multiple identities of marginalization. For instance, LGBTQ people of color may both experience racism within the LGBTQ community and homophobia within their respective racial/ethnic minority communities. The end result is that many of these families don't feel welcomed or included by either

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the racial/ethnic minority or LGBTQ community. Recognizing the compounding effect of the multiple minority stressors, the prevalence of mental health problems in LGBTQ communities of culture may not be captured by studies that investigate the association of mental health with race and sexuality independently.

LGBTQ people of color represent an underserved and under-researched population, especially in the area of mental health. Considering the potential consequences of the intersectionality of race and LGBTQ status, the mental health prevalence of this population may not mirror that of the larger population. One online survey of 200 participants suggests an additive effect of multiple forms of discrimination on the mental health of LGBTQ people of color. (12) However, few studies have investigated this issue or had a large enough sample size to elucidate significance.

As healthcare providers, we must investigate the etiologies and consequences of this inequity in the burden of mental health for the LGBTQ community of color and develop interventions to mitigate the effects of this disparity within our practices and ultimately within our health care system. Furthermore, as neonatal providers, we must recognize the burden of mental health issues impacting our families from LGBTQ communities of color and be proactive about assessing needs and providing essential support.

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- Make **health equity** and **implicit bias** training mandatory.
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- 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.
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- H**ELP EXPLORE OPTIONS
- A**SSESS PREFERENCES
- R**EACH A DECISION
- E**VALUATE THE DECISION



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- **UNCERTAINTY**

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We need to understand more about outcomes for mothers
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NICU Awareness

Did You Know?

Most NICU babies have special needs that last longer than their NICU stay. Many will have special health and developmental needs that last a lifetime. But support is available.

Learn about the programs in your community. Seek out other families like yours. Then ask for help. Working together we can create a community where our children will grow and thrive.

Special Health Needs

Babies who have had a NICU stay are more likely to need specialized care after they go home. **Timely follow-up care is important.**

NICU babies have a higher risk for re-hospitalization. So every medical appointment is important. Especially during cold and flu season when these babies are especially vulnerable to respiratory infections.

Who Can Help

- pediatricians
- neonatal therapists
- pulmonologists
- neurologists
- gastroenterologists
- cardiologists
- nutritionists
- CSHCN - Programs for Children with Special Health Care Needs

Special Developmental Needs

Any NICU stay can interrupt a baby's growth and development.

Needing specialized medical care often means that they are separated from their parents and from normal nurturing.

While most NICU graduates will meet all their milestones in the expected developmental progression, it is typical for them to be delayed. This is especially true for preterm infants who are still "catching up" and should be understood to be developing at their "adjusted age."

Who Can Help

- IBCLCs and lactation consultants
- Early Childhood Interventionists
- developmental pediatricians
- occupational therapists (OTs)
- physical therapists (PTs)
- speech therapists (SLPs)
- WIC - Special Supplemental Nutrition Program for Women, Infants, and Children
- social workers and case managers

Special Educational Needs

Every child has their own unique developmental needs and **every student has their own unique and special educational needs.**

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Who Can Help

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- Special Education programs under the Individuals with Disabilities Education Act (IDEA)
- educational psychologists
- speech therapists (SLPs)
- occupational therapists (OTs)
- reading specialists



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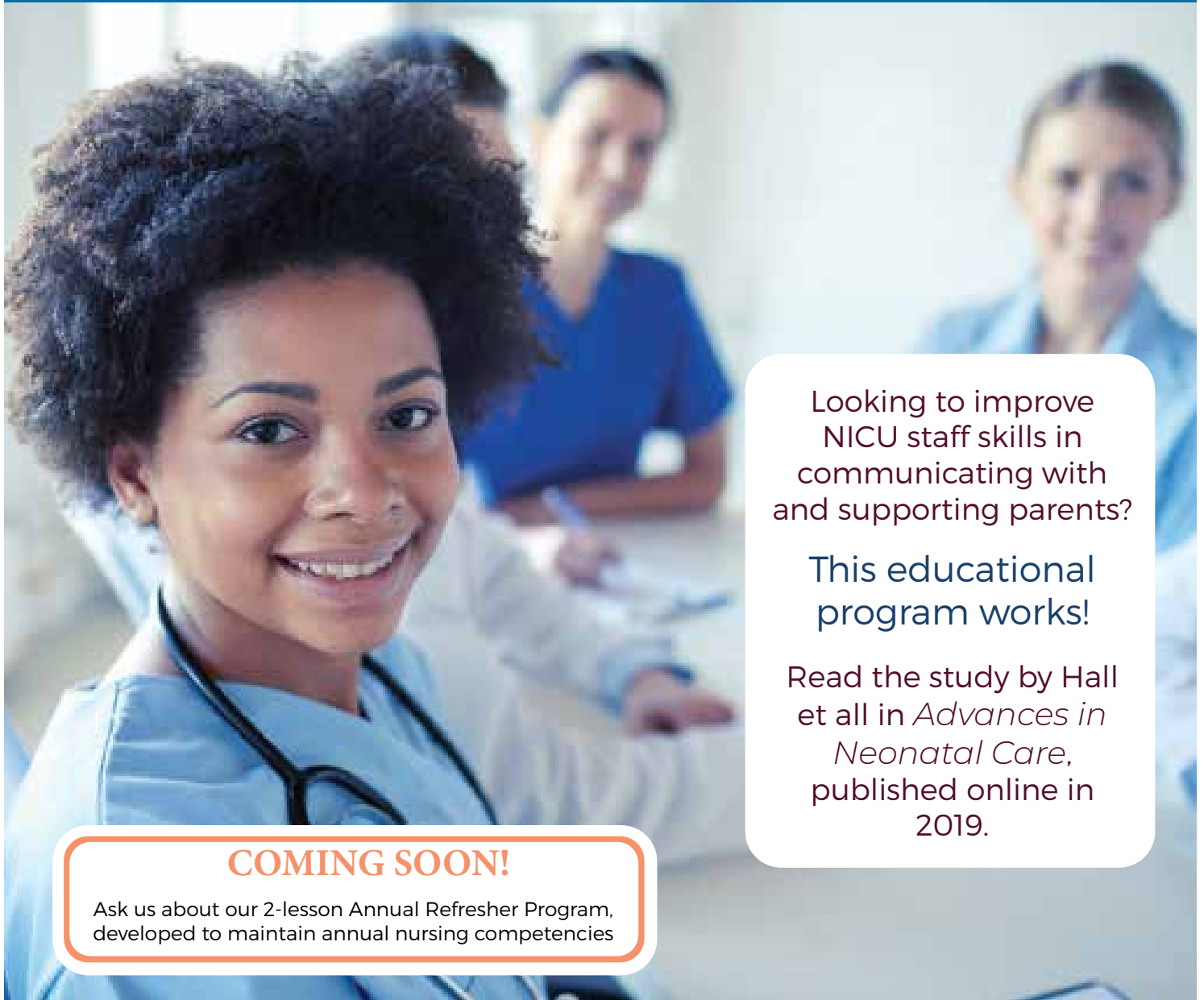


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How to Bridge Gaps in Preventive Care

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

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



As COVID-19 cases swelled this year, many pediatric specialists saw their daily caseloads dwindle – with vaccination rates tumbling alongside them.

“As COVID-19 cases swelled this year, many pediatric specialists saw their daily caseloads dwindle – with vaccination rates tumbling alongside them.”

The Centers for Disease Control and Prevention reported a significant drop off in provider orders through the Vaccines for Children Program. The program, which provides federally purchased vaccines to approximately half of children, saw roughly 3 million fewer doses of vaccine ordered in April, as compared to 2019.¹

Child vaccinations were down across the country but declines among the hardest hit urban areas were staggering. New York City, for example, in mid-May reported a “shocking” 91% decrease

in vaccinations for children older than two.² While the downfall in suburban and rural areas was not as severe, millions of children around the country missed routine immunizations. In many cases, immunizations were missed because well-child visits were canceled.

So how can providers and health systems ensure that missed visits, especially those that coincide with immunizations, get made up?

One large health system has a few suggestions. Nemours health system, which operates hospitals and primary care practices in three states, saw a 28.5% decrease in immunizations among pediatric patients between March and May. (3) Yet they rebounded strong. As recently highlighted in *Fierce Healthcare*, Nemours is now 4.6% above last year’s total immunization rate for children.

“One large health system has a few suggestions. Nemours health system, which operates hospitals and primary care practices in three states, saw a 28.5% decrease in immunizations among pediatric patients between March and May. (3)”

Here’s their three-pronged approach to buck the trend:

1. **Creating patient cohorts:** Nemours separated sick visits from well visits. This was done by time-blocking within single offices so that certain times of the day were reserved for well patients only, while sick patients visited during other hours. In areas with closely located offices, some clinics were earmarked “clean practices.” These locations saw only newborns or kids who were not sick.
2. **Increasing use of telehealth:** Nemours dusted off its underused telemedicine infrastructure. It created a virtual queue that allowed patients to be seen virtually on-demand, “almost like walk-in patients.”
3. **Outreach to patients:** With fewer in-person visits, Nemours reallocated some staff to make outbound



calls. After taking the time to explain the system's safety protocols and check in with the family, the staff then helped parents schedule make-up appointments.

“ By making adjustments that help families feel safe about preventive care, health care providers also can help keep immunizations on track as the COVID-19 pandemic marches on.”

Not all of these approaches – nor the scale to which they were implemented – may not be suitable for every practice. Yet, Nemours' success is a valuable example of how a willingness to adapt and employ some outside-the-box thinking can benefit patients and the public's health in the long term.

Outbreaks of vaccine-preventable diseases are the last thing American communities need right now. By making adjustments that help families feel safe about preventive care, health care providers also can help keep immunizations on track as the COVID-19 pandemic marches on.

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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:

- Jaundice
- Feeding issues
- Respiratory problems

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

Born preterm at a "normal" weight?

STILL A 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

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Interpreting Umbilical Cord Blood Gases: Cord Occlusion with Terminal Fetal Bradycardia: Part II

Jeffrey Pomerance, MD, MPH

Case 10: Umbilical Cord Occlusion with Terminal Fetal Bradycardia, Mild

The mother was a 26-year-old, gravida 4, para 3, aborta 0, with an intrauterine pregnancy at 40 0/7 weeks' gestation by good dates. Because of decreased fetal movement complaint three days before admission, a non-stress test was performed and was reactive, but had several mild, variable decelerations. Membranes ruptured spontaneously two hours prior to admission. During labor, the FHR monitor revealed recurrent variable decelerations that were deeper and longer-lasting, and then a deceleration to 60 bpm for three minutes. The patient was taken fully dilated to the delivery room, where the FHR monitor revealed a variable deceleration to 60 bpm for 90 seconds. The infant was then delivered by outlet forceps. The umbilical cord was tight around the shoulder and body. Apgar scores were 6 and 9 at one and five minutes, respectively.

Cord blood gas results were as follows:

	Umbilical Vein	Umbilical Artery
pH	7.22	7.10
Pco ₂ (mmHg)	52	70
(kPa)	6.93	9.33
Po ₂ (mmHg)	18	10
(kPa)	2.40	1.33
BD (mmol/L)	7	11

Interpretation

The respiratory acidosis in the venous sample is mild; the base deficit is within normal limits. The respiratory acidosis in the arterial sample is also mild, but there is also a mild metabolic acidosis. The usual relationship between venous and arterial values is intact; the venous pH and Po₂ are higher, and the venous Pco₂ is lower. However, the differences between venous and arterial pH, Pco₂, and base deficit are greater than usual. *The hallmark of cord occlusion with terminal bradycardia is widened venoarterial pH, Pco₂, and sometimes base deficit differences, usually associated with normal or near-normal umbilical venous cord gases.*

Widened differences also may be associated with fetal heart failure. With intact umbilical-placental circulation, any metabolic acidosis appearing in the umbilical artery will almost instantaneously appear in the umbilical vein. However, because lactic acid crosses the placenta poorly, a greater base deficit in the arterial cord blood sample indicates the presence of umbilical vein occlusion with at least some interval of partially restored umbilical arterial blood flow. There is no general agreement on the definition of a widened base deficit difference. However, it seems safe to assume that a difference of 4 mmol/L or more is significant.

Because pH is the most reproducible of the three measured blood gas parameters, looking at the difference between pHs to alert to an abnormally large difference is most helpful. Using the data published by Yeomans, Hauth, Gilstrap, and Strickland, the average pH difference is 0.07 (7.35 minus 7.28 = 0.07). Assuming a normal distribution of differences between umbilical venous and arterial pH, the upper limit of the 95th percentile range is 0.10 (see

Case 5). Finding a pH difference greater than 0.10 suggests either cord occlusion with terminal bradycardia or chronic fetal heart failure with terminal bradycardia. The former is a much more common event. Likewise, any umbilical venoarterial Pco₂ difference of greater than 18 mmHg also is associated with either cord occlusion with terminal fetal bradycardia or chronic fetal heart failure with terminal fetal bradycardia. Although widened pH differences are almost always associated with cord occlusion with terminal fetal bradycardia, rarely the pH difference falls within the normal range, 0.04 – 0.10. A widened difference in Pco₂ (18 mmHg or greater) in the absence of a widened pH difference is clinically quite rare.

“ Although widened pH differences are almost always associated with cord occlusion with terminal fetal bradycardia, rarely the pH difference falls within the normal range, 0.04 – 0.10. A widened difference in Pco₂ (18 mmHg or greater) in the absence of a widened pH difference is clinically quite rare.”

The umbilical vein is more easily compressed than the umbilical arteries because it has a thinner muscular wall, and the mean blood pressure in the vein is lower than that in the arteries by a factor of approximately ten. At term, normal mean umbilical venous blood pressure is 4.9 mmHg, whereas normal mean aortic blood pressure is about 52 mmHg. Although these arterial blood pressure measurements were taken in fetal sheep, they are thought to be a reasonable estimate for the human fetus.

As the umbilical cord is compressed, blood flow in the umbilical vein may briefly slow prior to coming to a complete stop. Johnson and Richards have reported that in cases of umbilical cord prolapse, umbilical venous Po₂, oxygen saturation, and oxygen content were all significantly greater than reference values. This makes good sense if there is a period of time preceding total venous occlusion when the blood in the umbilical vein is slowed rather than halted. The slower the circulation is through the placenta, the greater the amount of oxygen diffusion from mother to fetus, and the higher the Po₂ in the umbilical vein. Additionally, in the face of FHR decelerations, the mother is usually administered supplemental oxygen, which may also be expected to raise the umbilical venous Po₂ as long as there is continued umbilical venous blood flow.

Benirschke and Kaufman have observed that cord compression (presumably cord occlusion followed by terminal fetal bradycardia) leads to congestion in the terminal capillaries and an increase in villous blood volume, sometimes by more than 50%. One might use this estimate to calculate the maximum amount of blood a fetus could transfer to the placenta during cord occlusion associated with terminal fetal bradycardia. Then using 125 mL/kg of newborn weight as the total fetal-placenta blood volume and 84 mL/kg as the total blood volume of a term newborn, one could calculate

Cord Occlusion with Terminal Fetal Bradycardia

Anatomy and Pathophysiology: Sequential Events and Approximate Timeline

Anatomy	Changes in Cord Blood Flow	Duration	Effect on Cord Gases
Narrowing of the umbilical vein	UV: Slowed UAs: No change	None to seconds	UV: ↑ Po ₂ UA: No change
Complete occlusion of UV and UAs	UV: No flow UAs: No flow (↑arterial BP → reflex ↓ FHR)	One to few minutes	UV: No change UA: No change
UV: completely occluded UAs: regain partial patency (2° to ↑ BP)	UV: No flow UAs: Partial restoration of flow (2° to ↑ BP) → ↑ing fetal hypovolemia → ↑ing tissue ischemia	Few seconds (rare) to < 15 minutes	UV: No change UA: ↑ing respiratory and metabolic acidosis
Resumption of complete occlusion of UV and UAs	UV: No flow UAs: No flow (2° to ↑ing occluding forces, ↑ing hypovolemia and/or ↓ing BP)	None to many minutes (depending on the timing of delivery)	UV: No change UA: No further change (continued ↑ing respiratory and metabolic acidosis at fetal tissue level)

Table
Cord occlusion with terminal fetal bradycardia: Relationship of anatomy, pathophysiology, duration, and effect on umbilical cord blood gases.

UV, umbilical vein; UAs, umbilical arteries; ↑, increased; ↓, decreased; 2°, secondary

the approximate upper end of blood transferred from fetus to placenta, i.e., a placental blood volume increase of approximately 20.5 mL/kg (50% of placenta blood volume: 125 minus 84 mL/kg = 41 mL/kg times 50% = 20.5 mL/kg, divided by 84 mL/kg = 24%), giving an approximate maximum transfer of 24% of the total fetal blood volume.

Clearly, Po₂ is not always elevated following cord occlusion with terminal bradycardia. At times, congestion might lead to a decreased efficiency of the transfer of carbon dioxide and oxygen between mother and fetus.

The pH, Pco₂ and base deficit change quite slowly in a completely occluded umbilical vessel, likely because much of the surrounding tissue (Wharton's jelly) has very little metabolic activity and accordingly utilizes very little oxygen and produces very little carbon dioxide. Meanwhile, the fetus is being deprived of its only supply of oxygen and has a gradually decreasing blood volume. This results in progressive deterioration of the blood gas in the umbilical arteries as long as blood continues to flow in these ves-

sels. If cord occlusion occurs intermittently prior to a terminal cord occlusion and bradycardia, as is usually the case, any respiratory or metabolic acidosis in the fetus will likely recover completely between episodes. If the episodes are severe enough or frequent enough, there may be insufficient time for complete recovery between episodes, and acid-base values will deteriorate over time. In the experimental animal, it has been demonstrated that occluding the cord for one minute and repeating the occlusion every 2.5 minutes results in progressive acidosis in the fetus.

The most likely pathophysiology is as follows: Initially, in terminal cord occlusion, both the umbilical vein and the umbilical arteries are occluded. Usually, however, the blood flow in the umbilical arteries is restored temporarily due to increasing fetal blood pressure. Because of increasing occluding forces, or as fetal blood pressure begins to falter secondary to fetal hypovolemia and cardiac hypoxia, the fetus' ability to continue umbilical artery blood flow will end. When blood flow ceases in the umbilical arteries, the umbilical arterial blood gas will only reflect the fetal blood gas

status at the time blood stopped flowing (see Table above).

“The most likely pathophysiology is as follows: Initially, in terminal cord occlusion, both the umbilical vein and the umbilical arteries are occluded. Usually, however, the blood flow in the umbilical arteries is restored temporarily due to increasing fetal blood pressure.”

Differences between umbilical venous and arterial samples can become very wide (see next installment). Wider differences suggest a longer interval of umbilical vein obstruction with the restored umbilical arterial flow and greater fetal hypovolemia. The time-volume relationship has not yet been quantified, but the duration of umbilical arterial blood flow in the absence of venous return is likely to vary from just a minute or two to probably not more than 10-15 minutes in the extreme. To my knowledge, all animal studies of fetal cord occlusion involve sudden and complete occlusion rather than any period of continued venous occlusion with the restored arterial flow.

Volume expansion is encouraged as part of advanced neonatal resuscitation if more basic care does not result in the desired improvement. However, there is no clear evidence that volume expansion is helpful in neonatal asphyxia. This is difficult to study because of the rarity of delivery room resuscitation that includes volume expansion. As far as I am aware, cord occlusion with terminal bradycardia has never been studied separately as a cause of neonatal asphyxia. It is these infants who are most likely to benefit from volume expansion. As one erudite neonatologist summarized, "Just add water!" (saline).

Although uncommon, the venous sample also may demonstrate significant respiratory and metabolic acidosis. Of course, terminal cord occlusion does not preclude severe repetitive cord occlusion with insufficient time for even the PCO_2 to fully recover between occlusive episodes or a preexisting or simultaneous occurrence of uteroplacental insufficiency.

“Once terminal fetal bradycardia has begun, the umbilical venous blood flow does not reopen; therefore, the venous sample is usually a reasonable proxy for the infant's acid-base status prior to terminal fetal bradycardia.”

