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Peer Reviewed Research, News and Information in Neonatal and Perinatal Medicine

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Health and Wellness—Sleep, Part 1: Physiology and Changes with Aging

Hun-Seng Chao, MD

We healthcare workers work hard to care for our patients, but we sometimes forget to care for ourselves. In this series, I will discuss health and wellness, two things most of us never really learned much about in medical school, including nutrition, ways to prevent disease, and how vitally important our lifestyle is to our health. It will occasionally be relevant to our patients but is mainly directed toward healthcare workers. I am not an expert in this topic, but I will share with you what I have learned over the past few decades since med school from multiple research-backed sources, including functional medicine, functional nutrition, integrative medicine, and others, as well as allopathic medicine. Of course, this is not intended to be medical advice or to diagnose or treat any illness or condition.

"I am starting with this very important subject because it is one of the three pillars of wellness, the other two being nutrition and exercise, and it is one that many medical professionals do not get enough of—especially those who take overnight or long calls."

I am starting with this very important subject because it is one of the three pillars of wellness, the other two being nutrition and exercise, and it is one that many medical professionals do not get enough of—especially those who take overnight or long calls. I recently attended a fascinating and enlightening lecture given by Dr. Sara Mednick, a Professor at UC Irvine at the Center for the Neurobiology of Learning and Memory on this topic, and most of this series of articles is taken from that lecture as well as her book, *The Power of the Downstate,* (1) as well as Dr. Matthew Walker's book, *Why We Sleep.* (2) Both are highly recommended reads.

Most of us take sleep for granted. We older folks (I reluctantly admit I am now in that group) feel we do not need as much sleep; when we were younger, we were proud that we stayed up late at night and still got to school or work in the morning; we stayed up all night partying (not me, of course) or cramming for exams; we work long hours and say we will catch up on lost sleep over the weekend; most of us probably even think that spending a third of our lives sleeping is a big waste of time. However, good quality and quantity of sleep are paramount for our physical and mental well-being and lifespan. For example, in those under 65, sleeping ≤5 hours a night every night with no makeup sleep on the weekends leads to a 56% increase in mortality. (3) Underscoring the importance of sleep to our health and vitality, there is an autosomal dominant condition called Fatal Familial Insomnia, in which a mutation in the PRNP gene leads to the production of a prion that builds up in the thalamus of the brain. The onset of insomnia in this condition usually occurs in the 40s but can be as early as the 20s. This causes progressive neurodegeneration of the brain, resulting not only in problems with thought, cognition, memory, language, and behavior, leading to hallucinations, confusion, and dementia, but also dysfunction of the autonomic nervous system with fever, hypertension, tachycardia, increased sweating, temperature instability; and invariably resulting in death within a few months to at most three years, (4) highlighting the necessity of sleep for proper functioning of the brain and body.

"Most of us take sleep for granted... most of us probably even think that spending a third of our lives sleeping is a big waste of time. However, good quality and quantity of sleep are paramount for our physical and mental well-being and lifespan."

There are many issues involving sleep that I will cover, including the effects of aging and medications (including caffeine and alcohol), whether we can "catch up" after sleep deprivation and the long-term metabolic consequences of sleep deprivation. In this first article on sleep, we will discuss the stages of sleep and the effects of aging since these affect all of us.

Circadian Rhythm:

Let us start by looking at the body's circadian rhythm, in which every living organism that lives longer than a few days develops. (2) In humans, it is approximately 24 hours (around 24 hours and 15 minutes). It regulates wakefulness and sleepiness throughout the day and other body patterns, including temperature, cardiovascular performance, muscle strength, mood and emotions, preference for mealtimes, metabolic rate, bladder emptying, and release of hormones. Our biological clock is the **suprachiasmatic nucleus** (SCN), located just above where the optic nerves cross, which is

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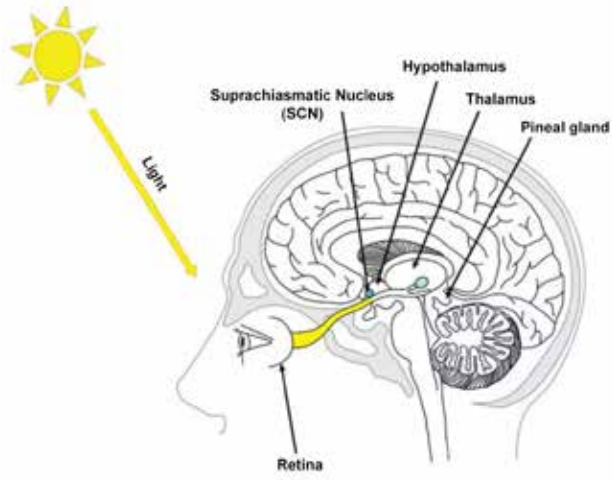
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convenient, as it receives a signal that light is coming into the eyes to reset our internal clock every day, thus preventing too much divergence from the 24-hour cycle. (See Figure 1.) The SCN communicates with the pineal gland to let it know when to release melatonin, usually a few hours after dusk, which helps regulate the timing of sleep onset. Melatonin release peaks around 4 AM and shuts off when sunlight is detected, and the SCN activates the hypothalamus-pituitary-adrenal (HPA) axis to stimulate the release of cortisol from the adrenals to start the day. (5)

"It [circadian rhythm] regulates wakefulness and sleepiness throughout the day and other body patterns, including temperature, cardiovascular performance, muscle strength, mood and emotions, preference for mealtimes, metabolic rate, bladder emptying, and release of hormones."

Circadian rhythms vary among individuals, with about 40% having peak wakefulness early in the day and sleepiness early in the evening—so-called "morning people" (definitely not me). About 30% are "night owls," preferring to rise later in the morning or even early afternoon and get to bed late at night. The remaining 30% are in between the two. Circadian rhythm also varies with age.

Figure 1. "Light stimulates the retina, sending a signal to the Suprachiasmatic Nucleus (SCN), which then sends a signal to the pineal gland to stop releasing melatonin and to the HPA axis to release cortisol" to start the day. (Source: https://www.cdc.gov/niosh/work-hour-training-for-nurses/longhours/mod2/14.html [5])



Ultradian Rhythm:

We also have an ultradian rhythm (which repeats more than once a day and lasts for a short period), namely the sleep cycle, which lasts about 90 minutes. (See Figure 2.) There are two main phases of sleep—REM and Non-REM. Everyone knows REM is when we dream, and non-REM is the rest, divided into Stages 1, 2, and 3. A typical night's sleep consists of 4–5 cycles (optimally 5 with about 7–8 hours of total sleep).

Before Stage 1, there is the **sleep latency period**, which is the time it takes to fall asleep (light blue in Fig. 2). EEG recordings (Figure 3) show beta waves (like when we are awake) when the eyes are open, and then alpha waves as the eyes close and drowsiness sets in. **Stage 1 sleep** (N1 or light sleep) makes up

Fig. 2. Non-REM and REM Sleep Cycle (adapted from and courtesy of Dr. Sara Mednick)

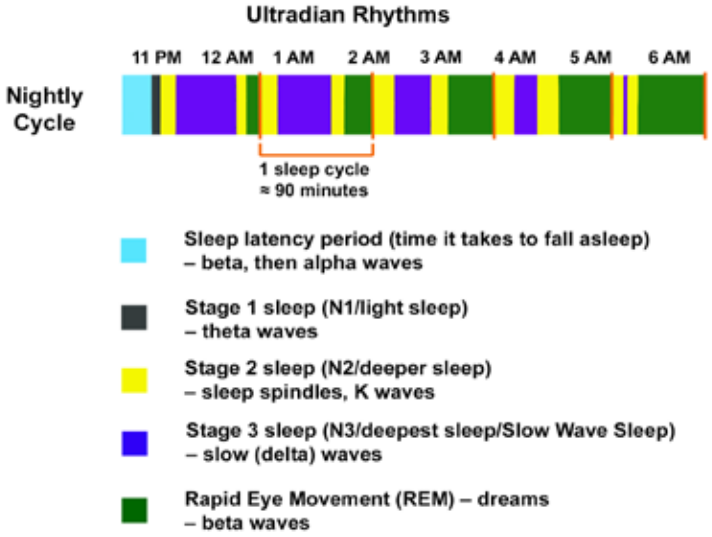
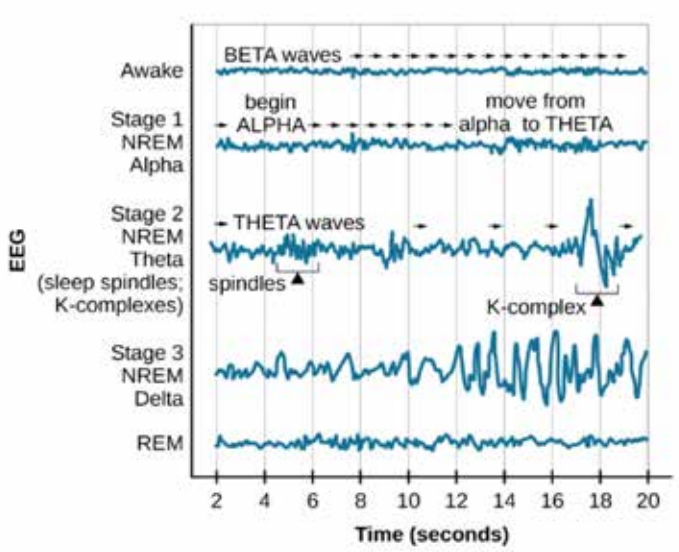


Figure 3. EEG during different stages of sleep (Source: Steven et al., https://caul-cbua.pressbooks.pub/intropsychneuro/chapter/stages-of-sleep/, licensed under CC 4.0 [6])



1–5% of total sleep, and low voltage theta waves are seen on EEG. **Stage 2 sleep** (N2, deeper sleep) makes up about 45–60% of total sleep time and is the transition period between stage 3 and REM. In Stage 2, the EEG shows sleep spindles (short bursts of thalamic brain activity) and K complexes (larger, slower waves that precede the slow waves in Stage 3). Sleep spindle pulses travel back and forth between the hippocampus (with its short-term, limited storage space) and the cortex (with larger, long-term memory storage). Thus, sleep allows the hippocampus to clear out short-term memories to allow for more learning, and researchers found that the more sleep spindles we have, the

more restoration of learning capacity occurs. With aging, we have deceased sleep spindles in amplitude and frequency, which is one reason learning becomes more difficult as we age. These NREM sleep spindles are concentrated between long periods of REM in the later morning hours—another reason why sleeping six hours or less deprives the restoration of the brain's capacity to learn. (2)

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Stage 3 (N3, deepest non-REM sleep, Slow Wave Sleep [SWS]) makes up about 10–25% of the sleep cycle and is characterized by delta waves (low frequency, high amplitude waves). This stage is the most difficult to wake up from with grogginess and decreased cognitive abilities up to an hour after awakening. This is also the most crucial stage for body regeneration when hormones vital for tissue repair and immune and metabolic function control of inflammation are released. These will be discussed in the next article in this series. SWS is also the stage where neurons in the brain synchronize and get the most rest. This is also the primary stage when the vital glymphatic system is most active. The glymphatic system is the glial cell-dependent, pseudo-lymphatic paravascular network discovered in 2012 (7) and is the main waste clearance pathway in the brain. (8) This system removes neurotoxic hyperphosphorylated tau and amyloid-β (Aβ), which build up during our waking hours. Inadequate SWS results in the accumulation of these, leading to neurofibrillary tangles and amyloid plaques, contributors to the development of cognitive impairment and dementia, including Alzheimer's (9, 10). Alarmingly, especially for those who work long shifts taking calls, even one night of sleep deprivation leads to increased tau accumulation (10) and Aβ. (11)

Although Alzheimer's is mainly a problem with memory, the main area of the brain involved in memory storage, the hippocampus, is not directly affected by the accumulation of Aβ. So, how does the accumulation of Aβ affect memory? Aβ collects in different parts of the brain, especially in the middle of the frontal lobe, where signals for deep sleep are generated (12), thereby leading to the deterioration of SWS/deep sleep, which leads to more Aβ accretion because of loss of clearance by the glymphatic system, which leads to worse deep sleep, and its sequelae. Thus, the problem becomes a vicious cycle. Also, unfortunately, the quality and quantity of SWS decrease naturally with aging.

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REM sleep is notably associated with dreaming with rapid eye movements and atonia (so we do not hurt ourselves thrashing around while dreaming), with beta waves (similar to when we are awake) and theta waves dominating the EEG. Unlike the rest of the sleep cycle, metabolism, heart rate, and blood pressure increase during REM sleep. REM sleep is also necessary for our well-being. In a rat model, sleep deprivation killed as quickly as food deprivation, and by itself, REM deprivation killed as fast as sleep deprivation. (13) NREM-deprivation killed somewhat slower. REM sleep is also essential for maintaining sanity (assuming it is already present). A study done in the 1960s by Dement et al. deprived young adults of REM sleep for a week while maintaining NREM sleep. By the third day, participants were showing signs of psychosis, with moodiness, anxiety, paranoia, and hallucinations (14)—really giving meaning to the word "demented," which is of Latin origin.

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We used to believe that REM was the most crucial sleep stage for memory, but it is more complicated than that. It has been found that deep NREM sleep/SWS is more important for memory retention of non-emotional content. Studies with sleep deprivation of either the first part of the night (NREM) or the last half (REM) showed those with adequate NREM sleep have better memory

retention than those who had more REM sleep and less NREM. (2) Another study gave a group of participants a list of facts to remember before bedtime, and those who had more NREM sleep did better than those with more REM sleep. (15)

As seen in Figure 2, the SWS and REM sleep amounts vary throughout the night, with SWS dominating in the first part of the night and REM sleep in the latter half. This is very important to note and one of the many reasons we need to get a full night's rest—all stages are important, and losing out on any one of these stages leads to brain impairment and suboptimal functioning of the body as well (in our next article of the series). Sleep experts recommend at least 7–8 hours but no more than 9. (16)

"...the SWS and REM sleep amounts vary throughout the night, with SWS dominating in the first part of the night and REM sleep in the latter half. This is very important to note and one of the many reasons we need to get a full night's rest—all stages are important, and losing out on any one of these stages leads to brain impairment and suboptimal functioning of the body as well (in our next article of the series). Sleep experts recommend at least 7–8 hours but no more than 9."