As previously discussed, when *uteroplacental insufficiency* causes fetal metabolic acidosis, the degree of metabolic acidosis is approximately the same in both umbilical venous and arterial samples. However, when *umbilical cord occlusion* associated with terminal bradycardia is the underlying pathology, the umbilical artery sample typically has a worse base deficit than in the umbilical

vein sample. In the current case, the difference in the degree of metabolic acidosis between venous and arterial samples is not great (BD 7 mmol/L versus 11). A difference between base deficits of four or more should suggest umbilical cord occlusion with terminal fetal bradycardia (or much more rarely, fetal heart failure). Once terminal fetal bradycardia has begun, the umbilical venous blood flow does not reopen; therefore, the venous sample is usually a reasonable proxy for the infant's acid-base status prior to terminal fetal bradycardia.

Key Points

- The umbilical vein is much easier to occlude than the umbilical arteries.
- Prior to total cord occlusion, there may be a brief period of slowed umbilical venous blood flow. When this occurs, one should expect a higher PO_2 , as increased transit time will result in more time for oxygen to download across the placenta.
- With an intact umbilical-placental circulation, any metabolic acidosis appearing in the umbilical arteries will almost instantaneously appear in the umbilical vein. However, because lactic acid crosses the placenta relatively poorly, a significantly greater base deficit in arterial cord blood indicates the presence of umbilical vein occlusion with at least some interval of partially restored umbilical arterial blood flow.
- Once the umbilical vein becomes occluded, a blood gas sample will only reflect the status prior to the occlusion.
- The hallmark of cord occlusion with terminal bradycardia is widened venoarterial pH, PCO_2 , and sometimes base deficit differences, and is usually associated with a normal or near-normal umbilical venous cord gas.
- A difference between umbilical venous and arterial pHs greater than 0.10 is suggestive of cord occlusion with terminal bradycardia.
- Wider than normal differences between umbilical venous and arterial pH, PCO_2 , and sometimes base deficit suggest an interval when the umbilical vein was occluded, but the blood flow in the umbilical arteries had been restored.
- The wider the differences between umbilical venous and arterial samples, likely the longer the interval of umbilical vein obstruction with the restored umbilical arterial flow. Likewise, there will also be a greater associated fetal hypovolemia.

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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.



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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!

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Medical Legal Forum: Simplified, Real-time, Free access to the Complete Medical Record in the NICU is Coming with Implementation of the 21st Century Cures Act

Jonathan Fanaroff, MD, JD, Robert Turbow, MD, JD
Gilbert Martin, MD

Parents of NICU patients have had the right to review their child's medical records for many years, but in the past such efforts required trips to the medical records department in the sub-basement, long delays, and the significant costs of copying the records. In recent years with the shift to electronic medical records and the development of patient portals, families have had an easier time accessing some, but not all, medical records. This is about to change with the implementation of a rule from the Federal Office of the National Coordinator for Health IT requiring health systems to provide greater access to patient health records.

“This is about to change with the implementation of a rule from the Federal Office of the National Coordinator for Health IT requiring health systems to provide greater access to patient health records.”

The rule is part of the implementation of the 21st Century Cures Act passed by Congress in 2016. The “Cures Act” was originally designed to accelerate medical product development and to bring new innovations to patients who need these products faster. The program also allowed patients to access all the health information in their electronic medical records without charge by their healthcare provider. The original deadline for the rule, November 2, 2020, was moved to April 5, 2021, due to the coronavirus pandemic. Patients will have access to the following types of clinical notes:

- Consultation notes
- Discharge summary notes
- History and physical
- Imaging narratives
- Laboratory report narratives
- Pathology report narratives
- Procedure notes
- Progress notes

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There are limited exceptions. These include certain psychotherapy notes by mental health professionals as well as information gathered for use in civil or criminal proceedings. A note can also be protected if it places the patient in potential danger, such as a discussion about domestic violence when the abuser can access the information. Additionally, certain health information for adolescents may be protected from access by the parents. It will be important to work with hospital legal and compliance experts to determine the specific application of the rule at your institution.

An important second aspect of the rule is penalties for anti-competitive behavior and information blocking that impedes the exchange of medical information. For example, some health IT vendors had a “gag clause” prohibiting the sharing of screenshots. These non-disclosure clauses hinder efforts to improve safety and openly discuss safety concerns.

“An important second aspect of the rule is penalties for anti-competitive behavior and information blocking that impedes the exchange of medical information. For example, some health IT vendors had a “gag clause” prohibiting the sharing of screenshots. These non-disclosure clauses hinder efforts to improve safety and openly discuss safety concerns.”

The destruction of ‘data silos’ and mandated interoperability is designed to improve care and decrease costs by allowing patients to control their electronic health information, download the information to their smartphones, and examine the data with the apps of their choice. For years there has been an issue of who ‘owns’ patient health data, and this question has clearly been answered in favor of patients.

What impact will free, easy access to the medical record have in the NICU? Certainly, some additional education may be necessary. For example, many laboratory ‘normal’ values reflect data for adults, not neonates. Additionally, very sensitive maternal information, such as herpes status and pregnancy history, is part of the neonatal medical record as well. Ultimately the change will likely be very positive, as with most improvements in transparency. Indeed, while a busy NICU team is caring for multiple patients, a family is focused on just one patient and may catch and prevent errors of omission.

Let us not forget that in 2013, the NICU Parent Network created the “NICU Parent’s Bill of Rights.” These ten statements are listed from the perspective of the NICU baby. An example of one statement is, “my parents are my voice and my best advocates; therefore, hospital policies, including visiting hours and rounding, should be as inclusive as possible.

The Cures Act “Final Rule,” which was issued on October 29, 2020, provides our healthcare system additional flexibility and clarifies privacy protections. Healthcare workers face quite a challenge. They must try to take the safest possible care of patients while working in extraordinarily complex systems. The High-Reliability theory offers insight into this dilemma. Increasing reliability has the potential to not only improve outcomes but also to decrease a hospital’s liability.

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Disclaimer:

This column does not give specific legal advice, but rather is intended to provide general information on medicolegal issues. As always, it is important to recognize that laws vary state-to-state and legal decisions are dependent on the particular facts at hand. It is important to consult a qualified attorney for legal issues affecting your practice.



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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

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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Hypermagnesemia and Spontaneous Ileal Perforation in a Preterm Infant

Karen Johal, MD, Shabih Manzar, MD

A case of a preterm infant with spontaneous ileal perforation is described in association with hypermagnesemia. No known causes (infection, hypotension, use of indomethacin, steroids, vasopressors, formula feedings) were identified as the etiology for perforation.

Case:

A female infant was delivered at 28-week gestation to a 21-year-old Gravida 4, Para 2012, with pregnancy complicated by pregnancy-induced hypertension. She was started on Nifedipine. Magnesium sulfate was started for fetal neuroprotection and maternal seizure prophylaxis. She did receive a course of betamethasone. Fetal ultrasound revealed severe intrauterine growth restriction and intermittent absence of umbilical artery (UA) dopplers. A decision was made to proceed with a primary cesarean section given a biophysical profile of 2/8 and persistent absence of end-diastolic flow on UA dopplers. Her urine drug screen and COVID screen were negative. She was O positive, HIV, and hepatitis B negative. She was rubella immune, and VRDL was non-reactive. Membranes were ruptured at delivery, and she remained afebrile.

At delivery, the infant had a weak cry. She was placed in a plastic bag on the pre-heated mattress. Nasal CPAP via T-piece was provided with FiO₂ of 40% to maintain SpO₂ within the range for age. She was continued on nasal CPAP and transported to the NICU. The Apgar score was 7 and 8, at one and five minutes, respectively. In the NICU, her vital signs were stable. Head circumference was 24 cm, weight of 740 g, and length of 34.5 cm. Her physical examination was unremarkable for her stage of prematurity. An umbilical venous catheter (UVC) was placed, and parental nutrition was provided. She remained NPO.

On day three of life, a percutaneous intravenous central catheter (PICC) was inserted to replace UVC. The x-ray obtained to look for the PICC placement showed pneumoperitoneum (Figure). An urgent laparotomy was carried out with loop ileostomy. The gut showed no sign of necrosis. The infant remained stable post-operatively and was extubated the next day. She is currently stable on a nasal cannula and weighs 940 grams (200 grams up the birth weight). A later reconnection is planned per the pediatric surgery team.

“On day three of life, a percutaneous intravenous central catheter (PICC) was inserted to replace UVC. The x-ray obtained to look for the PICC placement showed pneumoperitoneum (Figure). An urgent laparotomy was carried out with loop ileostomy. The gut showed no sign of necrosis.”

Discussion:

As noted in the case description, the perforation was spontaneous. Since birth, the infant remained NPO; there was no history of an umbilical arterial catheter, no use of indomethacin, hydrocortisone, or vasopressors. The infant was clinically stable with neither signs of infection nor any hemodynamic instability. On laboratory evaluation, she was noted to have hypermagnesemia (Table).

“In a recent study, the ratio of the mean umbilical vein magnesium level to the mean maternal serum magnesium level at the time of delivery was described as 0.94 ± 0.15 . (6) Preterm infants because of immature hepatic and renal functions are at increased risk for prolonged hypermagnesemia.”

Hypermagnesemia has been associated with intestinal perforation. (1,2) The proposed pathogenesis is slowing of gut motility resulting in ileus followed by poor perfusion and perforation. Magnesium has cholinergic effects causing hypomotility of the gut - which can be detrimental in premature infants with an immature gut. Magnesium ions can replace calcium ions, disrupting the actin/myosin interaction - reducing contractility - therefore generating atony of intestines and fecal impaction. This reaction can increase the mesenteric arterial resistance, which reduces the mesenteric blood flow resulting in ischemia and perforation. (3) The other plausible mechanism for poor gut perfusion could be the history of intrauterine growth restriction with abnormal UA dopplers.

Antenatal magnesium use is widespread in the management of preterm labor complicated by pre-eclampsia. (4,5) Magnesium ions cross the placenta rapidly, and fetal levels can increase in proportion to maternal levels. In a recent study, the ratio of the mean umbilical vein magnesium level to the mean maternal serum magnesium level at the time of delivery was described as 0.94 ± 0.15 . (6) Preterm infants because of immature hepatic and renal functions are at increased risk for prolonged hypermagnesemia.

In conclusion, preterm infants born to mothers who receive intravenous magnesium are at high risk for prolonged hypermagnesemia. High serum magnesium delays the gut motility and perfusion and is a potential risk factor for spontaneous gut perforation. We suggest a close observation, frequent abdominal examination, and serial serum magnesium monitoring in these groups of infants.

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Table


	Day 1	Day 2	Day 2	Day 3
CHEM PROFILE				
Sodium	142	145	148 ▲	143
Potassium	5.5 ▲	4.2	4.5	5.4 ▲
Chloride	113 ▲	118 ▲	121 ▲	115 ▲
CO2	19 ▼	20 ▼	21 ▼	21 ▼
Anion Gap	10	7 ▼	6 ▼	7 ▼
BUN, Bld	16	35 ▲	40 ▲	41 ▲
Creatinine	0.81	1.10	1.00	0.76
eGFR if non Africa...	SEE COMMENT *	SEE COMMENT *	SEE COMMENT *	SEE COMMENT *
eGFR if African Am...	SEE COMMENT	SEE COMMENT	SEE COMMENT	SEE COMMENT
Glucose	80	71	94	126 ▲
Calcium	9.4	9.3	9.1	9.4
Phosphorus	4.9	4.3		3.4
Magnesium	5.6* ▲	4.7 ▲		3.7 ▲
Alkaline Phosphatase	214	206	159	175
PROTEIN TOTAL	5.1 ▼	5.2 ▼	4.5 ▼	4.7 ▼
Albumin	2.7	2.9	2.7 ▼	2.6 ▼
BILIRUBIN TOTAL	4.0*	7.8*	7.2*	6.0*
Bilirubin, Direct	0.2			
AST	51 ▲	27	31	40
ALT	8 ▼	9 ▼	<6 ▼	6 ▼

Table:
Tabulated chart showing serial serum electrolytes levels.
Serum magnesium levels are marked by a bold black line.

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Figure



Figure:

Top panel: Pre-operative picture showing distended abdomen.

Bottom Right panel: Post-operative picture showing flat abdomen.

Bottom Left panel: X-ray showing the football sign (free air in the peritoneum).

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NT



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Respiratory Syncytial Virus:

How you can advocate for babies this RSV season

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



Identify 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

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

Learn More about RSV at www.infanthealth.org/rsv

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BY JENNÉ JOHNS

AUTHOR | SPEAKER | ADVOCATE



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Survey Says: RSV

RESPIRATORY SYNCYTIAL VIRUS, or RSV, is a dangerous virus that can lead to:

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 -  Lifelong health complications
 -  Death
- for infants and young children



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-  Only 22% consider themselves "very well" prepared to prevent RSV



RSV EDUCATION & AWARENESS CAN HELP

After parents learned more about RSV, they were:



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Preventing Risks to Preterm Infants through Age Five

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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



What Happens Now?

Julia Koehler MD

As someone who in the mid-to the late 2000s – the George W. Bush administration - began trying to grasp the vast, incomprehensible cruelties inflicted on our immigrant patient families, neighbors, and community members, I am trying to think about what happens now?

The Biden tickets' victory (where on Saturday I just felt pure ecstasy) is now causing me flashbacks to the Obama administration's brutality against immigrants. While not engaging in publicly advertised performances of cruelty, like taking children away from parents at the border, so over 500 children now may never know where their parents are, the Obama administration inflicted indelible harm on immigrant children and families.

The Obama administration deported more immigrants than all previous presidential administrations combined: over 2.5 million. It is estimated that for every two deported adults, a child is left behind. Thus, the Obama administration left over a million children, plus some hundreds of thousands, as deportation orphans. I know some of them. This trauma cannot be recovered from for the rest of these children's' lives. (<https://abcnews.go.com/Politics/obamas-deportation-policy-numbers/story?id=41715661>)

“The Obama administration deported more immigrants than all previous presidential administrations combined: over 2.5 million. It is estimated that for every two deported adults, a child is left behind. Thus, the Obama administration left over a million children, plus some hundreds of thousands, as deportation orphans. I know some of them.”

The Obama administration claimed they were deporting “felons, not families.” My anecdotal experience, and knowledge of community organizations, shows that this was completely untrue. Nevertheless, that slogan of “felons, not families” has a more sinister back story. In 1996, President Clinton signed the Orwellian-named “Illegal Immigration Reform and Immigrant Responsibility Act” (<https://www.vox.com/2016/4/28/11515132/iirira-clinton-immigration> and <https://immigrantjustice.org/staff/blog/why-we-must-abolish-1996-law-has-destroyed-thousands-families-video>), which turned “returning” to this country after deportation into a felony.

One of my patient's father had done this. He was then imprisoned for 1 1/2 years in Georgia before being deported again to the Dominican Republic. This little boy was devastatingly traumatized by his father's imprisonment and then his loss. Seeing this little boy in front of me is one reason I can never stop talking about this. Of course, his father had come back after being deported the first time: the reason he came to this country the first time, inability to

provide for his family in the DR, had not improved. And his family was now in Massachusetts.

Under the Obama administration, illegal entry after deportation became by far the most frequently prosecuted federal felony; see, for example, <https://trac.syr.edu/immigration/reports/251/>. In other words, they were turning families into felons. That is behind the Obama administration's statistics of having deported criminals.

Under the Obama administration, in a bill passed in 2009 while Democrats had House and Senate majorities, ICE was mandated to hold 34,000 immigrants in detention every night. I.e., the number of people imprisoned by ICE was mandated by Congress. See <https://www.npr.org/2013/11/19/245968601/little-known-immigration-mandate-keeps-detention-beds-full> and details https://immigrantjustice.org/sites/default/files/content-type/issue/documents/2017-01/Immigration%20Detention%20Bed%20Quota%20Timeline%202017_01_05.pdf). The vast immigrant imprisonment Gulag in which people are now dying of COVID-19 was built out at that time and handed over intact to the Trump administration. Of note, the 2017 appropriations bill eliminated this quota, but detentions continued.

The involvement of for-profit corporations in immigration enforcement was further expanded in the first years of the Obama administration over what the GW Bush administration had done. “As of August 2016, nearly three-quarters of the average daily immigration detainee population was held in facilities operated by private prison companies.” From <https://www.migrationpolicy.org/article/profitting-enforcement-role-private-prisons-us-immigration-detention>. These corporations generate a profit incentive to keep imprisoning immigrants. Under the Obama administration, “Between 2007 and 2014, CoreCivic's overall annual profits grew from about \$133 million to \$195 million, and GEO Group's profits grew from about \$42 million to \$144 million yearly” (from the same source).

“The involvement of for-profit corporations in immigration enforcement was further expanded in the first years of the Obama administration over what the GW Bush administration had done. 'As of August 2016, nearly three-quarters of the average daily immigration detainee population was held in facilities operated by private prison companies.'”

It was the Obama administration that built a giant holding center for children that had crossed the border – see, for example, <https://www.valleycentral.com/news/local-news/new-mcallen-facility-to-house-1000-immigrant-children/> - and it was the Obama administration that built the cages into which Donald Trump's administration put the children they took from their parents, see <https://azcapitoltimes.com/files/2014/06/24-guatemala-nogales->

[full.png](#), which shows Obama Homeland Security Secretary Jeh Johnson touring a facility for children in Arizona in 2014, together with Arizona Gov. Jan Brewer

And perhaps more fundamental than any of this, the Obama administration contributed to the violent taking of labor and land from people in Honduras and Guatemala, accelerating the reasons families flee to this country by tacitly supporting the 2009 military coup in Honduras that deposed the president who wanted to raise the minimum wage (see <https://www.washingtonpost.com/blogs/post-partisan/wp/2016/04/19/hillary-clintons-dodgy-answers-on-honduras-coup/> and <https://www.theguardian.com/world/2016/aug/31/hillary-clinton-honduras-violence-manuel-zelaya-berta-caceres>).

The Obama administration let the sequelae of the 1954 CIA-backed coup in Guatemala (<https://www.bbc.com/news/av/stories-48638209> and https://www.umbc.edu/che/tahlessons/pdf/historylabs/Guatemalan_Coup_student:RS01.pdf) and the 1980s genocidal wars against indigenous Guatemalans play themselves out undisturbed while deporting innumerable people back to Guatemala (see for example <https://www.nytimes.com/2014/05/15/opinion/new-bad-old-times-for-guatemala.html>).

Having seen the heartbreaking stunting of Guatemalan children in indigenous towns, and heard from parents there, that there is no way they can get more food for their children, the callousness with which the fathers of these children are treated as felons when they return to this country after deportation, is gut-wrenching.

In 2015, Vice President Biden did not play a good role in response to the tens of thousands of youth and children fleeing to this country unaccompanied in 2014 and 2015: <https://nacla.org/news/2015/02/27/will-biden%27s-billion-dollar-plan-help-central-america>

Among the immigrant families I know, a large majority would have wanted to stay home if they could have had a sustainable life and safety there. Over the decades, our own governments' policies support the rapaciousness of US agricultural and mining corporations, who have taken this option away from them. I believe that continuing to prefer oblivion to these policies, over the active opposition to them is the biggest disservice we can do our immigrant families.

We need to think now about what we need to ask of the Biden administration, other than revoking Donald Trump's executive orders and regulation changes like "Public Charge." My top 1, 2, and 3 are repeal IIRAIRA (Illegal Immigration Reform and Immigrant Responsibility Act of 1996). That law is like the Clinton administration's Crime Bill (and passed around the same time), which laid the foundation for mass incarceration and the New Jim Crow.

I also think we need to repeal NAFTA (<https://www.nytimes.com/roomfordebate/2013/11/24/what-weve-learned-from-nafta-under-nafta-mexico-suffered-and-the-united-states-felt-its-pain> and <https://cronkitenews.azpbs.org/buffett/mexico/corn/>) and CAFTA (<https://www.citizen.org/article/central-america-free-trade-agreement-cafta/>), so people regain the right to stay at home. This repeal would be good for many people in this country too (<https://www.epi.org/blog/naftas-impact-workers/>). However, those in favor of these treaties are vastly more powerful than those against them. I also realize President-elect Biden is a co-architect of these measures.

I was so happy on Saturday morning. But I think we now have our work cut out for us. Clarity may be an important place to start.

“We need to think now about what we need to ask of the Biden administration, other than revoking Donald Trump’s executive orders and regulation changes like ‘Public Charge.’”

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Scott Snyder, MD



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References:

1. <https://neonatologysolutions.com/explore-nicus-and-programs/>

The author is a principal of Neonatology Solutions, LLC.

NT

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Eunice Kennedy Shriver National Institute
of Child Health and Human Development



Medical News, Products & Information

Compiled and Reviewed by Mitchell Goldstein, MD Editor in Chief

NIH to fund research of racial disparities in pregnancy-related complications and deaths

Studies to focus on women from racial and ethnic minority groups, women with underprivileged socioeconomic status, and those living in underserved rural settings.

Tuesday, November 17, 2020

The National Institutes of Health will fund new research examining racial and ethnic disparities in pregnancy-related complications and deaths. According to the [Centers for Disease Control and Prevention](#), approximately 700 women die each year in the United States from pregnancy-related complications. The grants to six institutions are expected to total over \$21 million over five years, pending the availability of funds. The project is supported by the National Institute on Minority Health and Health Disparities (NIMHD), the National Heart, Lung, and Blood Institute (NHLBI), and the NIH Office of Research on Women's Health.

Research will include original, innovative, and multidisciplinary efforts to advance the understanding, prevention, and reduction of pregnancy-related complications and deaths among disproportionately affected women. This includes women from racial and ethnic minority groups, women with underprivileged socioeconomic status, and those living in underserved rural settings.

The racial disparities in pregnancy-related mortality are stark: respectively, African American and American Indian/Alaska Native women are 3.2 and 2.3 times more likely to die from pregnancy-related causes than are white women. In the case of African American women, the disparity increases with age. Black women under 20 are 1.5 times more likely to die from pregnancy-related causes than are white women in the same age group, but black women ages 30-34 are 4.3 times more likely to die from pregnancy-related causes than are white women ages 30-34. Approximately two thirds of pregnancy-related deaths are preventable, underscoring the need for more research to improve the maternal health outcomes for women before, during, and after delivery.

In addition to maternal deaths, over 25,000 women each year

experience severe maternal morbidity(link is external) (SMM), requiring unexpected short- or long-term life-saving healthcare interventions. Like maternal mortality, SMM has a high rate of preventability. All racial and ethnic minority populations have higher rates of SMM than do white women.

"This initiative is a significant undertaking to reduce preventable causes of maternal deaths," said NIMHD Director Eliseo J. Pérez-Stable, M.D. "We need to take a closer look at underlying factors beyond the individual, such as healthcare access, health care settings providing care, community resources, and racial bias and examine how these factors may impact the maternal health outcomes of racial and ethnic minority women."

In addition to examining factors influencing maternal health disparities, researchers will be among the first to evaluate the effectiveness of a multilevel intervention—at the individual, health care setting, community, and societal levels—to reduce maternal deaths and complications.

This funding effort expands upon NIH's commitment to address the rising rates of illness and death from preventable pregnancy-related complications through the [IMPROVE Initiative](#), which addresses disparities in maternal health.

Tufts University, Boston

Project name: Reducing Health Disparities in SMM Post COVID-19: Assessing the Integration of Maternal Safety Bundles and Community Doulas to Improve Outcomes for Black Women

Contact PI: Ndidiyaka Amutah-Onukagha, Ph.D.

Grant: [1R01MD016026-01](#)

This study will assess the effectiveness of an integrated care model to improve the level of maternal care for mothers of color and decrease disparities in severe maternal morbidity and mortality. This includes examining the engagement of mothers in the planning and implementation of maternal safety bundles in addition to prenatal, birth, and postpartum support from community doulas.

University of South Carolina at Columbia

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Project name: Hospital Quality, Medicaid Expansion and Racial/Ethnic Disparities in Maternal Mortality and Morbidity
Contact PI: Nansi Boghossian, Ph.D.
Grant: [1R01MD016012-01](#)

This study will examine to what extent hospital quality contributes to maternal racial and ethnic disparities in eight U.S. states, and whether Medicaid expansion has impacted hospital quality and maternal outcomes.

University of Pennsylvania, Philadelphia
Project name: Improving Health Outcomes and Equity by Targeting Postpartum Mothers at Highest Risk
Contact PI: Elizabeth A. Howell, M.D.
Grant: [1R01MD016029-01](#)

This study aims to better identify Black and Latina women most at-risk following delivery, the problems they experience, and to adapt an evidence-based intervention to improve quality of postpartum care for high risk women.

Emory University, Atlanta
Project name: Minding the Gap: A Multidisciplinary Approach to Reducing Maternal Health Disparities in Georgia
Contact PI: Denise Jean Jamieson, M.D.
Grant: [1R01MD016031-01](#)

This study will assess racial disparities in adverse maternal health outcomes, evaluate the effects of Georgia's Medicaid Inter-Pregnancy Care Program, and conduct and evaluate a trial of a comprehensive patient-centered postpartum care system in an urban safety-net hospital in Georgia.

Michigan State University, East Lansing
Project name: Meeting Women Where They Are: Multilevel Intervention Addressing Racial Disparities in Maternal Morbidity and Mortality
Contact PI: Jennifer E. Johnson, Ph.D.
Grant: [1R01MD016003-01](#)

This study will test the effectiveness and costs of a multilevel intervention to address pregnancy-related complications and deaths in two Michigan counties for Medicaid insured African American women.

The following award recipient is funded by the NHLBI:

University of Pittsburgh
Project name: Preconception and Prenatal Stress Effects on Cardiovascular Disease Risk in Black Women
Contact PI: Alison E. Hipwell, Ph.D.
Grant: [1R01HL157787-01](#)

This study will examine whether chronic stress impacts postpartum cardiovascular risk among Black women. New data from this study will improve understanding of cardiovascular risks and will inform the targets and timing of interventions to reduce persistent racial disparities in maternal health.

National Institute on Minority Health and Health Disparities (NIMHD): NIMHD leads scientific research to improve minority health and eliminate health disparities by conducting and supporting research; planning, reviewing, coordinating, and evaluating all minority health and health disparities research at NIH; promoting

and supporting the training of a diverse research workforce; translating and disseminating research information; and fostering collaborations and partnerships. For more information about NIMHD, visit <https://www.nimhd.nih.gov>.

National Heart, Lung, and Blood Institute (NHLBI): NHLBI is the global leader in conducting and supporting research in heart, lung, and blood diseases and sleep disorders that advances scientific knowledge, improves public health, and saves lives. For more information, visit www.nhlbi.nih.gov.

NIH Office of Research on Women's Health (ORWH): ORWH serves as the focal point for women's health research at NIH. It is the first Public Health Service office dedicated specifically to promoting women's health research within, as well as beyond, the NIH scientific community. The office also fosters the recruitment, retention, reentry, and advancement of women in biomedical careers. For more information about ORWH, visit <https://www.nih.gov/women>.

About the National Institutes of Health (NIH): NIH, the nation's medical research agency, includes 27 Institutes and Centers and is a component of the U.S. Department of Health and Human Services. NIH is the primary federal agency conducting and supporting basic, clinical, and translational medical research, and is investigating the causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit www.nih.gov.

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[National Minority Health and Health Disparities \(NIMHD\)](#)

Contact
[Sheleka Turnbull](#)
301-402-1366

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:

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- 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

Mitchell Goldstein, MD, FAAP, Immediate Past Chair, MGoldstein@llu.edu and

Jackie Burke

Sections Manager

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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. Reporters can access the meeting program and other relevant meeting information through the AAP meeting website at <http://www.aapexperience.org/>

NT

Neighborhood conditions associated with children's cognitive function

NIH-funded research from ABCD Study finds association despite household income.

Tuesday, November 3, 2020

What

A study published today in JAMA Network Open shows that children from poorer neighborhoods perform less well on a range of cognitive functions, such as verbal ability, reading skills, memory, and attention, and have smaller brain vol-



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umes in key cognitive regions compared to those from wealthier neighborhoods.

While multiple studies have shown that household socioeconomic status affects a child's cognitive development, less is known about the effect of the broader neighborhood context. By revealing a role that the neighborhood environment may play in shaping brain development, research findings can inform interventions aimed at improving outcomes for children from disadvantaged backgrounds. The study is funded by the National Institute on Drug Abuse, and nine other institutes, centers, and offices that are part of the National Institutes of Health.

The researchers analyzed data from the [Adolescent Brain Cognitive Development \(ABCD\) Study](#), which focuses on how environmental and biological factors influence adolescent development. The team looked at data from brain imaging and neurocognitive testing from 11,875 9- and 10-year-old children (48% female) from 21 sites within the United States, largely reflecting urban and suburban areas.

The researchers found that youth living in high poverty neighborhoods had lower volumes of certain brain regions, partially explaining the possible relationship between high neighborhood poverty and lower scores on cognitive tests. The affected areas of the brain were in the prefrontal cortex and the hippocampus, areas known to be involved in language and memory. The differences in volume were significant even after the researchers adjusted for the effects of household income. For every unit increase in neighborhood poverty, children scored 3.22 points lower on cognitive testing, even when accounting for household income.

While other studies have found poorer school and cognitive performance among children raised in impoverished environments, this study shines a light on the specific importance of the neighborhood context in a child's development, regardless of that child's household income. The study's findings suggest that policies that address uneven distribution of resources



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among neighborhoods may help lessen imbalances in cognitive performance. Additional research is needed to identify which neighborhood characteristics, such as school funding or environmental pollution, may influence children's brain and cognitive development.

The ABCD Study, the largest of its kind in the United States, is tracking nearly 12,000 youth as they grow into young adults. Investigators regularly measure participants' brain structure and activity using magnetic resonance imaging (MRI) machines, and collect psychological, environmental, and cognitive information, as well as biological samples. The goal of the study is to define standards for normal brain and cognitive development and to identify factors that can enhance or disrupt a young person's life trajectory.

The Adolescent Brain Cognitive Development Study and ABCD Study are registered trademarks and service marks, respectfully, of the U.S. Department of Health and Human Services.

Article

Taylor, RL, Cooper, SR, Jackson, JJ, Barch, DM. [Assessment of Neighborhood Poverty, Cognitive Function, and Prefrontal and Hippocampal Volumes in Children](#). JAMA Network Open. November 3, 2020.

Who

Gaya Dowling, Ph.D., Director, Adolescent Brain Cognitive Development Study, National Institute on Drug Abuse, is available for comment.

To learn more, go to: [Adolescent Brain Cognitive Development \(ABCD\) Study](#).

The National Institute on Drug Abuse (NIDA) is a component of the National Institutes of Health, U.S. Department of Health and Human Services. NIDA supports most of the world's research on the health aspects of drug abuse and addiction. The Institute carries out a large variety of programs to inform policy and improve practice. Fact sheets on the health effects of drugs of abuse and information on NIDA research and other activities can





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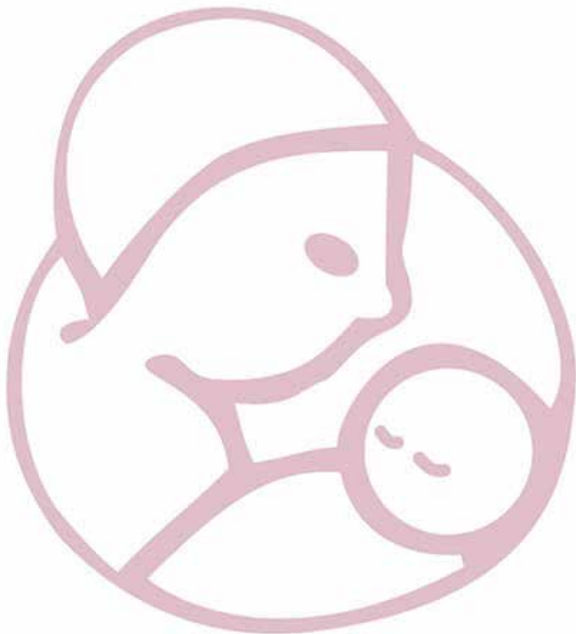
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[National Institute on Drug Abuse \(NIDA\)](#)

Contact
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301-443-6245

NT

Postpartum depression may persist three years after giving birth

NIH study suggests women with mood disorders, gestational diabetes may have a higher risk.

Tuesday, October 27, 2020

A National Institutes of Health study of 5,000 women has found that approximately 1 in 4 experienced high levels of depressive symptoms at some point in the three years after giving birth. The rest of the women experienced low levels of depression throughout the three-year span. The study was conducted by researchers at NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD). It appears in the journal *Pediatrics*.

The American Academy of Pediatrics recommends that pediatricians screen mothers for postpartum depression at well-child visits at one, two, four and six months after childbirth. Researchers identified four trajectories of postpartum depressive symptoms and the factors that may increase a woman's risk for elevated symptoms. The findings suggest that extending screening for postpartum depressive symptoms for at least two years after childbirth may be beneficial, the authors write.

"Our study indicates that six months may not be long enough to gauge depressive symptoms," said Diane Putnick, Ph.D., the primary author and a staff scientist in the NICHD Epidemiology Branch. "These long-term data are key to improving our understanding of mom's mental health, which we know is critical to her child's well-being and development."

The researchers analyzed data from the Upstate KIDS study, which included babies born between 2008 and 2010 from 57 counties in New York State. The study followed 5,000 women for three years after their children were born.

Researchers assessed women's symptoms through a brief, five-item depression screening questionnaire, but the study did not clinically diagnose depression in the women. Women with underlying conditions, such as mood disorders and/or gestational diabetes,

were more likely to have higher levels of depressive symptoms that persisted throughout the study period.

The researchers noted that the study participants were primarily white, non-Hispanic women. Future studies should include a more diverse, broad population to provide more inclusive data on postpartum depression, Dr. Putnick said.

About the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD): NICHD leads research and training to understand human development, improve reproductive health, enhance the lives of children and adolescents, and optimize abilities for all. For more information, visit <http://www.nichd.nih.gov>.

About the National Institutes of Health (NIH): NIH, the nation's medical research agency, includes 27 Institutes and Centers and is a component of the U.S. Department of Health and Human Services. NIH is the primary federal agency conducting and supporting basic, clinical, and translational medical research, and is investigating the causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit www.nih.gov.

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References
Putnick, D, et al. Trajectories of Postpartum Depressive Symptoms. *Pediatrics*. September 2020.

###

[Eunice Kennedy Shriver National Institute of Child Health and Human Development \(NICHD\)](#)

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pound reduces cognitive deficits in mouse model of Down syndrome

Mice treated with apigenin had better memory and developmental milestone scores.

Friday, October 23, 2020

What

The plant compound apigenin improved the cognitive and memory deficits usually seen in a mouse model of Down syndrome, according to a study by researchers at the National Institutes of Health and other institutions. Apigenin is found in chamomile flowers, parsley, celery, peppermint and citrus fruits. The researchers fed the compound to pregnant mice carrying fetuses with Down syndrome characteristics and then to the animals after they were born and as they matured. The findings raise the possibility that a treatment to lessen the cognitive deficits seen in

Down syndrome could one day be offered to pregnant women whose fetuses have been diagnosed with Down syndrome through prenatal testing. The study appears in the American Journal of Human Genetics.

[Down syndrome](#) is a set of symptoms resulting from an extra copy or piece of chromosome 21. The intellectual and developmental disabilities accompanying the condition are believed to result from decreased brain growth caused by increased inflammation in the fetal brain. Apigenin is not known to have any toxic effects, and previous studies have indicated that it is an antioxidant that reduces inflammation. Unlike many compounds, it is absorbed through the placenta and the blood brain barrier, the cellular layer that prevents potentially harmful substances from entering the brain. Compared to mice with Down symptoms whose mothers were not fed apigenin, those exposed to the compound showed improvements in tests of developmental milestones and had improvements in spatial and olfactory memory. Tests of gene activity and protein levels showed the apigenin-treated

mice had less inflammation and increased blood vessel and nervous system growth.

The NIH portion of the study was conducted at the National Human Genome Research Institute (NHGRI). Additional funding was provided by the NIH's Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD).


Who

Diana W. Bianchi, M.D., NICHD Director and senior investigator of the NHGRI Medical Genetics Branch, is available for comment.

Article

Guedj, F. et al. Apigenin as a candidate prenatal treatment for Trisomy 21: effects in human amniocytes and the Ts1Cje mouse model. American Journal of Human Genetics. 2020.

About the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD): NICHD leads research and training to understand human development, improve reproductive



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More Than 1 Million Children in U.S. Diagnosed with COVID-19

American Academy of Pediatrics calls on elected leaders to immediately implement nation-wide strategy to control spread of virus and address economic and social harms of pandemic

Since the start of the COVID-19 pandemic, more than 1 million infants, children and adolescents have been diagnosed with the illness, according to [data released Monday](#)

by the American Academy of Pediatrics and Children's Hospital Association, which are tracking data reported by state health departments.

As of Nov. 12, a total of 1,039,464 children have tested positive for COVID-19 since the onset of the pandemic. In the one-week period ending Nov. 12th, there were 111,946 new cases in children, which is substantially larger than any previous week in the pandemic. The increase tracks surges in the virus in communities across the U.S.

"As a pediatrician who has practiced medicine for over three decades, I find this number staggering and tragic. We haven't seen a virus flash through our communities in this way since before we had vaccines for measles and polio," said AAP President Sally Goza, MD, FAAP. "And while we wait for a vaccine to be tested and licensed to protect children from the virus that causes COVID-19, we must do more now to protect everyone in our communities. This is even more important as we approach winter, when people will naturally spend more time indoors where it is easier for the virus to be transmitted."

The AAP calls on elected leaders to immediately enact a new, national strategy to reduce the spread of the virus and address myriad harms resulting from the pandemic.

"We urgently need a new, nation-wide strategy to control the pandemic, and that should include implementing proven public health measures like mask wearing and physical distancing," Dr. Goza said. "This pandemic is taking a heavy toll on children, families and communities, as well as on physicians and other front-line medical teams. We must work now to restore confidence in our public health and scientific agencies, create fiscal relief for families and pediatricians alike, and support the systems that support children and families such as our schools, mental health care, and nutrition assistance."

In addition to children infected with the virus, the pandemic has taken a toll on children's health in numerous ways.

- Family stress and mental health: According to a [national survey](#), 27% of parents reported worsening mental health for themselves, and 14% reported worsening behavioral health for their children. According to the [Centers for Disease Control and Prevention](#), visits by children and adolescents to the emergency department for mental health problems increased more than 24% during the pandemic.
- [Disruptions to education](#) have impacted not only children's academic performance but family stability and equity from lost wages caused by school closings.
- Children have reduced access to health care during the pandemic, as demonstrated in a [recent data analysis by the Centers for Medicare & Medicaid Services](#). Compared with the same time period in 2019, there were 22% fewer immunizations for children 2 and younger against other infectious diseases like measles and whooping cough and 44% fewer (3.2 million) child screening services. The AAP is concerned about children missing developmental and other screenings that normally take place during these visits.
- Children were already vulnerable to abuse and neglect [before the pandemic](#), and research has shown that accumulated stressors like job loss and illness put families at risk of child maltreatment. Increased stress and isolation place children at immediate [risk](#) of severe harm, neglect and even death.

Severe illness due to COVID-19 remains rare in children. But the AAP urges health authorities to do more to collect data on longer-term impacts on children, including how the virus may harm children's physical health after the acute illness has resolved. The AAP also calls for more research into the emotional and mental health effects the pandemic is having on children and adolescents.

"We know from research on the impact of natural disasters on the mental health of

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children that prolonged exposure to this kind of toxic stress is damaging,” Dr. Goza said. “Most natural disasters have an end, but this pandemic has gone on for over eight months, and is likely to continue to disrupt our lives for many more. We’re very concerned about how this will impact all children, including toddlers who are missing key educational opportunities, as well as adolescents who may be at higher risk for anxiety and depression.”

The AAP believes the number of reported COVID-19 cases in children is likely an undercount because children’s symptoms are often mild and they may not be tested for every illness. The virus has had a disproportionate impact on Black and Hispanic children, who are suffering a higher number of infections, as well as other impacts of the pandemic including economic harms and lack of access to education and other critical services.

The data are compiled each week by AAP and CHA from reports by public health departments of 49 states, New York City, the District of Columbia, Puerto Rico, and Guam. The definition of a “child” case is based on varying age ranges reported across states; see the [full report](#) for more details and links to state and territory data sources.

The report on child COVID-19 cases is updated every week, usually on Monday.

AAP resources include:

- [Children and COVID-19: State-Level Data Report](#)
- Healthy Children.org article for parents: “[Can Children Get COVID-19?](#)”
- [Transition Plan: Advancing Child Health in the Biden-Harris Administration](#)

###

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 and follow us on Twitter @AmerAcadPeds

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NT

COVID Vaccine Trials Should Begin Including Children Now, Says American Academy of Pediatrics

COVID Vaccine Trials Should Begin Including Children Now, Says American Academy of Pediatrics

For Release:
11/17/2020

ITASCA IL – As trials of potential vaccines against COVID-19 show early signs of success, the American Academy of Pediatrics, representing 67,000 pediatricians, pediatric medical specialists and pediatric surgical specialists, calls on researchers to act quickly to ensure children are not left out of potentially life-saving vaccines.