Changes in Sleep Over Our Lifespan:

In the second trimester of pregnancy, the fetus's brain has developed enough to produce REM sleep and NREM sleep but is not mature enough to induce paralysis during REM sleep, so the fetus can still kick and move quite a lot during REM. At this stage of pregnancy, the fetus is sleeping almost constantly with 6 hours of REM sleep, 6 hours of NREM sleep, and twelve hours of sleep that has not been defined yet. (2) In the third trimester, the fetus begins to wake for about 2–3 hours a day. However, in the last two weeks of pregnancy, even as the total sleep time decreases, REM sleep in the fetus will increase to almost 9 hours a day and up to 12 hours a day in the last week. REM sleep is vital for brain development. (2) Blocking REM sleep in newborn rats inhibited brain growth, (17) something we need to consider in the NICU environment we provide for our patients' optimal neurodevelopment.

Because the infant's circadian rhythm is still weak at this point, newborns have a polyphasic sleep pattern with many short bouts of sleep throughout the day and night (as we parents could sleepily attest to while going through that delightful phase) and can transition into REM sleep immediately after a feeding. They usually require around 18 hours of sleep daily, spending about equal time in REM and NREM. (18)

Around 3–4 months of age, the SCN begins to mature and develop a much more acceptable circadian rhythm (to the great relief of most parents), with the four stages of sleep similar to adults above. (18) By six months of age, they require about 13 hours of sleep per day, usually in longer blocks. By one year, most children have developed a stronger circadian rhythm, primarily daytime wakefulness, a few naps, and sleeping at night. Children have strong circadian rhythms by four years of age with full daytime wakefulness, usually only requiring one nap, and sleep through the night. However (and unfortunately for non-morning persons like myself), they usually have an earlier circadian rhythm than their parents, waking early in the morning and having early bedtimes. Five-year-olds sleep about 70% in NREM and 30% in REM. (2)

REM sleep is vital for the building and proliferating neural pathways and interconnectivity; thus, it is dominant in the fetus and early childhood. During later childhood and adolescence, pruning those connections during deep NREM sleep becomes dominant. (2) The noted sleep research scientist-physician, Dr. Irwin Feinberg, performed serial sleep EEGs in children starting at 6–8 years of age every 6–12 months for the next ten years. (19) He found moderate deep sleep in mid-to-late childhood when the final neural growth spurts occurred. Then, there was a sharp rise in deep sleep intensity at puberty, indicating a rise in pruning of these neural connections and a drop in deep sleep throughout adolescence. The changes in deep sleep precede cognitive and developmental milestones, supporting the contention that deep sleep is a driving force for brain maturation. (2) Feinberg also found that brain maturation's rise and fall pattern begins in the back of the brain and proceeds forward. The last part to mature is the tip of the frontal lobe, which is involved in critical thinking and rational decision-making, which helps explain why teenagers sometimes make less than wise choices. (2, 19) Supporting this are studies in rats in which juveniles (at an equivalent stage to human adolescents) given caffeine, which disrupts deep NREM sleep, have delayed brain maturation with behavioral and structural changes, which may have a long-term impact, (2, 20) including psychiatric disorders, which often manifest during adolescence. (21)

"REM sleep is vital for the building and proliferating neural pathways and interconnectivity; thus, it is dominant in the fetus and early childhood. During later childhood and adolescence, pruning those connections during deep NREM sleep becomes dominant."

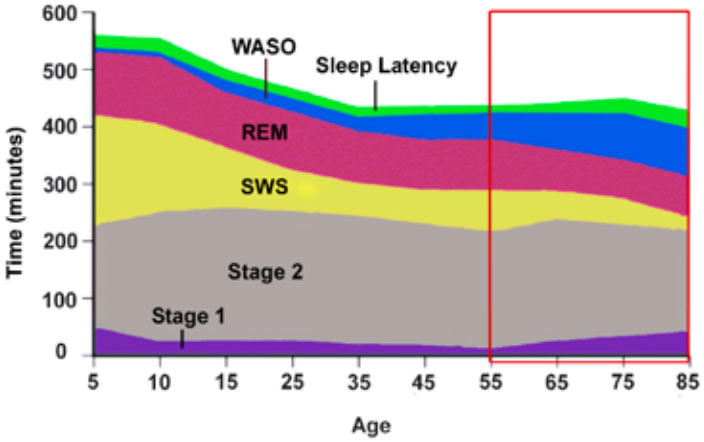
Adolescents also need more sleep (8–10 hours) and develop a delayed cycle compared to their parents, with naturally later peak wakefulness (sleeping longer and waking up much later than their parents would like) and thus sleepiness later in the night. (2) This often conflicts with parental wishes and the school schedule, which often starts earlier in the day than when the therefore sleep-deprived adolescents would optimally perform. This has a negative effect on sleep (especially the last REM cycle) and learning, which will be discussed in the next article of this series.

As most of us older folks know, good quality sleep comes much harder to us than when we were younger. As we age, three key changes come into play: reduced quantity and quality of sleep, reduced sleep efficiency (percent of time sleeping while in bed), and disrupted sleep timing. (2) As mentioned earlier, SWS decreases significantly with age and starts declining by the late

20s to early 30s. (See Figure 4.) Significant reductions in not only the quantity but also the quality of SWS are already seen in middle-aged adults relative to young adults and are even more prominent in older adults. (22)

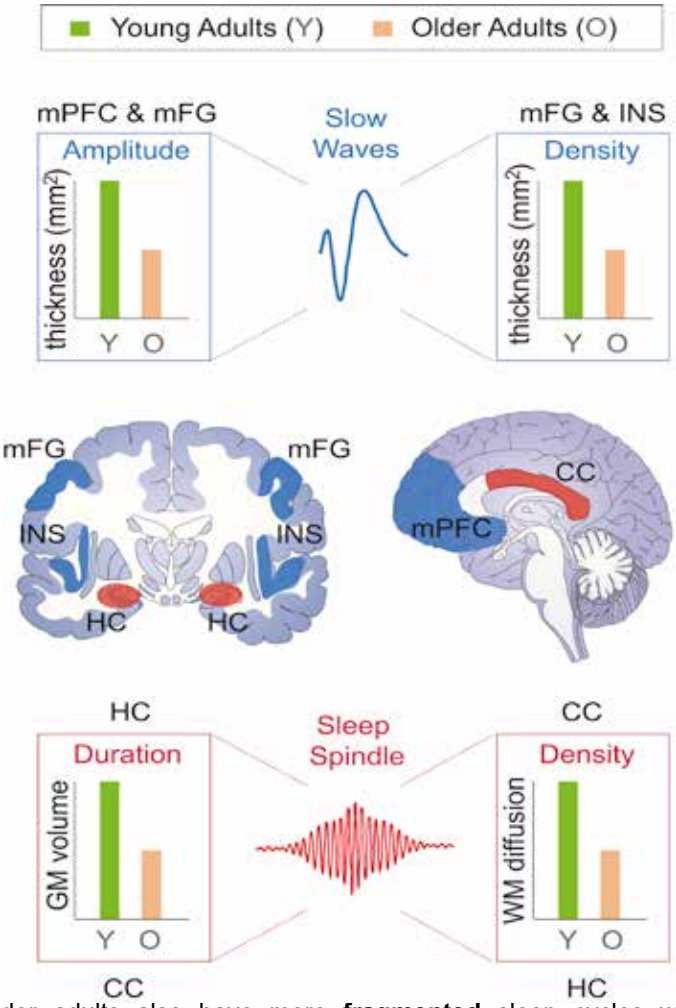
Along with decreased SWS, which correlates with neural degeneration in the prefrontal cortex, stage 2 sleep in older adults is accompanied by fewer sleep spindles (Figure 5), both in density and duration, resulting in decreased communication between the hippocampus and cortex and decreased learning capacity. These age-related impairments in slow waves are most evident during the first 1–2 NREM cycles, when slow waves are mainly expressed (24).

Figure 4. Changes in sleep stages with age. WASO (blue): the amount of time spent awake after initially falling asleep; REM (pink): rapid eye movement; NREM (non-rapid eye movement): stages 1 (purple), 2 (taupe), and slow-wave sleep (SWS)(yellow). (Adapted from Ohayon et al. [23])



"As most of us older folks know, good quality sleep comes much harder to us than when we were younger. As we age, three key changes come into play: reduced quantity and quality of sleep, reduced sleep efficiency (percent of time sleeping while in bed), and disrupted sleep timing. As mentioned earlier, SWS decreases significantly with age and starts declining by the late 20s to early 30s. Significant reductions in not only the quantity but also the quality of SWS are already seen in middle-aged adults relative to young adults and are even more prominent in older adults."

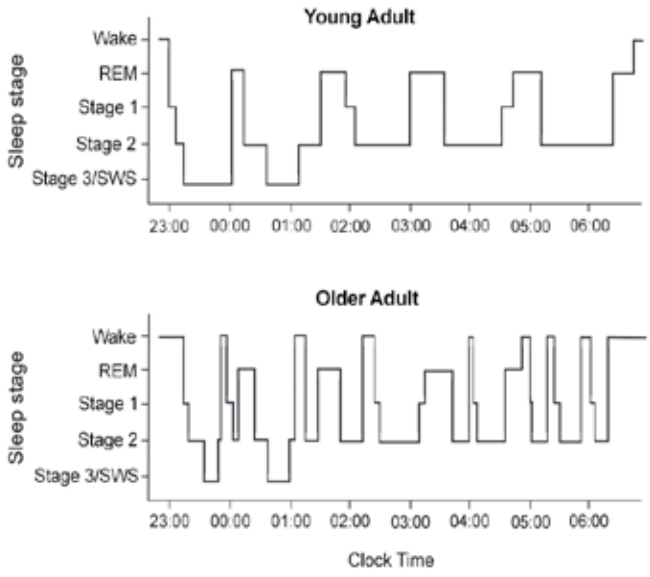
Figure 5. "Structural Brain Changes and Age-Related Impairments in NREM Sleep Oscillations. Upper and middle: Age-related deficits in NREM slow wave amplitude and density are significantly associated with the degree of reduced gray matter volume and thickness (middle; blue regions) in the medial prefrontal cortex (mPFC), middle frontal gyrus (mFG), and insula in older (orange) relative to younger (green) adults. Impairments in NREM sleep spindle duration and density (bottom right bar graph) reductions in older (orange) relative to younger (green) adults are associated with the magnitude of decreased hippocampal gray matter volume and white matter integrity within the body and splenium of the corpus callosum." (Source: Mander [22], used with permission)



Older adults also have more **fragmented** sleep cycles with longer sleep latency (the time it takes to get to sleep after going to bed), increased Wake After Sleep Onset (WASO)(Figures 4 and 6), less time in SWS, especially in the early sleep cycles, and therefore decreased sleep efficiency. We are on medications that may interfere with sleep; we need to use the bathroom in the middle of the night; we release less melatonin; and we have decreased sleep pressure (discussed below), among the many issues involved in aging. This may also help explain why memory issues increase with advancing age.

The decline in SWS not only varies with age but also with sex. (See Figure 7) More men than women suffer a significant decline in SWS (Fig. 7A), and this correlates with physiologic changes in

Figure 6. Changes in Sleep Architecture and NREM Sleep Oscillations in Young Adults (top) and Older Adults (bottom). (adapted from Pace-Schott [25])



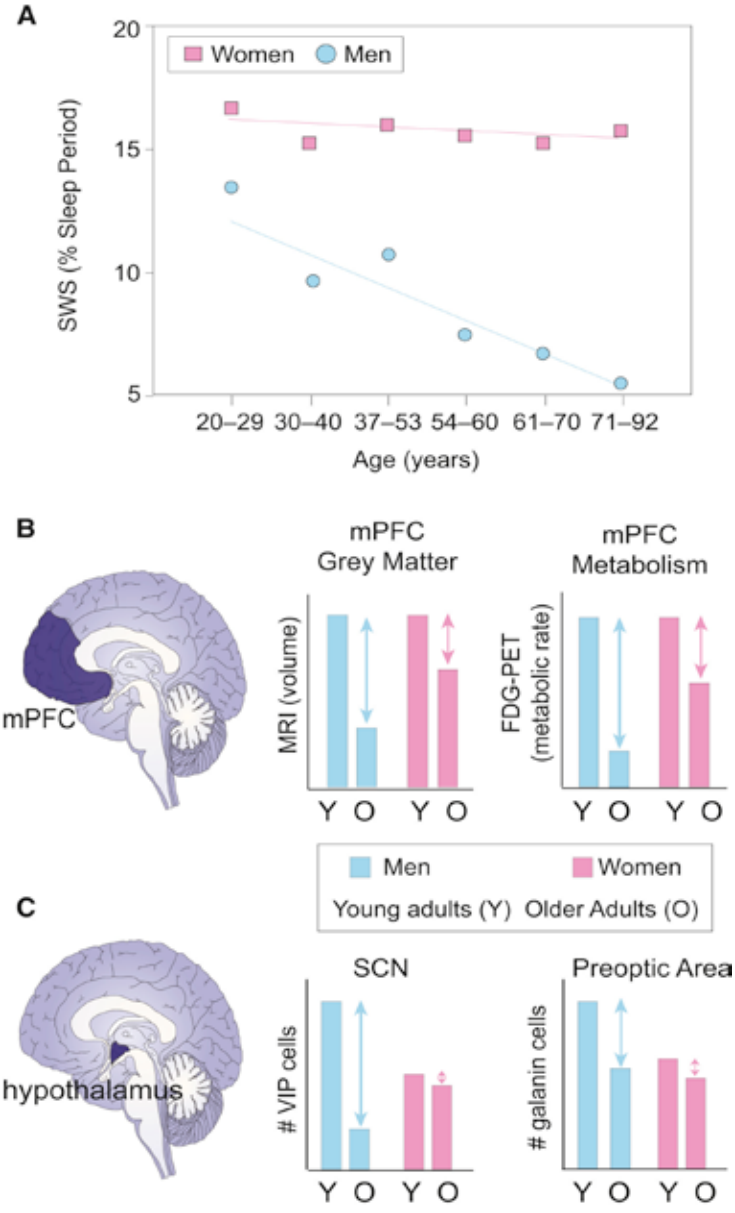
metabolism and loss of gray matter in certain areas of the brain (mPFC, medial prefrontal cortex)(Fig. 7B) associated with sleep homeostasis and regulation. VIP (Vasoactive Intestinal Peptide) synchronizes the SCN with light cues and is highly involved in establishing the circadian rhythm. Galanin is a neuropeptide involved in sleep homeostasis. Decreases in both of these (Fig. 7C) would lead to disturbance in sleep regulation. (22)

"Older adults also have more fragmented sleep cycles with longer sleep latency (the time it takes to get to sleep after going to bed), increased Wake After Sleep Onset (WASO)(Figures 4 and 6), less time in SWS, especially in the early sleep cycles, and therefore decreased sleep efficiency... This may also help explain why memory issues increase with advancing age."