“If we do not add children to these research trials very soon, there will be a significant delay in when children are able to access potentially life-saving vaccines. This is unconscionable,” said AAP President Sally Goza, MD, FAAP. “More than 1 million children have been infected with this virus since the beginning of the pandemic, and children have suffered in numerous other ways. This includes disruptions to their education, harms to their mental and emotional health, and greatly diminished access to critical medical services. It is unjust to allow them to take on these burdens, but not give them the opportunity to benefit from a vaccine.”

Dr. Goza outlined these concerns in a letter to federal health officials in October. Today, AAP and six other medical groups wrote to health officials asking for transparency, scientific rigor, and robust communications to improve public confidence in a COVID-19 vaccine.

“We eagerly anticipate seeing the safety and efficacy data in vaccine trials that are underway in adults, and urge pharmaceutical companies to rapidly expand their participant panels to include children and adolescents,”

said Yvonne Maldonado, MD, FAAP, chair of the AAP Committee on Infectious Diseases.

“Children are not little adults. We must include children in the trials as soon as it is safe to do so. Assuming that one or more of these vaccines are shown to be safe and effective in adults, in order for parents to be comfortable giving these vaccines to their children, we must have studies showing they are safe and effective in children as well.

“This research takes time. If this does not begin soon, it will be less likely a vaccine will be available for children before the next school year,” Dr. Maldonado said. “We know that children can be infected with COVID-19 and can transmit it to others. To reduce the spread of this virus and control the pandemic as well as for their own safety, it’s crucial that children be included in the national vaccination program, and that vaccines are made available to children as soon as possible.”

##

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NT

American Academy of Pediatrics Reports Highest One-Week Increase in Child Cases of COVID-19 Since Onset of Pandemic

American Academy of Pediatrics Reports Highest One-Week Increase in Child Cases of COVID-19 Since Onset of Pandemic

For Release:
11/2/2020

The surge in COVID-19 cases across the country is impacting children in unprecedented levels, according to [data](#) compiled by the American Academy of Pediatrics and Children's Hospital Association, which are tracking data reported by state health departments.

As of Oct. 29, more than 853,000 children have tested positive for COVID-19 since the onset of the pandemic, including nearly 200,000 new cases in children during the month of October. In the one-week period ending Oct. 29, there were 61,000 new cases in children, which is larger than any previous week in the pandemic.

"This is a stark reminder of the impact this pandemic is having on everyone – including our children and adolescents," said AAP President Sally Goza, MD, FAAP. "This virus is highly contagious, and as we see spikes in many communities, children are more likely to be infected, too. We can help protect everyone in our communities by keeping our physical distance, wearing masks, and following other recommendations from our doctors and public health experts."

At this time, it appears that severe illness due to COVID-19 is rare among children. However, the AAP notes an urgent need to collect more data on longer-term impacts on children, including ways the virus may harm the long-term physical health of infected children, as well as its emotional and mental health effects.

"Not only are children feeling the direct effects of the virus and becoming ill, but the pandemic has transformed their lives at critical stages of development and education," Dr. Goza said. "I'm very concerned about the long-term harms that children may suffer, particularly Black and Hispanic children, who are suffering a higher number of infections. This includes not only children who test positive for the virus, but everyone in these communities who are suffering disproportionate emotional and mental health harms."

The data are compiled each week by AAP and CHA from reports by public health departments of 49 states, New York City, the District of Columbia, Puerto Rico, and Guam. The definition of a "child" case is based on varying age ranges reported across states; see the [full report](#) for an age breakdown and links to data sources.

"These numbers reflect a disturbing increase in cases throughout most of the United States in all populations, especially among young adults," said Yvonne Maldonado, MD, FAAP, chair of the AAP Committee on Infectious Diseases. "We are entering a heightened wave of infections around the country. We would encourage family holiday gatherings to be avoided if possible, especially if there are high risk individuals in the household."

The AAP believes the number of reported COVID-19 cases in children is likely an undercount because children's symptoms are often mild and they may not be tested for every illness.

"On every measure – new infections, hospitalizations, and deaths – the U.S. is headed in the wrong direction," Dr. Goza said. "We urge policymakers to listen to doctors and public health experts rather than level baseless accusations against them. Physicians, nurses and other health care professionals have put their lives on the line to

Family Centered Care is trendy, but are providers really meeting parents needs in the NICU?

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You may be surprised to see what NICUs are doing right and where their efforts are clearly falling short.

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protect our communities. We can all do our part to protect them, and our communities, by wearing masks, practicing physical distancing, and getting our flu immunizations."

The report on child COVID-19 cases is updated every week, usually on Monday.

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

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PROTECT YOUR FAMILY FROM RESPIRATORY VIRUSES

flu

coronavirus

pertussis

RSV



WASH YOUR HANDS

often with soap and warm water.

GET VACCINATED

for flu and pertussis. Ask about protective injections for RSV.



COVER COUGHS AND SNEEZES.

Sneeze and cough into your elbow.

USE AN ALCOHOL-BASED HAND SANITIZER.



STAY AWAY FROM SICK PEOPLE

Avoid crowds. Protect vulnerable babies and children.

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AAP resources include:

- [Children and COVID-19: State-Level Data Report](#)
- Healthy Children.org article for parents: "[Can Children Get COVID-19?](#)"

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For Release:
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Providing Psychosocial Support in the NICU



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



The National Coalition for Infant Health advocates for:

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

www.infanthealth.org

Why **PREMATURE INFANTS** *Need Access to an* **EXCLUSIVE HUMAN MILK DIET**

In the United States, more than **1 IN 10 BABIES ARE BORN PREMATURE**. Very low birthweight babies are born severely premature, weighing less than 1,250 grams.

VERY LOW BIRTHWEIGHT BABIES 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 premature consumes non-human milk products.

When that happens:

5%	17%
1%	12%

Very low birthweight babies who get NEC

Very low birthweight babies requiring surgery to treat NEC

30% of very low birthweight babies requiring 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 very low birthweight baby can access an EXCLUSIVE HUMAN MILK DIET:

- Mortality is reduced by **36%**
- Feeding intolerance decreases
- Chances of NEC are reduced by **37%**

HUMAN MILK = MEDICINE

NEC is a life-threatening condition that can be prevented. All the babies that babies need. It's a gift of human milk. Your baby's best chance to be healthy. Talk to your care team about your baby's specific human milk needs and request support to find your healthy path.

LEARN MORE

Genetics Corner: Townes-Brocks Syndrome in an Infant with Familial Imperforate Anus

Robin Clark, MD, Subhadra Ramanathan, MS.

Case summary:

A genetic consultation was requested for a term male infant with a preauricular tag and an imperforate anus. He was born at 38 weeks six days gestation to a 22-year old G2P1 mother by repeat C-section at a local community hospital. The pregnancy was planned, and routine prenatal care began at nine weeks gestation. The mother denied all teratogenic exposures, including alcohol, tobacco, and drug use. The birth weight was 3739 grams, appropriate for gestational age. The baby was transferred to our tertiary care NICU on the day of birth for imperforate anus. Minimal meconium was noted on the perineum from an apparent fistula. An echocardiogram revealed a patent foramen ovale with a small shunt and bidirectional flow across the atrial septum. The Head ultrasound exam showed mild asymmetry of the lateral ventricles, left larger than right without sonographic evidence of intracranial hemorrhage. Spine ultrasound and radiographs were normal. A renal ultrasound exam showed minimal right renal pelvocaliectasis.

The physical exam showed an alert, active infant with mild hypertelorism. The left ear had an overfolded helix superiorly and a bifurcated ear tag on the tragus. The extremities, specifically the thumbs, were normal. There was a small tuft of hair at the base of the sacrum. The phallus, testes, and scrotum were normal. The anus was imperforate.

The baby underwent a posterior sagittal anorectoplasty without complications. He passed the newborn hearing screen and was discharged. When he was seen in a follow-up visit at two months of age, he was feeding and gaining weight well and stooling normally. His parents were using a Hegar dilator. His development was age-appropriate.

Family history:

The family history was significant for imperforate anus in the patient's 23-year old father, who was otherwise well. A 3-year old sister was healthy without ear or anal anomalies. There was no other significant family history of birth defects, developmental delay, intellectual disability, early infant deaths, or multiple miscarriages. Parents reported Hispanic (father) and Hispanic and Caucasian (mother) ancestry. They denied consanguinity.

Clinical assessment:

Because of the family history of anal atresia in the father and the presence of minor anomalies involving the ear and other organs in this infant, the genetics consultant proposed Townes-Brocks syndrome as the likely diagnosis and suggested *SALL1* gene testing with reflex testing for a clinical exome sequencing test if the *SALL1* study were normal.

Laboratory studies:

Chromosome microarray was normal: arr(1-22)x2,(XY)x1.

Gene analysis for *SALL1* included gene sequencing and deletion/duplication analysis. Results showed a heterozygous likely pathogenic variant in *SALL1*: c.3160C>T (p.Arg1054*). This variant causes a premature translational stop signal and a truncated protein product signified by the asterisk in the protein (p.) variant nomenclature.

Genetic counseling:

Townes-Brocks syndrome (TBS, OMIM 107480) is an autosomal dominant, multiple congenital anomaly syndrome that includes imperforate anus. It is characterized by the triad of the imperforate anus (84%), dysplastic ears (87%), and thumb malformations (89%). Hearing impairment, both sensorineural and conductive, can be seen in about 65% of affected individuals. Renal impairment, including end-stage renal disease, may occur with or without structural abnormalities in about 40%. Rare findings include eye anomalies (coloboma, Duane anomaly). Intellectual disability is not common and is seen in only 10% of affected individuals (Kohlhase et al., 2016).

The clinical features of TBS are variable, even among affected individuals from the same family. This infant has no thumb or other major anomalies, and the father had only imperforate anus without ear anomalies or other signs of TBS. This illustrates that there can be overlap between the milder expression of syndromic disorders and the nonsyndromic forms of congenital malformations

Penetrance and expression are terms used to describe the variable effects of single-gene disorders. Penetrance describes the proportion of individuals in a population who carry a specific gene variant *and* express any degree of the disease-related phenotype. Penetrance is "complete" when all individuals with a pathogenic variant in the responsible gene have physical features of that disorder; such is the case with achondroplasia. Penetrance is "reduced" or "incomplete" when some individuals with the genetic variant do not have any expected physical signs. Reduced penetrance occurs in familial cancer syndromes caused by variants in *BRCA1* or *BRCA2*. Nonpenetrance is complete when all individuals with the gene variant have a normal phenotype. Nonpenetrance could describe unaffected heterozygous carriers of a gene variant that, when homozygous, causes an autosomal recessive disorder.

Although penetrance of the TBS phenotype has been reported to be complete in individuals with heterozygous *SALL1* variants, there is clinical variability among affected individuals with TBS, which clinical geneticists describe as variable "expression." TBS features can vary widely, encompassing what might look like isolated and apparently nonsyndromic ear anomalies or imperforate anus. With this in mind, it was surprising to find that this particular *SALL1* variant had been previously reported, in a homozygous state, to cause an autosomal recessive disorder quite unlike TBS and with nonpenetrance in the apparently unaffected heterozygous relatives. Two affected siblings who were homozygous for this same *SALL1* variant had multiple congenital anomalies and intellectual disabilities (Vodopiutz et al., 2013). This family's affected children's phenotype included tetralogy of Fallot, polycystic hypoplastic kidneys with prenatal onset of chronic renal failure, limb and ear malformations, and sensorineural deafness corpus callosum hypoplasia, cortical

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Graphic 1: This infant with Townes-Brocks syndrome has minor anomalies in the left ear's helical folding that also has a bifurcated tag on the tragus.



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blindness, and lack of psychomotor development. Importantly, none of the twelve heterozygous carriers from this family had features of TBS. This report suggests that this variant results in a weaker and less pathogenic "hypomorphic" allele that causes disease in the homozygous state and that it may be nonpenetrant in heterozygous "carriers." However, the same variant has also been reported in a heterozygous proband and a heterozygous parent with clinical features that suggested TBS (ClinVar Variation ID: 219151).

It is possible that a hypomorphic allele, such as this *SALL1* variant, could result in such a mild expression of TBS that it could be interpreted as a nonsyndromic imperforate anus, as seems to be the case in our patient's father and an attenuated TBS phenotype in this infant. We postulate that the patient inherited his *SALL1* variant from his father, but this has not yet been confirmed. We recommended targeted testing for this *SALL1* variant in the patient's father. If testing confirms that he is heterozygous (or mosaic) for this variant, the recurrence risk for imperforate anus in his future offspring could be as high as 50%. Given the lack of penetrance of this gene variant in the family reported in 2013, we also recommended targeted variant testing in the patient's unaffected sister.

Practical applications:

1. Always take a careful family history as it may offer the key to the diagnosis
2. Take note of minor anomalies. Even those that are not functionally important may suggest a pattern of anomalies associated with a particular syndrome.
3. Understand that incomplete penetrance and variable expression can blur the line between a single gene syndromic disorder with a higher recurrence risk and a nonsyndromic, typically multifactorial congenital anomaly with lower recurrence risk.
4. Appreciate that some pathogenic variants may produce gene products with some residual function. Such "hypomorphic" alleles for syndromic disorders may contribute to the familial nature of some nonsyndromic congenital anomalies.

Reference:

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The authors have no relevant disclosures.

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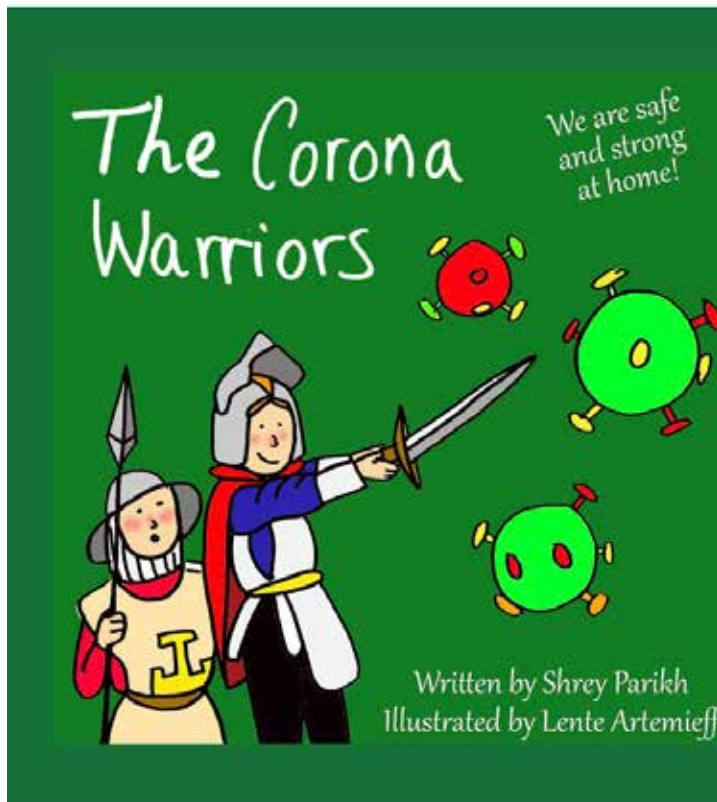
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When reporting on mothers, babies, and substance use

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!

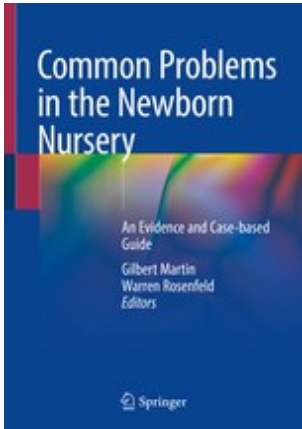
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Editors: **Martin**, Gilbert, **Rosenfeld**, Warren (Eds.)



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- Written by experts in the field in a clear, easy-to-use format
- Utilizes a case-based approach

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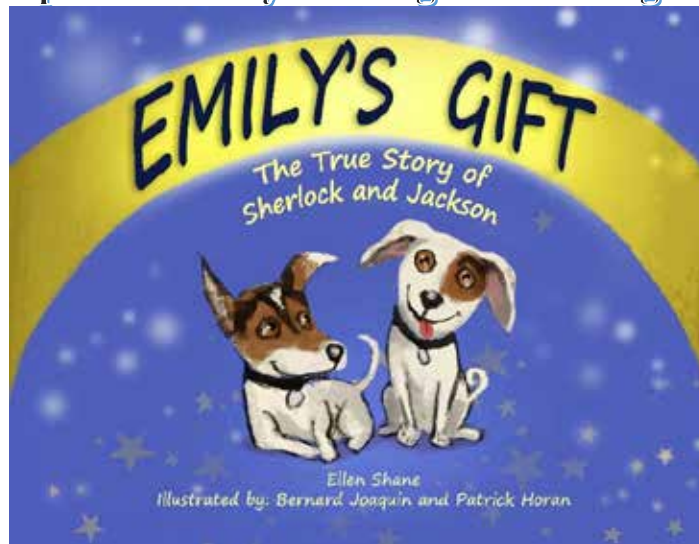
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The Premie Parent's Survival Guide to the NICU

Deb Discenza



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.

2nd Edition is Out and Helping Families Nationwide During COVID-19

When I had my daughter in 2003, there were only mainstream parenting magazines in the NICU pumping room, and I never got a NICU welcome packet. For us, we were in the dark, and the shiny perfect parenting magazines were off-putting. Our daughter's story was different, and we needed information that helped us through her extraordinary journey.

For my co-author, Nicole Conn, and myself, *The Premie Parent's Survival Guide to the NICU* was written with that isolated preemie parent in the NICU or at home in mind. It is part medical school for the parenting set, part advocacy tool to give parents power in the chaos, and part support system with personal stories throughout. We walk the walk with them - every step of the way and even sprinkle in preemie parent humor to add to the colorful and friendly design. Humor that preemie parents and pros will appreciate. This is the book we both desperately wanted and needed during our stay in the NICU.

2020 marked a significant milestone, our second edition launch . . . *all during a pandemic*. COVID-19 has rocked NICUs worldwide in a way not seen before. Early on, parents were separated from their babies, and a draconian 15 minutes a day was allowed in some units "to give them some help." As I write this column, the next surge is coming, and it appears to have a nasty bite. I fear separations again. I fear for those parents in the NICU. With support groups not being able to go into the units, families are more isolated than ever. We have to find a better way. Once again, I see this book as a true light in the darkness.

For our second edition, we did a number of updates throughout the book. Naturally, some things had changed, and in others, we had to adapt to new terms, medicine changes, and more. Having struggled through pumping on my own in my postpartum room without a clue of what I was doing (my husband turned the pump on high, and I yelled at him to turn it down) and attempted breastfeeding without success, I was left battered by the judgment, the unsolicited advice. Parents deserve real information, real support. This book speaks to what a 100% human milk-based diet looks like and how to advocate for it. We do it with respect, with honesty, and with resources, too.

Our first edition guide was sold nationwide and even overseas and received so many words of praise from parents and pros alike. It is gratifying that we have brought light and hope to the NICU out of our humbling experiences. With this second edition, we have already sold over 1,100 copies and counting, and we are marking Prematurity Awareness Month and Day with a 20% discount off books purchased at <https://premieworld.com> with the coupon code PREEMIEWORLD20. For bulk orders, please contact us at connect@premieworld.com

The National Coalition welcomes those interested in our activities as well as organizations interested in protecting access for premature infants through age two to visit our website www.infanthealth.org.

Disclosures: Deb Discenza is the co-author of the *Premie Parent's Survival Guide to the NICU*.

NT

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PremieWorld
www.PremieWorld.com
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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.