Interestingly, while men seem to suffer more significant loss of SWS and associated neurons and, therefore, should have more problems clearing phosphorylated tau and Aβ from their brains, dementia, especially Alzheimer's, is much more common in women, which may only be explained in part by longevity. Women also have accelerated brain-wide spread of tau (26), and researchers are looking into sex-specific genes for Alzheimer's (27) as well as gender differences in brain metabolism (28) and other factors. Researchers have also found that women who work outside the home for pay tend to have less decline in memory than women who have never worked outside the home. (29)

There is still much we do not understand about sleep and

Figure 7. *Gender Affects the Impact of Age on Sleep and Brain Structure and Function. (**A**) Changes in the percentage of the sleep period consisting of SWS in women (pink squares) and men (blue circles) across their lifespan. (**B**) Changes in the medial prefrontal cortex (mPFC) gray matter volume and resting metabolic rate in men and women, a region that is the source of NREM slow waves. Older (O) adult men (blue) demonstrate significantly more gray matter loss and reduced metabolic rate than women (pink). (**C**) Changes in multiple hypothalamic nuclei in older adult (O) males (blue) and females (pink) in relation to younger adult (Y) males (blue) and females (pink). (Source: Mander [22], used with permission.)*



dementia, except that perhaps good quality sleep combined with exercise, proper nutrition, and supplements **may** help prevent and sometimes even reverse dementia (30, 31). While this individualized approach is still very controversial in allopathic medicine, it is widely accepted among functional medicine practitioners, who have seen this effect in many patients in their

practice. However, these findings must be studied and validated on a larger scale to be accepted into regular medical practice, although the gold standard, randomized, double-blinded studies, would be almost impossible to perform, given the extent of the lifestyle changes involved. Studies show that improving REM sleep using donepezil, an acetylcholinesterase inhibitor and approved Alzheimer's treatment, improved cognitive abilities in patients with Alzheimer's (32, 33), confirming that improved sleep helps dementia patients, albeit temporarily. What we do know for sure is that the present drugs for Alzheimer's, with their attendant side effects, only slow the progression of the disease, not reverse, cure, or prevent it. In the meantime, lifestyle changes to include more exercise, better and cleaner nutrition, and adequate sleep seem prudent. (We will address exercise and nutrition in future articles.)

Sleep Pressure:

The circadian rhythm is one of two factors that determine wake and sleep. (See Figure 8.) The second is sleep pressure, which is determined by the buildup of adenosine in the brain while awake—the more adenosine accumulates, the more sleep pressure, which is the desire to sleep. Adenosine usually peaks around 16–18 hours of being awake, at which time we get really, really sleepy. **Sleep is the only way to reduce the adenosine buildup.**

What happens when we are sleep-deprived, like after a night of being on-call? (See Figure 9.) Adenosine continues to build up, so we should feel sleepier and sleepier, right? Well, yes, sort of. The difference between Process S (sleep pressure) and Process C (circadian rhythm and wake drive) determines sleepiness. The more significant the difference between these two processes, the stronger the urge to sleep; the smaller the difference, the stronger the urge to stay awake. So, at about 5–6 AM, at the nadir of the circadian rhythm, we would feel very sleepy, but then later in the morning, at around 11 AM, at the peak of the circadian rhythm, we get a "second wind" when the difference between sleep pressure and wake drive is much less than at 5–6 AM. (2)

As most of us know, this effect can be blocked (temporarily) by caffeine. Caffeine blocks adenosine receptors and, therefore, masks the feeling of sleepiness, but adenosine levels keep rising when not sleeping. Caffeine has an average half-life of 5 hours with a range of 1.5–9.5 hours and is metabolized in the liver. (34) Some people are fast metabolizers and can drink coffee at dinner while still being able to sleep. Others can drink it earlier in the day and still suffer from insomnia that night. Aging decreases the metabolism of caffeine, so older people are more sensitive to caffeine's influence on sleep.

"The circadian rhythm is one of two factors that determine wake and sleep. The second is sleep pressure, which is determined by the buildup of adenosine in the brain while awake—the more adenosine accumulates, the more sleep pressure, which is the desire to sleep. Adenosine usually peaks around 16–18 hours of being awake, at which time we get really, really sleepy. Sleep is the only way to reduce the adenosine buildup."

Once the body clears caffeine, then the now increased adenosine molecules after sleep deprivation flood the receptors, and we get incredibly sleepy—this is the well-known "caffeine crash." (2)

Aging and Sleep Pressure:

Of course, aging negatively affects sleep pressure. As mentioned, the increasing homeostatic drive to sleep (Process S) is partly driven by increases in extracellular adenosine buildup with increasing time awake. During sleep, adenosine, and thus sleep pressure, decreases proportionally to the intensity of the slow wave activity during stage 3 sleep (SWS), which, as mentioned earlier, decreases with age. In older adults, the homeostatic buildup of sleep pressure across a day is slower and weaker

Figure 8. *Interaction between circadian rhythm and sleep pressure.*(adapted from Walker [2])

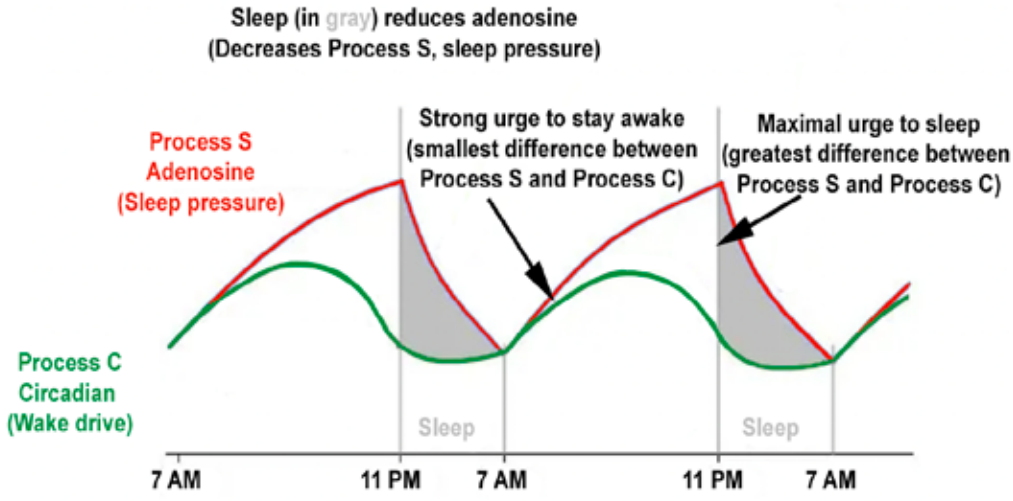
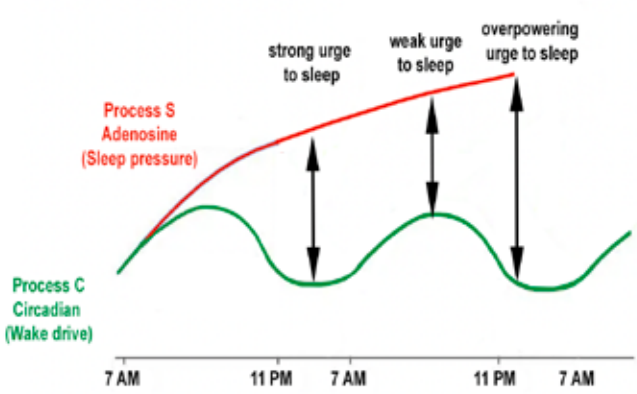


Figure 9. *Sleep pressure after sleep deprivation(adapted from Walker [2])*



than in younger adults despite having higher levels of adenosine. Why? Researchers hypothesize that adenosine insensitivity develops, possibly due to a decrease in adenosine receptors. (22) Therefore, despite higher levels of adenosine in older relative to younger adults, there is potentially weaker adenosine-associated signaling in the aging brain, resulting in a lower sleep drive in older adults, leading to worse quality and quantity of sleep.

"Caffeine blocks adenosine receptors and, therefore, masks the feeling of sleepiness, but adenosine levels keep rising when not sleeping...Once the body clears caffeine, then the now increased adenosine molecules after sleep deprivation flood the receptors, and we get incredibly sleepy—this is the well-known 'caffeine crash.'"

Therefore, while older adults feel less need to sleep and have shorter sleep durations with more fragmentation of sleep cycles than younger adults, **older adults need more and better quality sleep** to maintain a well-functioning brain, and naturally deteriorating sleep processes contribute to aging and decreased ability to learn. As previously mentioned, the deterioration in sleep quality already starts in adults in their 20s–30s. One study estimated that age-disrupted sleep accounted for about 30 minutes less sleep per night every decade beginning in our 40s. (35)

Conclusion:

Sleep is essential to our well-being; however, the quality and quantity of sleep naturally deteriorate with aging in most people. Older adults have reduced sleep efficiency with more fragmented sleep cycles, fewer and smaller sleep spindles, and decreased sleep pressure, contributing to poorer quality and quantity of sleep and memory and learning problems than young adults. The deterioration of SWS with age is more profound in men and leads to more significant neuronal degeneration in certain areas of the brain associated with sleep regulation. Loss of SWS results in decreased clearing of Aβ and phosphorylated tau by the glymphatic system, which can cause neurofibrillary tangles and plaque formation and eventually lead to cognitive decline or dementia.

"Therefore, despite higher levels of adenosine in older relative to younger adults, there is potentially weaker adenosine-associated signaling in the aging brain, resulting in a lower sleep drive in older adults, leading to worse quality and quantity of sleep."

Our next article will focus on sleep deprivation and its metabolic consequences, followed by methods to improve our sleep habits—or what sleep scientists call "sleep hygiene."

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Vaccines and Preventive Monoclonal Antibodies

WHAT'S THE DIFFERENCE?

The Importance of Immunization

Vaccines and preventive monoclonal antibodies are two different types of immunization. While they function differently, they both serve the same purpose: protecting people from serious illnesses and diseases.

Different Technology, Same Protective Value

	VACCINES	PREVENTIVE MONOCLONAL ANTIBODIES
	Teach the body to create antibodies that fight off a specific disease.	Introduce antibodies that are ready to ward off disease in the body.
How does it work?	By introducing an inactive piece of a disease or proteins that look like the disease, they trigger an immune response, training the body to create antibodies that defeat the disease.	Instead of teaching the body to create antibodies and defenses, they provide antibodies that are readily available.
	Both support the immune system's defenses.	
What are the benefits?	Many vaccines are readily and easily available. The technology behind vaccines has been around for decades.	Preventive monoclonal antibodies can provide protection for diseases where there isn't an existing vaccine or there isn't an existing vaccine for certain patient groups.
	Both protect against disease and provide a public health benefit by decreasing the burden of disease.	
What can this immunization protect against?	Polio Measles COVID-19 And more	RSV COVID-19
	Both can provide tailored protection from a variety of diseases.	
Is it safe?	Yes	Yes
	Both vaccines and preventive monoclonal antibodies undergo extensive testing for safety and efficacy.	

AfPA

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Peer Reviewed

Physiological and Behavioral Stress in Preterm Infants During NICU Clothing Application: A Case Series

Carrie Crozier-Arena, PT, DPT, NTMC, CNT, DCS, Jane Sweeney, PT, PhD, MS, PCS, FAPTA, Joseph J. Krzak, PT, PhD, PCS

Abstract:

Purpose: Determine physiological and behavioral stress in preterm infants during bodysuit application in the Neonatal Intensive Care Unit (NICU).

Design: Randomized crossover design using two clothing interventions: 1) hospital blanket swaddling and 2) a short-sleeve bodysuit.

Sample: Preterm infants (N = 8) at $32^{0}/_{7}$ to $34^{6}/_{7}$ weeks postmenstrual age (PMA) at testing.

Main Outcome Variables: Heart rate (HR), oxygen saturation (O_2), and Neonatal Pain, Agitation, and Sedation Scale (N-PASS) measured in three phases: baseline before a diaper change, intervention after the diaper change, and recovery.

Results: An increase in HR above normal limits and a clinically significant increase in N-PASS scores were observed when the infants were dressed in a bodysuit compared to swaddled only. Donning a bodysuit did not affect O_2 levels. Dressing a preterm infant in a bodysuit while in the NICU added temporary but consistent stress and should be avoided.

Keywords: premature, infant, neonate, swaddling, clothing, N-PASS, stress, NICU, case series

"It is clear that preterm infants experience substantial stress. D'Agata et al. reported that preterm infants in the Neonatal Intensive Care Unit (NICU) experience 1,804 stressful events on average, for approximately 43 stressful events per day. Stress from the NICU may impact brain development and disrupt hypothalamic-pituitary-adrenal (HPA) axis regulation, causing the inability to maintain homeostasis during stress."

Introduction:

In the United States 2023, 10.4% of live births were born preterm. (1) It is clear that preterm infants experience substantial stress. (2, 3) D'Agata et al. (4) reported that preterm infants in the Neonatal Intensive Care Unit (NICU) experience 1,804 stressful events on average, for approximately 43 stressful events per day. Stress from the NICU may impact brain development and disrupt hypothalamic-pituitary-adrenal (HPA) axis regulation, causing the inability to maintain homeostasis during stress. (5, 6) Eliminating stressful tasks in the NICU is impossible, but limiting unnecessary stressful activities is valuable for decreasing total infant stress exposure.

"A variety of stressors exist in the NICU. Potential stressful procedures are blood pressure and temperature measurements, nasogastric tube placements, diaper changes, handling, oral suctioning, skin care, clothing changes, weighing, and tape removal."