The Premie Parent's SURVIVAL GUIDE to the NICU

By

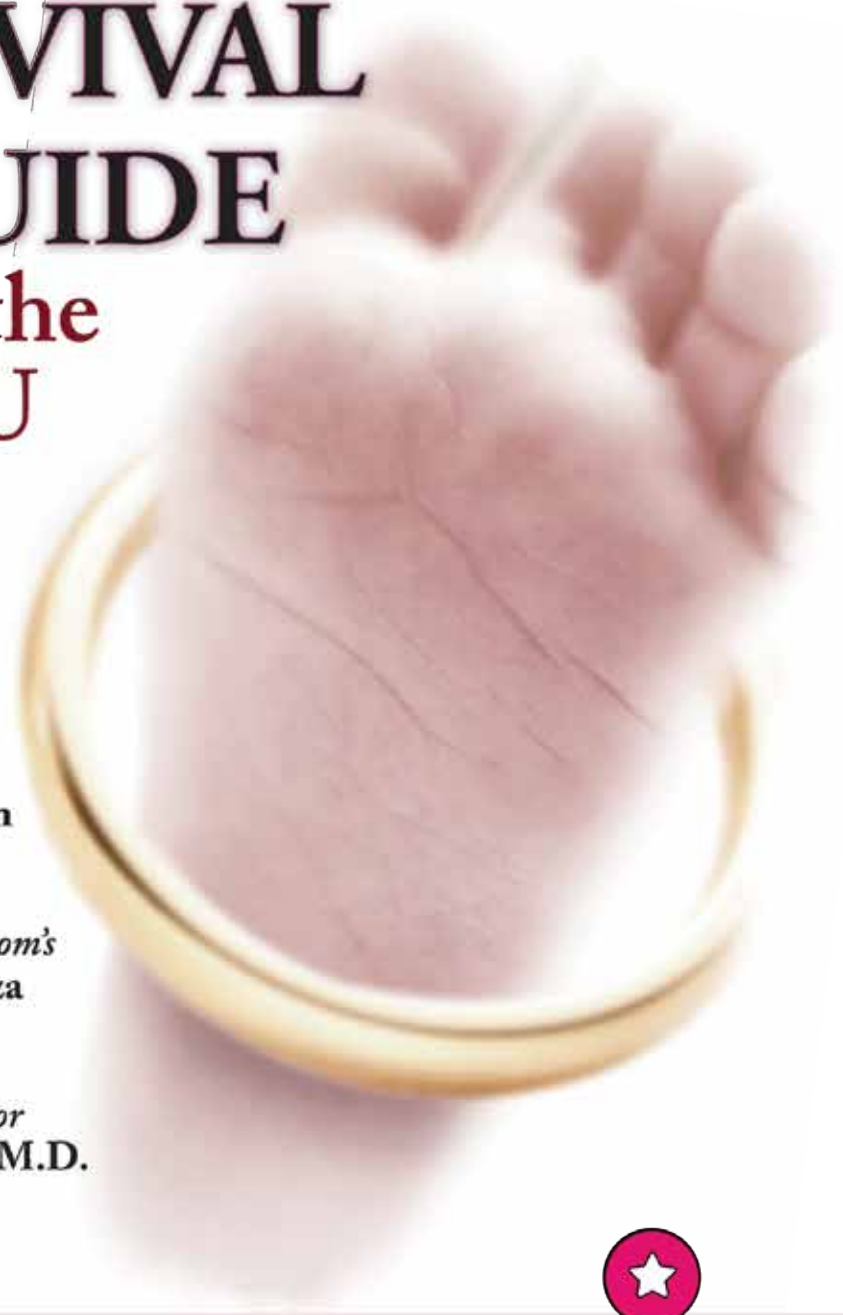
little man's
Nicole Conn

&

PremieWorld.com's
Deb Discenza

with

Medical Editor
Alan R. Spitzer, M.D.



HOW TO
MAINTAIN YOUR SANITY
& CREATE A NEW NORMAL

second edition



National Statistics

Respiratory Syncytial Virus



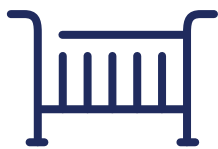
About Respiratory Syncytial Virus

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.¹ 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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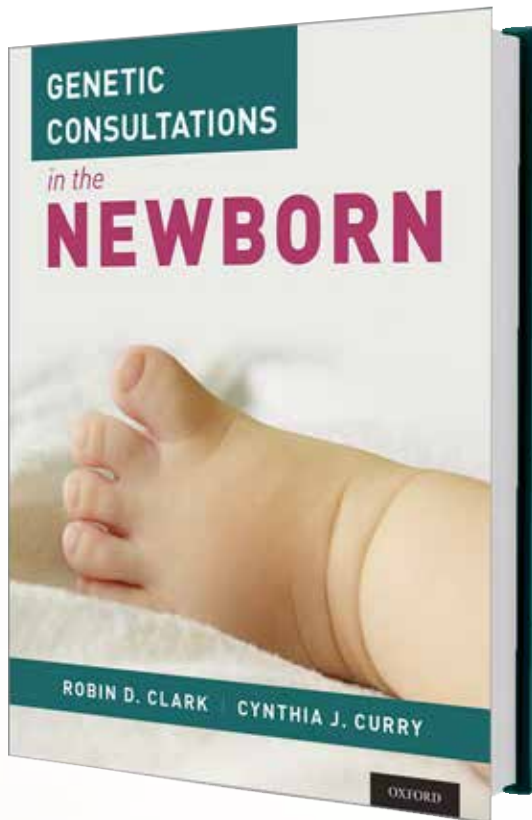


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OXFORD

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

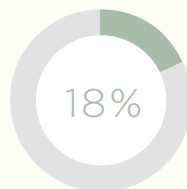
Preparedness

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.

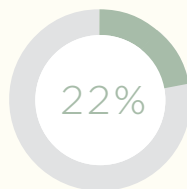
Specialty health care providers reiterated these concerns; 70% agreed that parents of their patients have a low awareness of RSV. Meanwhile, specialty health care providers themselves actively monitor for RSV. They reported that:

PARENTS

Only 18% said parents know “a lot” about RSV, reflecting an awareness level that’s roughly half that of the flu

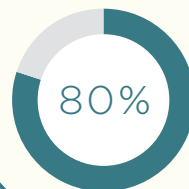


Only 22% of parents consider themselves “very well prepared” to prevent RSV.

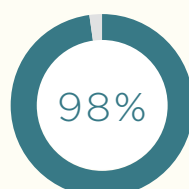


SPECIALTY HEALTH CARE PROVIDERS

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:

The Clinical Utility of the World Wide Web As It Relates to the COVID-19 Pandemic: Part 2

Joseph R. Hageman, MD, Tatiana Anderson, PhD, Kelty Allen, PhD, Mitchell Goldstein, MD

In last month's editorial, we discussed the World Wide Web's discovery by Tim Berners-Lee and how his goal of connecting information to investigators all over the world has been achieved during this COVID-19 pandemic as it relates to clinical and research data. (1) As a Post-Doctoral Research Fellow, Tatiana Anderson suggested some additional important clinically relevant questions for us to discuss.

“In last month’s editorial, we discussed the World Wide Web’s discovery by Tim Berners-Lee and how his goal of connecting information to investigators all over the world has been achieved during this COVID-19 pandemic as it relates to clinical and research data. (1)”

1) How exactly does the WWW help clinicians, researchers, and data scientists in their day-to-day jobs?

I have co-edited four clinical textbooks with colleagues that have been published since 2016. What was interesting was some feedback I received from our pediatric residency program director at Comer Children's Hospital at the University of Chicago, Dr. Lisa McQueen, who was coeditor in our most recent book about pediatric simulation. (2) When I proposed the idea to her, her concern was that no one reads and refers to textbooks anymore! As Tatiana also noted, textbooks get outdated quickly. The information on the internet can be continuously updated to reflect the latest research. This is certainly the case when it comes to information coming from investigators from all over the world regarding COVID-19 infection/disease. However, the readers, whether they be clinicians, investigators, administrators, or parents, need to know where to look and what information they can trust. Here are a couple of updated examples as it relates to COVID-19 in pregnant women and their newborn infants. Zambrano and colleagues from the Centers for Disease Control and Prevention (CDC) published an update about the characteristics of symptomatic women of reproductive age with lab-confirmed SARS-CoV-2 infection by pregnancy status in the United States (U.S.), January 22-October 3, 2020 in the Morbidity and Mortality Weekly Report (MMWR). (3) These data were from 409,825 women, ages 15-44 yrs., with symptomatic SARS-CoV-2 acute infection, and 23,434 (5.7%) were pregnant. After adjusting for age, race/ethnicity, and underlying medical conditions, pregnant women were significantly more likely than non-pregnant women to be admitted to the intensive care unit (10.5 vs. 3.9 per 1000 cases; adjusted risk ratio=3.0). (3) Although the absolute risks are low, pregnant women are still at increased risk for more severe illness. (3) Pregnant women with symptoms of COVID-19 infection should be counseled to seek

“The third point made relates to connecting patients to clinical trials, and in this case, the new COVID-19 vaccine trials are up and running, although, at this point, they do not include pregnant women and newborn or young infants.”

prompt medical care safely. What is relevant for this discussion of the WWW's utility is that these data come from reliable sources and are clinically up to date and readily available via the internet. The absolute numbers of cases in this report are truly impressive, and the authors note that these cases are reported electronically to the CDC using a standardized case report form or NNDSS as part of COVID-19 surveillance efforts. (3) This information relates to the second point made by Tatiana Anderson, which is the utility and reliability of centralized data repositories at local, national, and global levels that can be analyzed using open-source data tools like R or Python. The third point made relates to connecting patients to clinical trials, and in this case, the new COVID-19 vaccine trials are up and running, although, at this point, they do not include pregnant women and newborn or young infants. The researchers' concerns relate to the safety of these new vaccines for pregnant women, their fetuses, and the potential effects on their newborns after birth. (4) However, quick dissemination of these trials and other research results are evident on an almost daily basis. (5)



Indeed it is these data tools that will help make the web smarter and more context-sensitive. Although many of the search engines of today are very good at guiding searches and predicting the intent of the user, and disseminating information, they will pale in comparison to the data-intensive tools of tomorrow, where algorithms will understand the ramifications of multiple users in multiple locations searching for causes of unusual symptoms that may be linked to the next pandemic. These predictive analytics leveraging the best of breed data tools will take us to the next quantum improvement.

2) How does having a deeper understanding of the structure of the WWW help a clinician access information?

In the previous paragraph, we discussed the paper by Zambrano and colleagues from the Centers for Disease Control (CDC) recently published in the *MMWR*. The CDC is a reliable resource for up-to-date research and evidence-based guidelines to follow during this pandemic. Unfortunately, there has been much controversy over the politicization of the recommendations published by the CDC, leading to a decrease in the public's trust in the organization's ability to provide reliable information controversy over the politicization of the recommendations published by the CDC.

Another crucial source of credible and reliable data come from articles published in peer-reviewed journals from all over the world. An example is a paper by Yang and colleagues from BMC Medicine entitled 'Pregnant women with COVID-19 and risk of adverse birth outcomes and maternal-fetal vertical transmission a population-based cohort study in Wuhan, China.' (7) This was a population-based cohort study of 11,078 pregnant women, 65 of whom had confirmed COVID-19 infections, and no maternal or neonatal deaths. (7) However, they were at increased risk of having preterm birth and cesarean section compared to those pregnant women without COVID-19 infection. (7) In addition, there was little evidence to support the vertical transmission of COVID-19 infection in this study. (7) This paper was published in a peer-review journal by investigators from the Chinese Department of Public Health and Tongji Medical College, Wuhan, China. (7)

Having a deeper understanding of how data are collected, analyzed and the rigors of the peer-review process for credible journals can help guide clinicians and researchers to find reliable data at the source. One can think of the source of this data as the center of a 'web.' As the results/conclusions of the study are re-reported through various means (for example, through print media, social media, blogs, etc.), they get further and further away from the source and become more and more subject to bias, opinions, and political spin.

The dynamic nature of the web must be leveraged to prevent the insertion of extraneous information. "Web-centric" information can and should always be appropriately sourced and linked to direct reporting. While there is always room for "OP-ED," it must be clearly identified as such.

3) Why is it sometimes a problem that patients consult the internet and "self-diagnose"?

As a pediatric critical care pediatrician for about 30+ years in a highly-educated area, families would often come to us when their infants and children were admitted to the hospital after "Googling" information on the internet and talking with their relatives. Now that patient-centered care and family-centered rounds have become best practice in most areas, clinicians need to take our families' ideas into serious consideration. As Tatiana notes, searching the internet for any clinical issue does not guarantee that the information you get is truly evidence-based, best practice, and state-of-the-art. The average patient may not know the difference between a credible and non-credible source, may not have access to the source of the

information because the original article is behind a paywall, or may not have the medical background knowledge necessary to interpret findings. The matter is further complicated by rampant misinformation (whether intentional or unintentional) amplified over social media platforms such as YouTube and Twitter (8). Misinformation about health issues, such as the safety and effectiveness of vaccines, can delay or prevent care and, in some cases, cost lives. (9)

"Although these web-like manifestations are the substance that makes the World Wide Web so enduring to us, we must remember its potential as "an internet." The very fact that it provides connection, content, and context is the basis for our ability to amalgamate data from myriad sources to provide the raw material for big data and predictive analytic solutions that would have been improbable just twenty years ago."

The term 'infodemic' was coined to describe the current climate, defined as "an overabundance of information- some accurate and some not- that makes it hard for people to find trustworthy sources and reliable guidance when they need it." (10,11) Some studies have even found that 'fake news' and inaccurate information may disseminate more quickly and wider than evidence-based news. (12) In focusing on information related to pregnancy and the care of newborns, websites can range from best-practice (13-15), to mother's internet clubs, to grandparent's advice websites. It is little wonder that patients and family members often come into the clinic with pre-conceived notions related to their health- accurate or not.

Moreover, the arbitration of news sources has taken on a new and enhanced priority, with many social media sites, now labeling or identifying potential misinformation or conflict with known facts. Although some may protest that this is a form of censorship, contextualizing information and providing a basis for reporting, highlighting these posts by those in a position of authority, defines the essence of evidence-based research. Since the web can promulgate misinformation, there must be a method for checks and balances.

Especially during this COVID-19 pandemic, clinicians must help manage rumors and dispel misinformation and conspiracy theories to mitigate fear and stigma. Clinicians should stay up to date on current recommendations for diagnosis and management of COVID-19 and be able to refer patients and families to reliable resources such as the CDC, National Institutes of Health (NIH), American College of Obstetrics and Gynecology (ACOG), and American Academy of Pediatrics (AAP) websites.

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Summarize the pearl for emphasis.
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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.

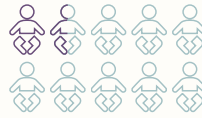
I am so much more than my NAS diagnosis. My drug exposure will not determine my long-term outcomes. But how you treat me will. When you invest in my family's health and wellbeing by supporting Medicaid and Early Childhood Education you can expect that I will do as well as any of my peers!



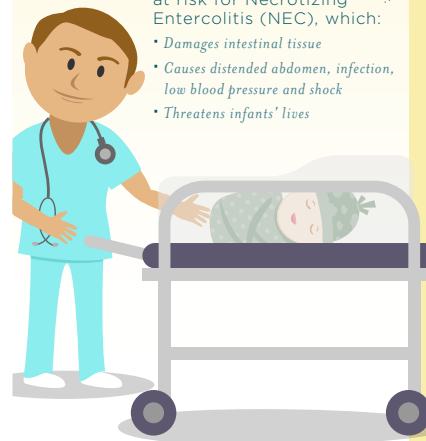
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Why PREMATURE INFANTS Need Access to an EXCLUSIVE HUMAN MILK DIET



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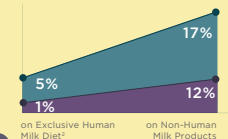


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Micro preemies who get NEC
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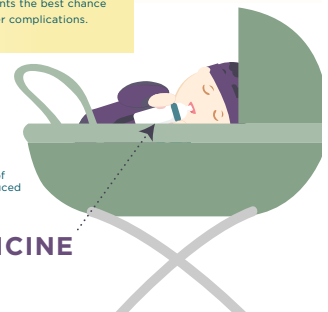
Mortality is reduced by **75%***



Feeding intolerance decreases*



Chances of NEC are reduced by **77%***



HUMAN MILK = MEDICINE

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During Pandemic COVID-19, the High-Reliability Organization (HRO) Identifies Maladaptive Stress Behaviors: The Stress-Fear-Threat Cascade

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Abstract:

Stress has become an organizational characteristic. Organizations work toward stress reduction, seek stress management, increase cognitive capacity, attend to our mindfulness, and refer staff for anger management. The HRO acknowledges that stress, fear, and threat are natural elements of dangerous work. They are integral to and support actions when we do not know how events will resolve. Rather than compartmentalizing stress fear and threat, the HRO harnesses these driving forces to initiate engagement and support the resilience necessary to maintain enactment. For this to occur, we must identify unrecognized stress for its deleterious effects on performance. As we accomplish this, the organization can harness this energy to resolve the original stimuli while achieving an acceptable, if not desirable, end-state. The stress-fear-threat cascade enables us to engage uncertainty and threat, but without neuromodulation, the same cascade can cause more damage than the inciting event.

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Introduction:

Stress can become one of an organization's characteristics, impeding reliability, creating unsafe conditions, and contributing to staff attrition. The “original” HROs operated where stress was endemic (van Stralen and Mercer 2020). The development of stress capacity in novices (Novaco et al. 1979) and staff (van Stralen and Mercer 2015) became integral to achieving reliability. On the other hand, maladaptive responses to stress, fear, and threat have a detrimental effect on safety and compromise reliability. Vigilance for these maladaptive stress responses is a form of *preoccupation with failure*.

The human stress system evolved to support an effective response against an acute physical life-threat, assisting immediate escape and survival (Hediger 1950, 19-20; Sapolsky 2004, 4–5; Lupien et al. 2007; Clinchy, Sheriff, and Zanette 2013). In modern times, acute stress can become sustained or chronic. Psychological stress “linked to mere thoughts” (Sapolsky 2004, 4–5) can sustain the release of stress mediators (Lupien et al. 2007; Clinchy, Sheriff, and Zanette 2013), causing structural changes in the brain (Lupien et al. 2007). We will discuss stress as an acute response because that describes the imminent danger for a person or the

HRO. The chronic psychological stress reactions start with an acute reaction, becoming sustained when the individual cannot extinguish the acute phase of the stress reaction.

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HROs accept the presence of stress and acknowledge the function of stress behaviors. The emphasis HROs place on stress capacity, psychological stability, and leadership (van Stralen, McKay, and Mercer 2020a, b) comes out of the purposes of the HRO characteristics and the fundamental reliance on the individual, a form of *deference to expertise*. This does not mean the HRO accepts or tolerates maladaptive stress or fear behaviors. It means that the HRO acknowledges that people (in the type of environments in which HROs operate) can become mentally or emotionally overtaken by abrupt, ambiguous events. The HRO, then, engages these behaviors as normal behaviors rather than weaknesses or moral shortcomings.

We have numerous first-hand or witnessed (DvS) accounts of widely respected physicians or surgeons treating a patient at the moment of abrupt deterioration. These doctors would freeze or rapidly and wordlessly begin acting. What these incidents have in common are barking, shouting, demanding orders given rapidly, without coordination or plan, often nonspecifically delivered to the general group. When one of the authors (DvS) presented such a case to a group of chief officers in the fire service, framed as a fire captain on the fireground, they unanimously said they would immediately remove the captain from duty with a referral for mental health assistance. When told that the scenario was a physician or surgeon, they reacted with astonishment.

While the conserved stress system inhibits top-down cognitive control and enhances bottom-up reflexive actions, modulation by human executive processes can move mental processes toward effective cognitive flexibility. We describe the development of

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maladaptive stress behaviors in this paper.

'Sustained *psychological* stress' is a modern dysregulation of physiological and mental systems that had evolved for 'acute *physical* crises' (Sapolsky 2004, 4-5; Clinchy, Sheriff, and Zanette 2013). The constant work to maintain stability leads to chronic pathology. From a functional perspective, sustained stress feeds back to the individual's acute response, but in a negative way. Understanding acute stress functionality will refocus efforts away from preventing or mitigating *all* stress, limiting allostasis toward identifying dysfunctional stress, which contributes to allostatic load.

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Functionally evolved for imminent physical danger, the stress-fear-threat cascade today reacts to thoughts and perceptions and can be modulated by thoughts and perceptions. A sense of controllability modulates stress responses. Fear, as a process of distance from threat, can drive adaptive actions or decompose to undirected offensive or defensive self-protection. Subcortical threat reflexes quickly initiate engagement or interfere with effective actions for self and others in a similar manner. This is not obvious; unrecognized stress, fear, and threat have become pervasive to the point of normalization in culture.

The authors' experiences in live-or-die situations illustrate that the stress-fear-threat cascade, when neuromodulated, is necessary for effective survival, safety, resilience, and reliability.

From Perception to Stress

Perception to action

Effective action responding to a changing environment integrates, from opposite ends of the brain, perception, hastily created plans, and motor activity. The dorsolateral prefrontal cortex (DPFC) and the posterior parietal cortex (PPC) functionally cooperate during time-based contingencies between continuous perception and emerging motor action (Quintana and Fuster 1999). Cognitive function for this to occur must include timing and coordination, the mode of information analysis of environmental events, and the temporal sequencing of the analytic processes as concurrent, reciprocal processing (Fuster 2000). The *executive functions*, acting hierarchically, coordinate temporary behavioral structures, and "integrate actions with perceptions in the presence of novelty and complexity" (Fuster 2000).

To maintain a working representation of circumstances, one must remember backward in time for several seconds to minutes and remember "forward" in time for "planned," prospective, near-future motor acts. This requires a timed element of acquiring, holding, and releasing information (Fuster 1999). Organizing behavior by time and timing, including the temporal closure of the perception-action cycle, sequences novel, and complex behavior (Fuster 1999). *Working memory* mediates perception and action in real-time (Fuster 1999).

A novel or complex environment contains distracting information and interference. The individual must protect goal-directed

behavior from interference or impulsive or reflexive behavior (Fuster 2000) and inhibit emotional memories (LeDoux 2000; Joëls, Fernandez, and Roozendaal 2011), well-established habits, or more easily processed intuitions (Shtulman and Valcarcel 2012). The DPFC mediates internal and external stimuli to bring this *inhibitory control* (Fuster 2000).

Executive Functions:

The temporal organization of behavior, essential for sequencing novel and complex behavior, requires integration across time between prefrontal cortex *representational* neurons and posterior parietal cortex *operant motor* neurons (Quintana and Fuster 1999; Fuster 1999, 2000). From lesion studies, brain cooling experiments, functional imaging, and electrophysiological studies, the authors identified specific roles for *motor attention* (impending motor action), *working memory* (sensory information for action), and *inhibitory control* (interference, impulsive and reflexive behavior). These three elements produce the operational control and temporal organization of behaviors that characterize the executive functions.

Complex cognition could control and organize behavior by any relatively independent processes or by a single process having multiple subfunctions. Akira Miyake et al. (2000) investigated the separability and contributions of the three generally proposed executive functions: mental set-shifting, information updating, and monitoring, and inhibition of prepotent responses. Using historical neuropsychological studies of patients with frontal lobe damage and current neuropsychological and cognitive studies, they characterized *shifting mental sets*, *working memory*, and *inhibition* as separable processes. They are not entirely independent, though, as they share related functions.

Using insights from developmental cognitive neuroscience, Adele Diamond (2013) showed a developmental progression in children. Further, the executive functions are effortful, though trainable, and can improve with practice.

This digression underscores the executive functions as separable, physiological processes with a developmental progression, rather than an esoteric academic construct. These functions, during the novel and complex circumstances, create logical reasoning and behaviors. In these circumstances, we use short-term memory of planned motor actions, memory to incorporate changing sensory information, adjustments to motor actions in progress, and inhibition of distracting information. We can easily lose the purpose of executive functions when we list them as three seemingly independent terms.

Perception to stress

Novelty, uncertainty, and uncontrollability, while in the domain of the executive function, can also cause stress (Mason 1968; Gagnon, and Wagner 2016). Novelty is processed in the right cerebral cortex, while the left cerebral cortex processes familiar perceptions. Uncertainty and ambiguity in decision-making occur in the ventromedial prefrontal cortex (vmPFC). Uncontrollability or unpredictability is the stimulus for the HPA axis.

The amygdala detects conflict from acute threats or stressors, receiving exteroceptive stimuli (the external environment) and interoceptive stimuli (the body's internal environment). The amygdala activates the sympathetic-adrenal-medullary (SAM) axis for the proverbial "flight-or-fight" response and the hypothalamic-pituitary-adrenal (HPA) axis for the release of peripheral adrenal hormones, including cortisol (Shields, Sazma, and Yonelinas 2016). The brain, reacting from bottom-up reflexive and priming processes, prepares the body for survival.

The rapid response of these directed, top-down responses gives the appearance of instinctive behaviors. Interpreting learned fixed action patterns, triggered by reflex, as instinct is a common misinterpretation. The presumption of instinctive behaviors dismisses salience, interpretation, and goal-directed behaviors, adding to the sense of uncontrollability.

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Uncontrollability alone causes minor stress, impairing the executive functions (Arnsten 2009). If unrestrained neurological stress responses develop, then almost pure bottom-up control and self-preserving behaviors occur. Cortisol and the amygdala increasingly suppress the executive functions, and a defense cascade follows (Kozłowska 2017). Threats that are proximal (static distance) or approaching (changing distance) will mobilize one to move toward safety or, if escape is not possible, to fight in self-defense.

Impaired executive functions, particularly working memory, are easily unidentified as we use our executive functions to evaluate our executive functions (“we use our judgment to judge our judgment”). Subordinates are then more likely to accept a leader’s impairment as normative. Working memory manipulates the “chunks” of information that we can retain in short-term memory, limited to 4-7 chunks (Cowan 2001). The characteristics of these chunks contribute to the variance in number, whether due to temporal or spatial properties, the nature of the content, segregating into groups or integrating to a group, coherence of patterns, and capacity limits with information overload (Cowan 2001).

An unrecognized contribution to uncontrollability, given the facts above, is the presence in high-risk environments of compliance, rules, or linear protocol for engaging the embedded problem (van Stralen 2020). These become chunks of information readily reducing short-term memory by half and influencing, if not redirecting, working memory away from the problem at hand, moving toward an “accepted” response.

The author (DvS) sent a PICU transport team to a local medical center for an infant in cardiac arrest, over four hours intermittently responding but never stable. A second-year pediatric resident responded with the team, which successfully resuscitated and stabilized the infant twenty minutes after arrival. The resident sensed herself entering the attentive freeze response and, from the author’s lectures, recognized it as neurochemical. She immediately examined the endotracheal tube, which brought immediate relief from her freeze sensation.

Stress responses also affect the salience of external and internal stimuli, influencing perception with changes in selective or focused attention, ultimately altering cognition. An immediate proximal but moderate threat can prime an array of reflexive, subcortical behaviors focused solely on one’s survival. The acute effects of stress on perception can continue after the episode. Memory consolidation occurs after an event, making it amenable to cognitive edits from the individual or comments from bystanders or authority figures.

Stress is a measure and consequence of uncontrollability while at the same time, stress promotes allostasis. After an abrupt change in circumstances, we must reset what we have learned and possibly change how we learn. Stress from a functional perspective tells us we need to improve performance and sustain our capacity if stress is sustained. Stress from an evolutionary perspective keeps the animal alive long enough to learn, then to be able to use that learning. Allostasis describes achieving stability through change. Continuous effort to achieve allostasis or allostatic load can create chronic pathophysiology and sustain psychological stress (McEwen and Wingfield 2003). Stress becomes a demand we have yet to meet.

Authors	Fuster	Miyake et al.	Diamond
Purpose	Temporal, functional organization of behavior	Separable Not completely independent	Developmental progression Representative measures
Cognitive-motor	<i>Motor attention</i> Representation of plan Impending motor action Motor memory for execution	<i>Shifting</i> Complex tasks Mental set shifting between multiple tasks Disengage from an irrelevant task set	<i>Cognitive flexibility</i> Exploit sudden, unexpected opportunities Adjust to new demands, priorities Change perspectives, approaches spatially, interpersonally Switch between tasks Admit when wrong
Information	<i>Working memory</i> Sensory information for action	<i>Updating</i> Information updating Manipulate relevant information Monitor working memory	<i>Working memory</i> Mentally work with information: - Held in mind - No longer perceptually present
Controllability	<i>Inhibitory control</i> Interfering information Impulsive, reflexive behavior	<i>Inhibition (deliberate)</i> Dominant, prepotent responses	<i>Inhibitory control</i> Attention, behavior, thoughts, emotions Dominant, prepotent mental representations

Top-down modulation harnesses cognitive flexibility for rapid improvisation during abrupt, fluctuating change. Without recognizing how stress impairs perception, cognition, and behavior, we risk conserving maladaptive responses and not trusting our improvisations.

Stress as Controllability:

Acute stress functionally inhibits the *executive functions* through cortisol, the stress hormone in the hypothalamic-pituitary-adrenal (HPA) axis, and the amygdala in the sympathetic-adrenal-medullary (SAM) axis. Cortisol blocks memory retrieval in the prefrontal cortex and hippocampus (memory center), and the amygdala directly inhibits the prefrontal cortex.

“If we understand stress, fear, and threat as suites of behaviors, part of a person's response to the environment, we can understand the logic in their grouping and how they derive from, and form, a person's temperament. Temperament, as the affective, activational, and attentional core of a person, represents a person's reactivity (excitability, responsivity, and arousability) and self-regulation (Rothbart and Derryberry 1981; Rothbart and Bates 2007).”

Researchers remove or impair the volunteer's or animal subject's ability to control the experimental intervention to measure the effects of stress. The Yerkes-Dodson Curve (Yerkes and Dodson 1908) came about from studies increasing an electrical stimulus while measuring white-black discrimination in dancing mice. Their third and fourth conclusions were: 3) with easy discrimination, the dancers learned as the electrical stimulus increased, and 4) when “discrimination is extremely difficult,” learning is rapid as the stimulus increases until a threshold is reached, then it decreased. The dancers were not the ones controlling the electrical stimulus.

Fire department Rescue Ambulance medics, working in a high crime area, would gain protection by asking the strongest appearing male to hold a roll of gauze for them. The individual gained a sense of control and participation. If violence threatened, he would intervene to protect “his” team, the medics. Similar control was observed in the PICU when anxious doctors adjust a knob on the ventilator, not realizing the knob simply changed the display. They would studiously look at the child's chest, turn the knob, look at the display, look at the chest, and turn the knob again. This was similar to the “producer's knob” in a recording studio, not connected to anything, that would thwart “non-knowledgeable” participants from detrimental influence (Bates 2019). In experimental situations simulating the danger of combat, those recruits who remained at their post had focused on repairing a “nonfunctional” radio needed for evacuation while those who self-evacuated had stopped working on the radio (Berkun et al. 1962). Through a sense of controllability, simple physical acts keep a person engaged and performing with the team.

Following the Yerkes-Dodson Curve, immediate life-threat would decrease a person's performance. That has not been our experience in live-or-die circumstances. Pragmatic HRO develops controllability in staff by strengthening their capabilities and stress capacities, thereby mitigating performance deficits due to stress. Authority can then migrate to those with expertise, allowing them to act. *Deference to expertise*, leading to action, promotes controllability to a greater degree than merely listening.

Impairment of the prefrontal cortex also impairs abstract thought. A sensitive indicator of a stress response, almost quantitatively, is the appearance of concrete thinking. “How much do the people on the scene think like a child. That tells you how serious the call is.” This was one of the first ambulance lessons the author (DvS) received in 1972. The more serious the call, the more concretely people think without conditioning and modeling by experienced service veterans (defined in the fire service by comparing “the person who does the same thing every year for 20 years versus the person who does something different every year for five years”). This situation is also true in critical and emergency care. Berkun et al. (1962) placed well-trained soldiers, most with combat experience, into the previously described study. These soldiers performed better than recruits, as expected, but differed from recruits in that the experienced soldiers performed better under the stress conditions than control.

Alfred North Whitehead (Whitehead, 1926/1967, 64) described “the Fallacy of Misplaced Concreteness” — the “error of mistaking the abstract for the concrete” — accepting abstractions “as the most concrete rendering of fact.” Excluding the environment and context to make abstract concepts measurable supports the illusion of concepts as concrete reality and abstractions as concrete facts. We hear this when people rely on abstract concepts, metaphors, and clichés. Concepts are *images* of reality; we must not mistake concepts *for* reality.

Even though intuitions and scientific thoughts are abstractions, the loss of executive functions means that intuitive thought is not inhibited. Because intuitive responses are mentally faster than scientific responses, childlike misconceptions emerge, and the individual begins thinking in intuitions and superstitions. Inhibitory control is one of the executive functions. Without cognitive inhibition, intuitions predominate over scientific thought (Shtulman and Valcarcel 2012, 2016; Shtulman and Young 2019).

Stress is portable. Contrary to intuition, obtaining precise information and following rules and protocols is an unrecognized source of stress. Precise information becomes a goal, lacking feedback on its effectiveness. Accuracy requires feedback as we repeat goal-directed behavior to become more effective. Hence the artillery phrase, “ready, fire, aim!” (Dutch Army artilleryman, personal communication). Feedback augments, if not initiates, bottom-up influence. Managing feedback is critical for learning and reducing stress. Rules are, by their nature, discrete.

In the contingencies of the NICU, rules may overlap, compete, or conflict with the query of who chooses the rule. Protocols are deterministic and linear, while, as noted above, our executive functions operate for the novel and routine situations of complexity where information changes and the effectiveness of actions are not known until the act. Even then, we cannot identify effectiveness versus mistake [or error] while the situation unfolds (Paget 1988, 45). The pressure to predict drives the passive search for predictive information rather than active engagement, which will generate Shannon Information by converting uncertainty to certainty through action. This type of engagement, to generate information, creates order, structure, and predictability.

While the demands on leaders are greater than their subordinates, their sense of control from leadership can buffer against stress

(Sherman et al. 2012). Unfortunately, this can be a draw for some leaders to increasingly retain control during a crisis, reducing their stress load at the expense of subordinates.

Inhibition allows one to inhibit thoughts or prepotent responses, allowing selective attention to task-relevant information and engagement of goal-directed actions. Working memory refers to keeping information in mind and updating/integrating current content with new information. Cognitive flexibility refers to the ability to shift between cognitive rules or modes of thought (Lupien and Lepage 2001).

Fear As Process:

The pragmatic stance integrates the mental and behavioral effects of fear within the operations of HRO. We cannot predict anything about fear other than it will affect someone. More damaging to an HRO than the effects of fear are the unrecognized effects of fear on interpersonal interactions, behaviors, cognition, emotion, and attrition.

When a predator approaches, an animal responds to avoid the enemy with what Heini Hediger (1950, 19-20) called an “escape reaction.” The animal does not run away but has a suite of behaviors to avoid the enemy (not all threats come from predators). The suite is characteristic for the animal, the species, the enemy, and the environment. If the enemy continues to approach and reaches a specific distance, the “flight distance,” the animal will flee, trying as quickly as possible to regain the flight distance. During flight, the animal will *not* attack. If the enemy enters the “defense distance,” the animal will attack but always with the character of emergency self-defense. When the enemy enters the “critical distance,” the animal will attack with emergency characteristics, going beyond self-defense. This attack is associated with territoriality.

This departure into animal behavior illustrates fear as a threat to the significant characteristics of:

- Distance
- Bottom-up subcortical reactions
- Top-down cortical modulation
- Rapid behavioral shifts

Because fear reactions integrate stress and threat, we will discuss in this section fear as a reaction to a threat coming closer in proximity.

Threats:

The subjective nature of threat prevents us from predicting what a person will perceive as a threat or how they will respond to a threat. In this sense, threat in an HRO becomes a shared experience in that colleagues, particularly leaders, monitor each other and subordinates for early signs of stress or fear. For example, the nature of a person’s humor reveals evidence of fear – humor as mastery, tension relief, or to redirect aggression – gives clues to the leader about a person’s state (van Stralen, Byrum, and Inozu 2017, 291-3).

The subjective representation of threat, and the degree to which it is felt, is processed in the midbrain periaqueductal gray (PAG) nucleus. The PAG coordinates behaviors essential to survival, including threat reflexes, rapid changes to subcortical behaviors, and startle/posture corrections. The PAG also processes the proximity of threats (Mobbs et al. 2007).

Fear motivates a person to act in order to reduce the potential danger from a threat. While it is common to speak of predator-

prey interactions, it is more useful to view fear as a motivating drive to protect one’s physical, mental, and emotional body from attack or collision (Graziano and Cooke 2006). How we protect ourselves every day is how we protect ourselves in an extreme crisis or life-threat (Jim Denney, Vietnam Veteran, and Captain, Los Angeles Fire Department).

An unrecognized or misinterpreted threat may come from ventilator management. The intensive care unit properly focuses on blood gas derangements, treated with technical methods for oxygenation and ventilation. Overlooked is the effect of sensation. In a study to evaluate curare’s central nervous system effects, a volunteer received curare stepwise until achieving full paralysis (Smith et al. 1947). “Shortness of breath” occurred “in the presence of adequate pulmonary ventilation and oxygenation” but resolved with “smooth rhythmical pressure...alternating with slow even release” at a slightly higher than normal rate. Curare had been administered to infants and children without additional medication (Smith et al. 1947), and a belief persisted that curare had some central depressant action and could enhance analgesic or anesthetic action (Kellgren, McGowan, and Wood 1946). The study also disconfirmed the motor theory of voluntary thinking, that muscle activity was necessary for perception and thinking (Cohen 1986).]

Subcortical fear responses or threat reflexes can occur from the sense of suffocation in the presence of adequate oxygenation and ventilation. Any form of chest restriction, for example, COVID-19, acute asthma, or mechanical restriction, can induce physiological and psychological fear reactions despite sufficient ventilatory efforts for gas exchange and speech. With central neurological injury, a neonate in the NICU may, instead, show symptoms of hypoactive delirium (Groves, Traube, and Silver 2016). In a study of PICU patients, 17% had delirium with 46% hypoactive delirium (Traube et al. 2017). In two pediatric subacute facilities, pediatric patients with hypoactive or hyperactive delirium immediately calmed by hand ventilation alone, changing their diagnosis from persistent vegetative state to profound intellectual disability. Many began smiling and attending school (author’s experience, DvS).

Distance: Physical, Emotional, Mental, or Temporal:

We maintain distance for safety. The distant threat, yet within the “flight distance” for physical, emotional, mental, or temporal threat, increases activity in the ventromedial prefrontal cortex (vmPFC), which connects to the amygdala for the determination of the motivational importance of or degree of, the threat. The vmPFC also incorporates contextual factors into decision-making, whether intrinsic or extrinsic to the organism or environmental factors (Fellows and Farah 2007). The amygdala connects onward to the bed nucleus of the stria terminalis (BNST) to control a repertoire of behavioral defensive states (Mobbs et al. 2007).

The additional proximal threat will switch activity from the vmPFC to the phylogenetically older midbrain, increasing PAG activity. The PAG controls fast reflexive behaviors (e.g., fight, flight, or freeze) and fear-induced analgesia (Graziano and Cooke 2006; Mobbs et al. 2007). The release of endogenous opioids in the PAG inhibits the effect of expected pain on decision-making. (The vmPFC is important for decision-making in uncertain, risky, ambiguous, or context-dependent conditions, Fellows and Farah 2007.)

The PAG also identifies an approaching or receding threat (Adolphs 2013), specific to one of the *greatest* fears, an approaching predator. Detection of changes in distance from threat functionally switches the repertoire of behaviors the animal uses (Adolphs 2013). Berkun et al. (1962) found this from the descriptions of army recruits in dangerous situations. Distance as perceived physical proximity or time dominated the thinking of “evacuators,” becoming the determinant for running away.

This movement from contextual decision-making under uncertainty in the vmPFC to reflexive decision-making from the PAG makes the fight or flight of the fear reactions appears to be the same as the fight or flight from *threat reflexes*. What it describes, though, is the functional flow of response to a developing danger as apprehension leads to avoidance (flight), then becomes engagement (self-defensive fight). As a functional approach, the *fear reactions* (PAG) develop from distance-based assessments, while *threat reflexes* (amygdala) come from active danger.

The PAG has different functions in its several dorsoventral and rostrocaudal divisions. Dorsal stimulation promotes passive freezing, while ventral stimulation promotes escape and other active coping behaviors (Mobbs et al. 2007). From nose to tail, active coping strategies shift from moderate threat display to active defense, then aggressive defense; then strong threat display and *non-opioid*-mediated analgesia; followed by vigorous escape when the enemy is near. When escape from an enemy is impossible, passive coping strategies disengage from the environment and behaviors shift to freezing, and then with increasing proximity, moderate to strong immobility. Lastly, strong freezing with *opioid*-mediated analgesia occurs (Koutsikou, Apps, and Lumb 2017; Watson et al. 2013).