A variety of stressors exist in the NICU. Potential stressful procedures are blood pressure and temperature measurements, nasogastric tube placements, diaper changes, handling, oral suctioning, skin care, clothing changes, weighing, and tape removal. (7) Neonatal stress can include positive, tolerable, toxic, physical, environmental, and maternal, depending on the time, intensity, and source of the stress. Positive stressors are brief and mild, tolerable stressors are a greater magnitude than positive stressors, and toxic stressors are intense, frequent,

"Neonatal stress can include positive, tolerable, toxic, physical, environmental, and maternal, depending on the time, intensity, and source of the stress. Positive stressors are brief and mild, tolerable stressors are a greater magnitude than positive stressors, and toxic stressors are intense, frequent, prolonged, and without a supportive caregiver. Physical stress includes procedural pain, hypoxia, infections, and inflammation; environmental stress comes from the nursery environment; and maternal stress encompasses the atypical maternal relationship. "

prolonged, and without a supportive caregiver. (8) Physical stress includes procedural pain, hypoxia, infections, and inflammation; environmental stress comes from the nursery environment; and maternal stress encompasses the atypical maternal relationship. (6) A preterm infant shows physiologic instability and behavioral signs of stress when handled during routine daily care activities. (9, 10) The stress response is variable among preterm infants, and investigators have demonstrated distinct reactions based on postmenstrual age (PMA) and neurodevelopmental maturity. (11–13)

"A preterm infant shows physiologic instability and behavioral signs of stress when handled during routine daily care activities. The stress response is variable among preterm infants, and investigators have demonstrated distinct reactions based on postmenstrual age (PMA) and neurodevelopmental maturity."

It is essential to monitor a preterm infant's response to both painful and stress-inducing procedures. Physiologic signs of stress include fluctuations in heart rate (HR) and oxygen saturation (O_2). (7, 14) Preterm infants may also demonstrate motor or behavioral reactions to stress, including muscle flaccidity, hypertonicity, hyperflexion, or frantic movements. (14–16) Researchers commonly use HR, O_2, and agitation scales to interpret perceived stress during routine care of hospitalized preterm infants. (7, 17, 18) The Neonatal Pain, Agitation, and Sedation (N-PASS) scale considers physiologic changes and motoric responses to stress. (19)

"Physiologic signs of stress include fluctuations in heart rate (HR) and oxygen saturation (O_2). Preterm infants may also demonstrate motor or behavioral reactions to stress, including muscle flaccidity, hypertonicity, hyperflexion, or frantic movements. Researchers commonly use HR, O_2, and agitation scales to interpret perceived stress during routine care of hospitalized preterm infants. The Neonatal Pain, Agitation, and Sedation (N-PASS) scale considers physiologic changes and motoric responses to stress."

Staff and parents commonly dress a preterm infant in clothing, including a short-sleeved bodysuit, while in the NICU. Bosque and Haverman (20) reported that parents feel *less scared* of their baby, the baby seems more like an *actual baby*, the baby *must be doing better*, and mothers feel *more like a mom* once they can dress their baby in clothing. Seeing the preterm infant in clothing may reassure parents of the baby's well-being. (21) Decreasing parental anxiety is an essential developmental care strategy;(22) however, educating parents on how to read their infant's cues and minimize unnecessary stress is essential. (16, 23) Care of preterm infants in the NICU should focus on minimizing physiologic instability. (24)

Evidence-based literature describing clothing application on preterm infants in the NICU has not been found. The purpose of this case series was to describe the physiological and behavioral reactions of preterm infants when dressing in a bodysuit compared to swaddling only. This study was submitted and deemed exempt from an Institutional Review Board (IRB) review, and it had no external funding.

"Evidence-based literature describing clothing application on preterm infants in the NICU has not been found. The purpose of this case series was to describe the physiological and behavioral reactions of preterm infants when dressing in a bodysuit compared to swaddling only."

Methods:

Sample

Participants were a convenience sample of eight preterm infants between the ages of $32^0/_7$–$34^6/_7$ weeks postmenstrual age (PMA) at the time of testing. Inclusion criteria included infants born before 34 weeks PMA and deemed medically stable by a neonatologist. Exclusion criteria included infants with an endotracheal tube, chest tube(s), central line, infusion line, phototherapy, nil per oral (NPO) feeding, genetic conditions, congenital cardiac disease, seizure history, neonatal opioid withdrawal, or upper extremity musculoskeletal injury. The infants were in a Level III NICU in a midwestern, urban hospital system. This hospital practiced cluster care at three-hour intervals and followed sensory-shielding developmental guidelines during caregiving. (23) The primary investigator (PI), a physical therapist with 13 years of NICU experience, obtained parental consent.

Instrumentation

The primary outcome measures were heart rate (HR), oxygen saturation (O_2), and Neonatal Pain, Agitation, and Sedation Scale (N-PASS) score. The Philips Intellivue MP50 cardiopulmonary monitor (Koninklijke Philips NV, Amsterdam, Netherlands) attached to each infant in the NICU provided a continuous recording of HR in beats per minute (bpm) and O_2 saturation

(percentage of oxygen in the blood). HR and O_2 saturations are reliable and standard physiologic indicators of infant stress. (14, 24, 25) The N-PASS is an observational scale that assesses five areas of pain and stress, including crying/ irritability, behavioral state, facial expression, extremity tone, and vital signs. (26) The N-PASS was used to determine infant behavioral stress levels, using a score range of 0 to 2 points for each criterion for ten total points. (26) A higher score equates to a greater level of pain or agitation, and a score over 3 indicates an intervention is warranted. (19) The sedation component of the N-PASS was not used for this medically stable sample. The N-PASS is a valid, sensitive, effective, and consistent measure of pain and stress in preterm infants. (17, 27, 28) Interrater reliability (0.85–0.95, $p<0.001$), convergent validity by correlation with PIPP scores (0.83 with high pain scores, 0.61 with low pain scores), and internal consistency were high (0.82). (29)

Design

A randomized, repeated measures crossover design used two clothing conditions precisely 24 hours apart. This 1-day "washout" period was designed to avoid changes in medical status while decreasing the chance of maturation and carryover effects. The order of the clothing intervention sequence was selected randomly from an envelope to eliminate an order effect.

"HR and O_2 saturations are reliable and standard physiologic indicators of infant stress. The N-PASS is an observational scale that assesses five areas of pain and stress, including crying/ irritability, behavioral state, facial expression, extremity tone, and vital signs."

Procedure

The PI completed data collection and included a chart review and direct observations. A medical chart review provided the following infant demographics before testing: PMA and weight (birth and testing day), gender, and race. Testing occurred during the second nursing assessment of the day shift and included only a diaper change and no temperature or blood pressure measurements. The infant remained supine in an open crib throughout testing with no calming strategies (e.g., pacifier, containment, or holding). Parents could observe but not engage with the infant throughout the testing period.

Data collection began 30 minutes before the infant's feeding time and before handling or talking to the infant. All measurements were recorded by the PI and included HR and O_2 observations from the infants' monitor and the N-PASS. Baseline measurements were taken first, followed by a 5-minute break period. After the break time, the PI removed any developmental positional supports from the bed space and changed the diaper without using any calming measures. The diaper change was completed in a 5-step process: a new diaper was placed under the infant's pelvis, the previous diaper was removed, the infant's "bottom" was cleaned with a water wipe, diaper cream was applied, and a new diaper was secured anteriorly. The infant remained unswaddled and not handled for two minutes after the diaper change and before the clothing intervention. After the two-minute wait time, the PI completed the clothing intervention by either a) swaddling the infant snugly in a standard hospital blanket and dressed in a diaper only (Figure 1a–c) or b) placing a short-sleeved bodysuit over the head of the infant with the arms pulled through the sleeves gently (Figure 2a–c), before swaddling in a standard hospital blanket (Figure 1a–c). The infant remained supine in the crib without developmental support, and no calming strategies were provided for 5 minutes. Lastly, recovery measurements were recorded after the 5-minute break period. This sequence was repeated 24 hours later with the other intervention.