Social distance acts as either a threat or as support. The close physical proximity of a threatening person elicits the same reactions as any threat. Fear responses are also transmitted through social interactions. On the other hand, as social support, people create a protective factor against stress, reducing the hypothalamus-pituitary-adrenal axis responsiveness to social stress (Brill-Maoz and Maroun 2016).

As favorable or unfavorable, social distance is subjective, but the peripersonal (i.e., near body) space is not. This is the space where intrusion by others elicits discomfort. This space is measurable in the encoding of the visual receptive fields involving the ventral intraparietal area (VIP) and a polysensory zone in the precentral gyrus (Lloyd 2009). Responses are sensitive to nearby or approaching objects (Graziano and Cooke 2006). The VIP connects to the amygdala, then to the PAG for defensive and aggressive behaviors (Lloyd 2009). The neuropeptide oxytocin partly mediates social interaction and may also regulate fear in these situations (Brill-Maoz and Maroun 2016).

Flexibility:

The continuous switching within the PAG is a blend of the bottom-up responses to threats before they come to our awareness and top-down cortical neuromodulation from the vmPFC and the anterior cingulate cortex. This switching supports rapid behavioral shifts from the threat reflexes.

Fear reactions are conscious sensations experienced when exposed to an imminent threat (Panksepp, Thomas, and Paolo 2011; LeDoux and Pine 2016). The amygdala sends signals to the unconscious (subcortical) and conscious (prefrontal cortex) regions of the brain, accounting for the uncontrolled fear responses and the feeling of fear. The emotional response of fear, preceded by a threat to self-preservation, diminishes danger (Oatley & Johnson-Laird 2014). This creates the drive to avoid or escape, generally focusing on self-interest, self-protection, or the protection of others. We can regulate the feelings of fear by reappraising the situation or suppressing the behaviors (Ochsner and Gross 2008; Heilman et al. 2010; Cutuli 2014; Gross 2014, personal experience of the authors).

Actions for *offensive protection*, often developed from a developed plan, take the individual into a prompt attack to stop the problem's spread. The aggressive projection of force secures the initiative but becomes pathological when directed at people. The person

will use surprise, concentrated actions, fast tempo, and audacity. They will use blame, accusation, and personal attacks.

Actions for *defensive protection* focus on the individual's safety, often with the person moving to a place of psychological or physical safety (Oatley & Johnson-Laird 2014). Any ad hoc emergency plan is singularly focused on personal survival or a sense of safety. The person enters this defensive mode when demands *clearly* exceed capabilities, and risks become too great for them to feel they can continue or survive. The person will not go near the threat source, which could be the leader, an administrator, or a colleague. Rationalizations and abstractions (for example, clichés and metaphors) support actions since the individual has not approached sufficiently close to the situation to identify correlations or causations. This individual is less useful to protect others because the focus is primarily to reduce risk to themselves. The person will deflect, excuse, justify, or use prophylactic self-blame.

Threat as Reflex:

Fight, flight, and freeze are commonly referred to as the "fear responses." For the functional reason previously mentioned, we distinguish between the cortical "fear responses" due to *distance from a threat* and the subcortical "threat reflexes" due to *attack*, that is, the *imminence of a threat*. We cannot control the threat reflexes as a reaction, but we can inhibit sustained threat reflexes and control consequent behaviors. The term "instinct" is commonly used to describe the reflexive response and associated pattern of action. This disregards the associated learned behaviors, called "fixed action patterns," that form mammalian "instinctive behavior."

The wide repertoire of behaviors observed and experienced derives from a few mammalian defensive behaviors. Conscious, top-down modulation of the nonconscious, reflexive motor and emotional elements generate this complexity. Therefore, the behavioral or emotional component of the reflex may not occur. For example, the fight response without the behavioral component appears as anger. The threat responses, with or without both components, will continue to impair cognition. A sense of uncontrollability enhances the appearance of maladaptive consequences. Uncontrolled defensive behaviors are brittle and imperil survival. Even the perception of control is sufficient to diminish these reflexive behaviors.

Threat reflexes initiate behaviors for survival and adaptation to adverse or hostile environments. Perceptions of threat trigger reflexes that operate below the level of consciousness (LeDoux 2014).

- Fight engages in overcoming the threat.
- Flight rapidly increases separation to the flight distance previously described.
- Freeze, as attentive awareness with the cessation of movement, has two components: 1) focused collection of the necessary information and 2) posture poised for immediate, effective action.
- Tonic immobility, the intense awareness with the inability to move, is accompanied by mild-to-severe nausea and possibly evacuation of body contents.

Three other threat responses bear discussion: startle reflexes, dissociation, and emotional memory.

- Startle reflex for defensive posture, gait and postural responses, and voluntary escape movements.
- Dissociation occurs when abrupt, unexpected,

overwhelming events depersonalize an individual and fragment memory consolidation.

- Emotional memory develops from a single, emotionally charged incident, preparing the individual for a similar circumstance.

How they present:

- Fight is manifested by anger and frustration
- Flight takes the form of avoidance and distraction.
- Freeze as a physical freeze is an immobility with intense attention, while a mental freeze is the inability to recall knowledge or use working memory.
- Tonic immobility, despite awareness of surroundings, prevents physical movement, but milder presentations are intense aversion, gastric upset, or nausea.
- Startle reflex scream, an involuntary jerk, or "start."
- Dissociation is depersonalized, emotional numbing.
- Emotional memory presents as a severe response independent of and disproportional to the event.

Fight. As described by Hediger (1950, 20), an animal will attack with emergency characteristics, going beyond self-defense, when an enemy enters the critical flight distance. The separation of the motor and emotion components leads to responding with anger (emotion component) without physical contact (motor component).

The prevalence and pervasiveness of relaxed fight responses give the impression that anger is normal, if not necessary, behavior in an urgent or emergency environment. The immediate reactions observed by the use of the fear responses of anger and force, for example, reinforce the belief in their effectiveness. However, the observed effectiveness is an immediate change toward homeostasis at best, while impairing allostatic strengthening.

Flight. As described in "The Process of Fear" above, the animal flees due to an enemy's proximity. Fight during the fear process enables escape (Hediger 1950, 20).

In human terms, the person will "flee" due to the motor component to physically leave or display the emotional component and avoid, ignore, or distract, perhaps by asking for more information (McConnell and van Stralen 1995). Verbal maneuvers include denial, dismissiveness, or depreciation of disconfirming information.

Attentive freeze. The body is tense and poised to act; the mind is watchful, collecting information. In prey species, it prevents motion detectable by predators. Freeze is the brake on fight-or-flight reactions to learn more, avoid a fight, or prevent futile flight to failure. Freezing is also associated with faster subsequent cue-signaled responses (Roelofs 2017)

Information can have more than one meaning, and actions can have more than one effect, contributing to the hypervigilant freeze. This pause can be misinterpreted as denial, indecision, confusion, or waiting for leadership.

Tonic immobility. The person is "frozen" and, despite muscle tone, *cannot* move (differing from attentive freeze), emotionally aroused, full of fear, unable to call out, or respond to pain. Yet the person maintains full awareness and consciousness (Abrams et al. 2009; Kozłowska et al. 2015). The vagus nerve mediates many of the tonic immobility features: bradycardia (slow heart rate), life-threatening arrhythmias, decrease in respiration, nausea and

vomiting, urination, and defecation.

Without the behavioral component, tonic immobility appears as the feeling of nausea when faced with a difficult decision, the "pit of my stomach" feeling. For novices, nausea accompanies their first independent decision and, if not resolved, will inhibit future decision-making. The individual does not necessarily become trapped in tonic immobility. Kozłowska et al. (2015) described actions a Second World War Flying Officer would take when training pilots: he used a "firm voice devoid of fear to issue simple orders that the men had already learned and that was automatic: 'flaps,' 'raise the stick,' 'rudder.'"

Startle reflex. A stumble, a sudden, loud sound, or a quick movement noticed from the corner of your eye, requires reflexive protective action. With rapid body movements, one regains balance, reflexively postures to protect vital organs, and becomes poised for action. Mentally, one assesses information for salience, meaning, and relevance (Valls-Solé et al. 1999; Nonnekes et al. 2015; Shemmell 2015). Through convergent evolution, startle became a repertoire of protective behaviors reflexively, bringing protection from disconnected threats represented by sound, sight, and imbalance. More commonly, they present as a single scream (for example, in a scary movie), flexing into the fetal position for protection during a fall (Bakker et al. 2006) or suddenly attending to a "distraction."

Vocalizations in the startle response may be misinterpreted as "screaming in panic" when they are actually an involuntary reflexive response to regain posture, orient toward a threat, and prepare for voluntary movement.

Dissociation. Fragmented awareness and derealization, producing an oddly calm but flaccid, vague stare, an emotionally numb individual, can appear during objectively innocuous situations. Though this dissociative response is more likely when circumstances overwhelm, realities suddenly become intolerable, or intense emotions are experienced (Frewen and Lanius 2006; Lanius, Paulsen, and Corrigan 2014). You may have observed this flaccid look of absence at the moment circumstances disrupt and fragment the individual's worldview, even when the individual has experience and authority.

Though it appears the person does not care, it is better explained as dissociation. Dissociation can occur as detachment, described above, or by compartmentalization, when controllable processes or actions become separated, continuing to operate without conscious control. The person functions inappropriately for the circumstances (Holmes et al. 2005). Dissociation may be more common than we realize, such as the individual receiving overwhelming information or the leader receiving information that disconfirms strongly held beliefs.

Emotional memory. Novices entering a dangerous field have all felt the sudden sting of the "old timer's" wrath, seemingly out of proportion to the minor act. Those in the work environment, immersed in events, have experienced the abrupt, unexpected, abject failure without recovery. Both authors have heard and lived with the understated phrase, "Well, we don't want to do that again." "That" likely being injury or death during operational activity. While the memory of events may fade, similar indices will, through the amygdala, trigger a life-preserving response. With meaning-giving and insight, this becomes adaptive. With isolation or blame, this becomes pure destruction. *The HRO gives meaning and shares insight. No one is allowed to be isolated. No one is to blame.*

Strong emotional experiences, particularly those associated with threat, encode into a type of memory that is readily triggered by closely similar circumstances and that does not extinguish with

time (LeDoux 2000; Joëls, Fernandez, and Roozendaal 2011). Rarely does memory recall come in the form of the person re-experiencing the event, known as a ‘flashback.’ More likely, the current circumstance elicits sensations associated with the originating experience. The emotional memory directly and unintentionally takes over redirection of attention. Neonatology, as a field of practice, is quite associated with emotional memory.

Relations Between Fear-Stress-Anxiety-Threat:

Behaviors and feelings emerge from nonlinear, complex neurological interactions between several orthogonal systems. Novel and familiar perceptions enter the right or left cortex, respectively. Some people are comfortable with novelty; some are not. Novelty can trigger the HPA system to release cortisol. Decision-making under uncertainty occurs in the vmPFC. Uncertainty can trigger the HPA system to release cortisol. Events in flux can be uncontrollable, another releaser of cortisol from the HPA system. As an enemy comes closer, spatially or temporally, the origin of behaviors moves from the vmPFC to the PAG, where self-defensive behaviors begin to predominate. Cortisol, released due to novelty, uncertainty, or uncontrollability, begins to inhibit memory systems, drawing focus on learned behaviors rather than cognition. At some point, the threat becomes imperiling, and threat reflexes predominate. Cortisol release interferes with cognitive neuromodulating influence. Isolating the brain laterality, the HPA axis, and the SAM axis makes sense for research and developing models but misleads when attempting to understand and observe behaviors during an incident. Confounding factors include perceptions, experience, and social support, whether convergent, local, or from leaders.

Comparison of fight and flight between fear and threat

Fight or flight, as offensive and defensive fear responses or as threat reflexes, have different timelines, stimuli, and purposes. “Fear flight” begins more slowly, mediated by the PAG, while the enemy is at a distance from the individual, initiating the movement to regain the “flight distance.” Threat flight occurs immediately when a sudden immediate threat stimulates the amygdala and SAM’s survival behavior. Physically, the person in “fear flight” has impaired cognition (cortisol) and escapes directly *toward* a safe place. In “threat flight,” the individual retains cognition, begins evasive actions, and maneuvers away from the threat.

Flight due to fear. As a fire paramedic, the author (DvS) responded to a shooting in a city park during a friendly neighborhood touch football game. Arriving fairly shortly after the event, people were uncharacteristically distant from the victim. At close range, a shotgun round removed a section of the victim’s rib, exposing his lung. The victim was deceased. A few bystanders reported an adolescent, a second victim, had run home. Reaching this victim in his house, he frantically repeated that he tried to be good, go to school, do his homework, stay away from gangs. With shotgun pellets in his body, he had run directly to a safe place and sat – his home. *Flight as an unengaged fear response*, without neuromodulation, drives the individual to escape to a safe zone rapidly.

Flight due to threat. As a US Navy Aviator flying over North Vietnam early in the war, the author (TAM) routinely encountered gunfire and surface-to-air missiles. Unless you were in the target area, you may not know or be concerned about its source and direction. You countered with normal jinks (random turns to counter the firing solutions) and continued to the target in a random direction. You could often visually spot a SAM missile lifting off, a new method of attack that even the Korean War veterans (CO/XO) in the squadrons had not experienced. Your primary countermeasure was mild maneuvering to determine whether the missile was tracking toward your aircraft. If it was,

you maneuvered to keep it in sight and continued jinking until it was close enough that the missile was very close, then you turned hard into it. With command detonation from the ground, you could outmaneuver the big/fast missile, confounding efforts to detonate it. But with hard maneuvering, you lost altitude and airspeed, and the energy necessary to evade a second missile or remain above the intense gunfire at low altitude. *Flight-as engaged threat reflex* could dominate the action during the bombing mission, but damage could result without neuromodulation.

Fear fight, for self-defense, starts within the defensive distance, to help the individual escape. Threat fight, like threat flight, also occurs immediately in response to life-threat. George Williams, police tactics trainer, found that law enforcement officers experienced with street fights had no experience with THE FIGHT. That is the self-defense fight and is the more common way to escape. In THE FIGHT, the assailant wants to hurt the officer (van Stralen Byrum, and Inozu 2017, 257-9). Without the motor component, we can distinguish a self-defense argument, to escape with pride and ego intact, from the attack argument, the “assailant” wants to (emotionally or professionally) hurt the healthcare professional. Mismatched responses risk acceleration and loss of control. We use a different analysis level for the different systems (fear, threat), not different responses.

Comparison of tonic immobility with vasovagal syncope

The “common faint” occurs in an emotional context when the vagus nerve rapidly decreases blood pressure (Blanc et al. 2015). Complete loss of consciousness distinguishes vasovagal syncope from tonic immobility, where the person remains fully aware. Vasovagal syncope could, like tonic immobility, be an adaptation to mimic death (Bracha et al. 2005) or as a response to the sight of blood, injury, or injection. Syncope from seeing one’s own blood may have adaptive value to reduce blood loss by rapidly decreasing blood pressure through vagus nerve activation (Diehl 2005).

Comparison of attentive freeze with tonic immobility

Freeze and tonic immobility responses appear similar to an observer but have distinct survival purposes. A person in the “freeze state” maintains attentiveness while remaining motionless, poised for action whether to initiate fight or flight. A person in tonic immobility maintains awareness and will create memories during this phase but cannot respond to stimulation.

Comparison of dissociation and emotional memory

During the experience of overwhelming, threatening circumstances, the individual may retain vivid memories (Kozłowska et al. 2015) or experience memory retrieval deficits (Schauer and Elbert 2010). In the hypervigilant state, a narrow range of stimuli may be sharply encoded (Allen, Console, and Lewis 1999). *Emotional memory* formation is closely linked to the amygdala and hippocampus (Murty et al. 2010), appearing to need timing with norepinephrine and cortisol release (Joëls, Fernandez, and Roozendaal 2011). On the other hand, during dissociation, the loss of context fragments the memory and impairs encoding the ongoing experience into memory. The dissociation of context and disrupted cortical integration prevent memory encoding (Allen, Console, and Lewis 1999).

Unrecognized Stress, Fear, Threat:

We tend to think of a fear response as something physical, such as the fight-or-flight response. Most people do not recognize anger or avoidance as fear responses. We also tend to see confusion and fear as weakness or failure. These are all fear responses mediated by neurochemicals. They can come on with incredible

speed and, when accepted as simple neurochemical effects, can be interrupted almost as quickly.

The unrecognized *fight* responses include anger and frustration. One author (DvS) routinely queried staff, “What would make an attending angry with you?” Answers focused on errors or poor performance. After learning about stress, fear, and threat, the answers changed – “The attending is in a fear response or threat reflex.” The significance lies in the subordinate’s response; becoming more careful or working harder does not decrease fear. Asking “How can I help?” moves cognition from the amygdala to the prefrontal cortex.

The unrecognized *flight* is manifested by aversion, plausible avoidance, distraction, delay, and denial behaviors. Unrecognized *attentive freeze* responses include mental freezing and confusion while maintaining awareness. *Tonic immobility*, as a sensation, gives an unsettled feeling in the stomach and commonly nausea. One author (DvS) found that nausea is commonly associated with the first independent decision a novice makes.

The behaviors we identify with *unrecognized fear* have become incorporated into today’s culture as acceptable behaviors, if not norms, to be emulated. They arise from the well-known fear responses of fight, flight, and freeze but are redirected to more modulated behaviors than the “wild type” we would expect outside the workplace. Unrecognized fear behaviors include anger (including instrumental anger), avoidance, mistaken deference to authority, over-scrutiny of disconfirming information, and cognitive dissonance. We label them “unrecognized” because people all too commonly consider them accepted, or even normal, responses.

Failure develops either because of unrecognized fear responses or the instrumental use of fear or threat by someone. This failure may also be a failure to respond to signs or signals undetectable for some reason.

Conclusion:

Because the human brain evolved for the novel and complex, we see in the stress fear threat cascade the recruitment of specific aspects for our protection, for example, constrained memory, focused perception, or quick motor action. For survival on the savannah, the enemy must be far enough for security, a relatively objective distance. Flight distance and imminent harm in modern life, however, is subjective and contextual. Constant exposure to the enemy and conflict, with the continuous release of mediators, corrupts neuromodulation by the PFC and executive functions. The threat does not resolve, we cannot resolve the last decision, and the temporal closure of the perception-action cycle (Fuster 1999) does not happen. We do not receive our reward from the

nucleus accumbens. We do not feel the internal signal that the enemy is gone, that we now have security. Organizational stress as a culture of stress generates a continuous release of mediators, priming perceptions to make the next threat more daunting. The threat, during an already aroused state, signals a dangerous environment. This is not HRO.

The hallmark of acute stress is cortisol release with inhibition of memory. Chronic stress also releases cortisol with a subtle, nuanced effect on the executive functions of inhibition, working memory, and cognitive flexibility. To say “we feared for our lives” or “is there liability” is to normalize these suites of behavior and normalize *not* neuromodulating stress responses. For an organization operating in chronic stress, a culture of stress, performance deficits are no longer noticed, if not becoming normative, and performance decrements are part of operations. This normalizes suites of behaviors derived from stress, fear, and threat. Learned ensembles of stress behaviors come into routine use. Burn out, the loss of meaning in work or value of our efforts, and staff attrition, a form of fear flight, become expected.

The drive to survive generates emotional energy that, somewhat like thermodynamics, can transform, but it must dissipate. This survival energy supplants the rewards of the nucleus accumbens or, through aggression, transforms stress into reward. The short-term reward comes from changing the environment; even change that hurts or damages is good because it gives a sense of control. Unfortunately, this energy may be released as aggression, which, through immediate feedback, becomes reinforced. Even if the individual suffers or creates a challenging living environment, the sense of control over other people immediately reduces stress. Rationalizations and justifications alleviate stress between acute stress episodes.

Emotional survival energy also transforms into tissue damage, producing the long-term effects first identified by Selye. Freud described behaviors through evolution and the principles of thermodynamics when applied to procreative energy. We describe behaviors through survival and the principles of thermodynamics applied to stress behaviors.

The control of any form of energy contributes to productivity and safety, the principle behind HRO. When uncontrolled, accidents can become normal. This is the same regarding neuromodulation of the stress-fear-threat cascade. When neuromodulated, we can effectively and safely engage uncertainty or threat. Without neuromodulation, the same cascade can cause more damage than the inciting event.

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Condition	Cause	Characteristics	Location	Effects	Resolution
Stress	Novelty Uncertainty Uncontrollability	Objective Neurochemical release	SAM HPA Axis, cortisol	Impaired declarative, working memory Impaired cognition	Perception of control
Fear	Proximity	Subjective Feeling	Ventromedial Prefrontal cortex Periaqueductal Gray	Maintain distance	Reframe
Threat	Existential harm	Objective Behaviors	Amygdala Prefrontal cortex	Fight, anger Flight, avoid Freeze, vigilance Tonic immobility, nausea Dissociation	Conditioning

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Rear Admiral
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SKIN-TO-SKIN CARE DURING
COVID-19



GET INFORMED ABOUT THE RISKS + BENEFITS

work with your medical
team to create a plan

GET CLEAN WASH YOUR HANDS, ARMS, and CHEST

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



PUT ON FRESH CLOTHES

change into a clean
gown or shirt.

IF COVID-19 + WEAR A MASK

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



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nationalperinatal.org/NICU_Awareness
projectsweetpeas.com
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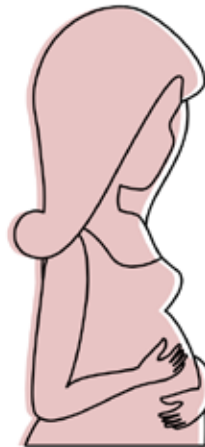
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NATIONAL PERINATAL ASSOCIATION

Update: CORONAVIRUS COVID-19



According to data
published in The Lancet

Pregnancy
and the risk of
**VERTICAL
TRANSMISSION**

LOW



www.nationalperinatal.org

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:



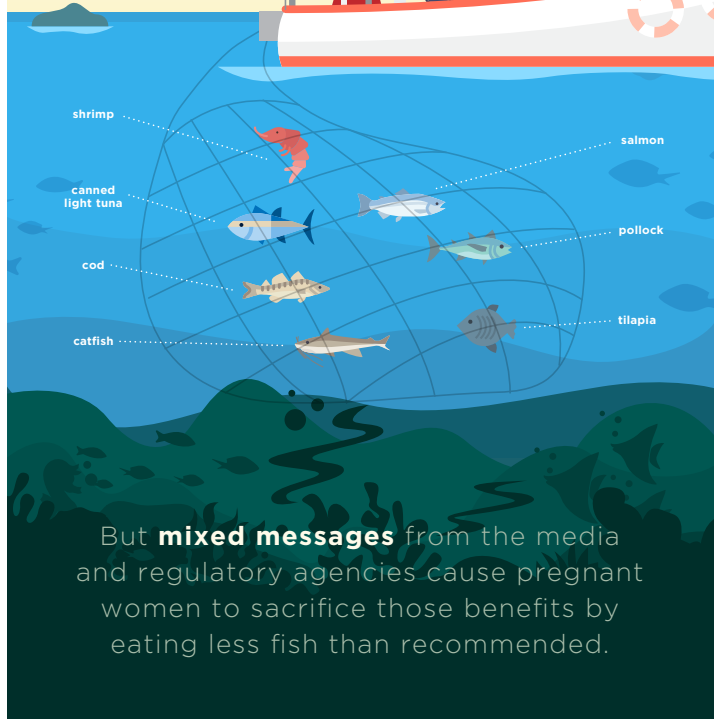
Iron



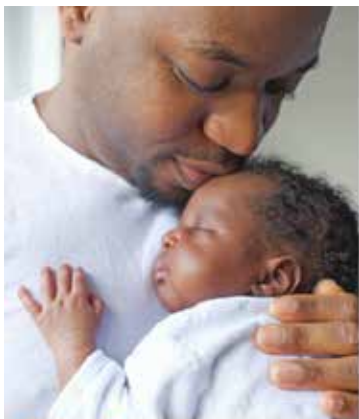
Omega 3 fatty acids



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?

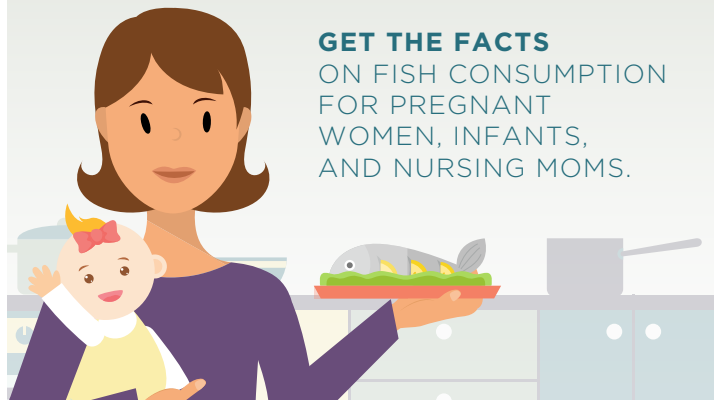
Join  **NPA**

nationalperinatal.org/mental_health

**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

From: Hageman, Joseph [PED] <jhageman@peds.bsd.uchicago.edu>

Sent: Tuesday, November 17, 2020 6:26 PM

To: Goldstein, Mitchell <MGoldstein@llu.edu>

Subject: [EXTERNAL] SARS-CoV-2 Neonatal Infections

Dear Mitchell,

We had a journal club presentation of a couple of new papers about neonatal SARS-CoV-2 infections. The papers were by Raschetti, which was a synthesis and systematic review and a collection of cases from the United Kingdom. There were a number of questions about the quality of the data presented as these were a collection of cases from around the world or in the UK. My comment was that the state of the art re neonatal SARS-CoV-2 is, at present, primitive. What are your thoughts?

Raschetti R et al. Nature Communications <https://doi.org/10.1038/s41467-020-18982-9>.

Thanks,

Joe

Joseph R. Hageman, MD (he,him,his)

Section of Neonatology

Director of Quality Improvement

Editor-in Chief

Pediatric Annals

MC6060

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Chicago, IL 60637

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jhageman@peds.bsd.uchicago.edu

Dear Dr. Hageman:

From the early case reports of neonates with SARS-CoV-2 to a more recent case series of infections in pandemic areas, the data has been frankly underwhelming. Although there is ample evidence of long term morbidities and mortalities in older pediatric patients and adults, the breadth of disease burden appears to have bypassed many of the infected neonates. Whether this is related to innate protection from a passive antibody, less chronic disease in the population, a less toxic immune reaction, or an "immature" reaction to the various cytokine and interleukin activation factors implicated in late disease, we have been fortunate enough not to

have our NICU's filled with moribund neonates.

The reference indicated that 70% and 30% of neonatal infections are secondary to environmental and vertical transmission. Although 55% of infected neonates developed COVID-19, fever (44%) was most common, followed by gastrointestinal (36%), respiratory (52%), and neurological (18%) symptoms. Not unlike older pediatric and adult patients, lung imaging showed aberrancies in 64% of the cases. Mother–neonate cohabitation was associated with the development of late SARS-CoV-2 infection. Most interesting, perhaps, was that this data was compiled from just 176 patients suggesting an extremely low rate of penetrance or subclinical disease that has not been reported.

Notwithstanding data quality, primitive is an apt description of where we are at present. Long term morbidities and developmental aspects of past infection require more vigilance and enhanced disease tracking. Until we reach that point, we risk the potential for unknown long term effects.

Sincerely,



Mitchell Goldstein, MD

Editor in Chief

NT NEONATOLOGY TODAY

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A Delaware "not for profit" 501(c) 3 Corporation.

c/o Mitchell Goldstein, MD

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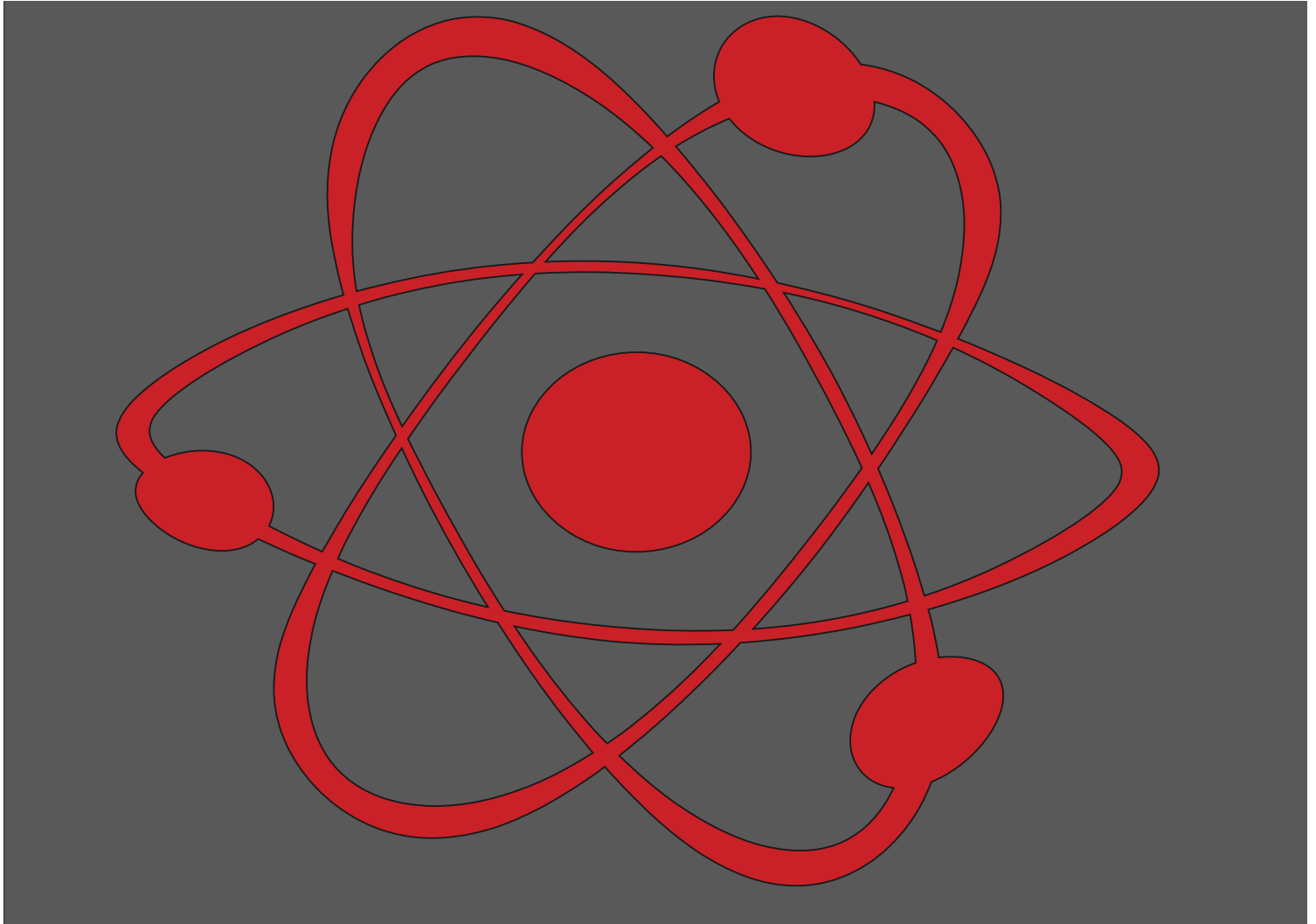
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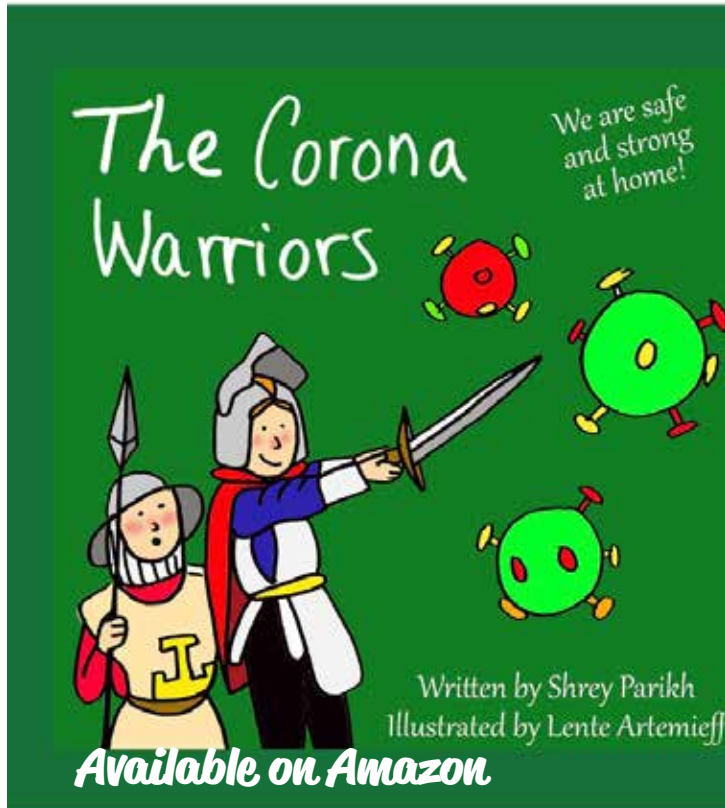
Which Infants are More Vulnerable to Respiratory Syncytial Virus?

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.

AfPA
Alliance for Patient Access

NT



Erratum (Neonatology Today October, 2020)

Neonatology Today has identified no erratum affecting the October, 2020 edition.

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

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Will your **PRETERM INFANT** need **EARLY INTERVENTION** services?

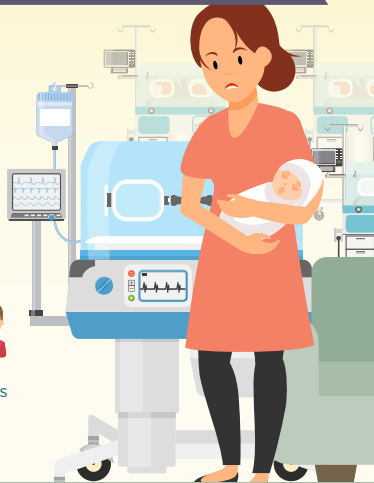
Preterm infants are:

2x more likely to have developmental delays

5x more likely to have learning challenges



1 in 3 preterm infants will require support services at school



Early intervention can help preterm infants:



Enhance language and communication skills



Build more effective learning techniques



Process social and emotional situations



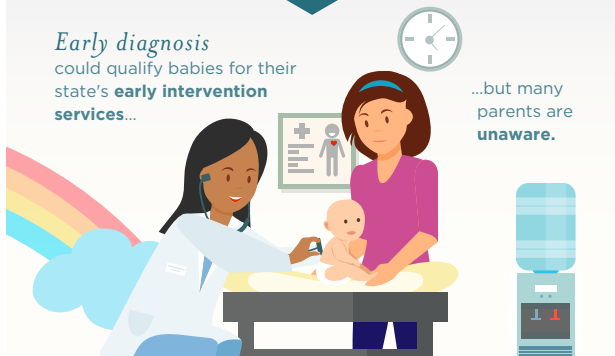
Address physical challenges



Prevent mild difficulties from developing into major problems

Early diagnosis could qualify babies for their state's **early intervention services**...

...but many parents are **unaware**.



NICU staff, nurses, pediatricians and social workers should talk with NICU families about the challenges their baby may face.

Awareness, referral & timely enrollment in early intervention programs can help **infants thrive** and grow.



NCFIH National Coalition for Infant Health
Protecting Access for Premature Infants through Age Two
www.infanthealth.org

Visit CDC.gov to find contact information for your state's early intervention program.

Las nuevas mamás necesitan acceso a la detección y tratamiento para **LA DEPRESIÓN POSPARTO**



1 DE CADA 7 MADRES AFRONTA LA DEPRESIÓN POSPARTO, experimentando



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 POSPARTO



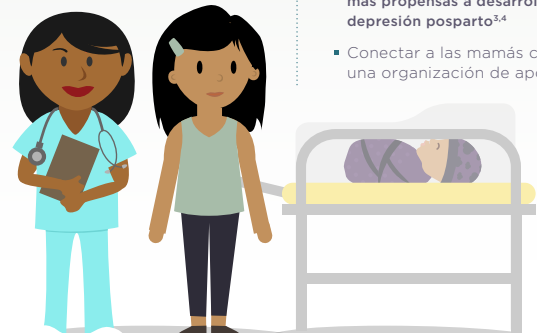
LOS ENCARGADOS DE FORMULAR POLÍTICAS PUEDEN:

- 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 posparto**^{3,4}
- 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

¹ American Psychological Association. Accessed on: <http://www.apa.org/women/advocacy/reports/postpartum-depression.aspx>

² National Institute of Mental Health. Accessed on: <http://www.nimh.nih.gov/health/publications/postpartum-depression-facts/index.shtml>

³ Journal of Perinatology (2015) 35, 529–536. doi:10.1097/JP.0000000000000147

⁴ Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: a systematic review. Vigod SN, Villages L, Dennis CL, Ross LE BJOG. 2010 Apr; 117(5):540-50.

Upcoming Medical Meetings

Miami Neonatology 2020: 44th International Conference
live interactive online conference
November 16-20, 2020
University of Miami Miller School of Medicine
Miami Beach, Florida
<http://pediatrics.med.miami.edu/neonatology/international-neonatal-conference/>

Perinatal Care and the 4th Trimester: Redefining Care
National Perinatal Association
Aurora, Colorado
<http://www.nationalperinatal.org/2020conference>

Hot Topics in Neonatology
December 6 - 9, 2020
Organization: Nemours
National Harbor, Maryland
<http://www.hottopicsonneonatology.org/>

38th Annual Advances in Therapeutics and Technology Conference
March 23 -27, 2021
Snowbird , Utah
<https://paclac.org/advances-in-care-conference/>

Annual Neonatal and Pediatric Airborne Transport Conference
May 5 - 7, 2021
International Biomedical
Austin, Texas
<https://www.int-bio.com/events-news/airborne-conference/>

Pediatric Academic Society Virtual Meeting
Phase 1: April 30 - May 4, 2021
Phase 2: May 10 - June 4, 2021
<https://www.pas-meeting.org/pas2021-virtual/>

22nd Annual International Perinatal Bereavement Conference (IPBC)
May 12 - 15, 2021
Pregnancy Death and Infant Loss Alliance (PLIDA)
Chicago, Illinois
<https://www.plida.org/ipbc-2021>

44th Annual Conference on Neonatal Perinatal Medicine
June 17 - 21, 2021
AAP District VIII Section on Neonatal-Perinatal Medicine
<https://nm2020.district8sonpm.org/>

Location: Santa Fe, New Mexico
Innovations in Neonatal Care
August 9 - 11, 2021
Mednax
<http://www.innovationsconference.com/>

Location: Austin, Texas
For up to date Meeting Information, visit NeonatologyToday.net and click on the events tab.

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EOE/AAE

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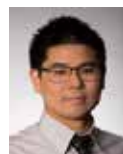
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flu

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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<https://www.nc3rs.org.uk/arrive-guidelines>

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NT

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 from Larry Tinsely, MD who shares a photograph of a quilt that portrays a geisha. Our Bird for this month is a Wood Duck from site somewhere in Southern California.



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Manuscript Submission: Instructions to Authors

1. Manuscripts are solicited by members of the Editorial Board or may be submitted by readers or other interested parties. Neonatology Today welcomes the submission of all academic manuscripts including randomized control trials, case reports, guidelines, best practice analysis, QI/QA, conference abstracts, and other important works. All content is subject to peer review.

2. All material should be emailed to: LomaLindaPublishingCompany@gmail.com in a Microsoft Word, Open Office, or XML format for the textual material and separate files (tif, eps, jpg, gif, ai, psd, or pdf) for each figure. Preferred formats are ai, psd, or pdf. tif and jpg images should have sufficient resolution so as not to have visible pixilation for the intended dimension. In general, if acceptable for publication, submissions will be published within 3 months.

3. There is no charge for submission, publication (regardless of number of graphics and charts), use of color, or length. Published content will be freely available after publication. There is no charge for your manuscript to be published. NT does maintain a copyright of your published manuscript.

4. The title page should contain a brief title and full names of all authors, their professional degrees, their institutional affiliations, and any conflict of interest relevant to the manuscript. The principal author should be identified as the first author. Contact information for the principal author including phone number, fax number, e-mail address, and mailing address should be included.

5. A brief biographical sketch (very short paragraph) of the principal author including current position and academic titles as well as fellowship status in professional societies should be included. A picture of the principal (corresponding) author and supporting authors should be submitted if available.

6. An abstract may be submitted.

7. The main text of the article should be written in formal style using correct English. The length may be up to 10,000 words. Abbreviations which are commonplace in neonatology or in the lay literature may be used.

8. References should be included in standard "NLM" format (APA 7th 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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