During swaddling for both interventions, the arms were flexed toward the chest, and the hands were placed together at the sternum. One side of the blanket was tucked around one shoulder, twisted in the center, and then tucked around the other shoulder (Figure 1a). Next, the legs were flexed on the infant's belly, and the pelvis was placed into a slight posterior pelvic tilt. The bottom of the blanket was folded up to encase the feet (Figure 1b). Lastly, the remaining side of the blanket was tucked around one shoulder, twisted in the center, and then around the other shoulder and under the baby to secure any loose fabric (Figure 1c).

Figure 1a–c. Swaddling procedure: a) blanket tucked over one shoulder. b) bottom of the blanket folded up, c) final side of the blanket tucked over the other shoulder.



Figure 2a–b. Donning bodysuit procedure: a) arm gently pulled through the sleeve; b) immediately after buttoning



Data Analysis:

The PI analyzed data using Intellectus Statistics computer

software (Intellectus Statistics. Clearwater, FL. 2023). Summative descriptive analysis was used. Aggregate statistical comparisons were impossible due to the low subject numbers consistent with a case series design. A secondary analysis of the effect of neurodevelopmental maturity on stress was conducted using the sample's central tendency of PMA. Infants were grouped by PMA range (32- and 34-weeks), and the group reported HR, O_2, and N-PASS scores. Separation of infants by PMA was completed a priori to examine variation in stress responses based on neurodevelopmental maturity.

Results:

Eight infants were recruited, including five females and three males. The participants' demographics are described in Table 1. One infant was on Continuous Positive Airway Pressure (CPAP) supplemental oxygen during the testing period, while the others were on room air.

Heart Rate

Normal HR limits in infants are 120–160 bpm with tachycardia or elevated heart rate, between 160–180 bpm. (30) Tachycardia can be a normal physiologic response during agitation. (30) This study considers a HR greater than 180 bpm above normal limits. During the bodysuit intervention, each infant increased HR above the pretreatment level, with 7 of the 8 (87%) infants above normal limits when donning the bodysuit (Figure 3). Only one infant was above the normal HR level in the pretreatment period, and levels increased when donning the bodysuit. During the swaddle-only intervention, one infant was above a normal limit level at baseline, which decreased to normal limits when swaddled, and 1 infant demonstrated an increased heart rate above normal limits when swaddled (12.5%). All infant HR returned to pretreatment level or below after the 5-minute recovery period in both interventions. In this small sample, donning a bodysuit increased HR consistently above normal limits (100%), while an increase above normal limits was seen in just one infant (12.5%) when swaddled only. That infant was not on supplemental oxygen.

"In this small sample, donning a bodysuit increased HR consistently above normal limits (100%), while an increase above normal limits was seen in just one infant (12.5%) when swaddled only."

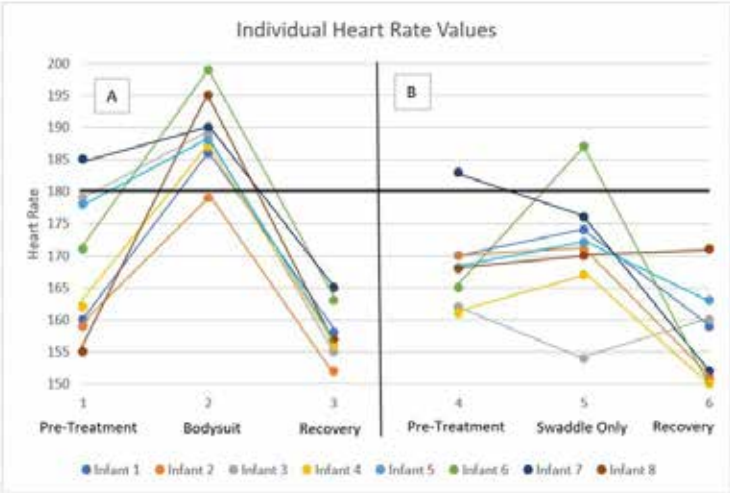
The mean HR for both groups is in Table 2. The mean HR for pretreatment and recovery nearly matched for both conditions (168.62 versus 168.38 and 157.88 versus 156.88, respectively). The HR mean was noticeably higher and outside of the normal range in the bodysuit intervention (189.12) compared to the swaddle-only intervention (171.38). The mean percent change (MPC) was an increase of 12.1% from pretreatment to the bodysuit intervention, compared to a 1.5% MPC in the swaddle-only condition. A 2-standard deviation (2SD) value based on the

Table 1. Participant Demographics

Patient # Current weight	Birth PMA Gender	PMA at Testing Race	BW
1 1735	$25^{4}/_{7}$ Female	$32^{4}/_{7}$ H	807
2 1180	$29^{1}/_{7}$ Male	$32^{4}/_{7}$ C	815
3 1520	31 Female	$32^{5}/_{7}$ C	1585
4 1860	$29^{1}/_{7}$ Female	$32^{5}/_{7}$ C	1325
5 1935	$25^{1}/_{7}$ Female	$34^{1}/_{7}$ AA	845
6 2050	30 Male	$34^{1}/_{7}$ C	1750
7 2390	$29^{6}/_{7}$ Male	$34^{4}/_{7}$ AA	1550
8 2050	$32\ ^{4}/_{7}$	$34\ ^{5}/_{7}$ C	2140

Abbreviations: PMA = postmenstrual age in weeks, BW = birth weight in grams, H = Hispanic, C = Caucasian, AA = African American

Figure 3. Individual HR Values During Each Intervention—A) Bodysuit, B) Swaddle Only



Key: Infants 1–4 were 32–32$^{6}/_{7}$ weeks postmenstrual age; infants 5–8 were 34–34$^{6}/_{7}$ weeks postmenstrual age; above normal hear rate value indicated by the solid black horizontal line (180 beats per minute)

pretreatment mean was used to determine the clinical significance of the intervention (Figure 4). The bodysuit intervention exhibited a nearly clinically significant value and did cross the pretreatment 2SD value with the error range.

The mean HR of the 32-week infants was lower than the 34-week infants during each data collection point (Table 3). The 32-week- and 34-week infants were above the normal range during the bodysuit intervention (185.25 and 193, respectively).

Oxygen Saturation

Pretreatment and recovery O_2 were not different for each infant during both dressing interventions and even exceeded normal limits based on published recommendations. (32) Only one infant demonstrated a sizable decrease in O_2 saturation below normal levels during the bodysuit intervention. That infant was on CPAP oxygen support during testing and was removed briefly to don the bodysuit. In this small sample, O_2 levels were not affected by dressing a preterm infant in a bodysuit; however, the infant on CPAP demonstrated a brief oxygen desaturation while being dressed in the bodysuit when the CPAP was removed temporarily.

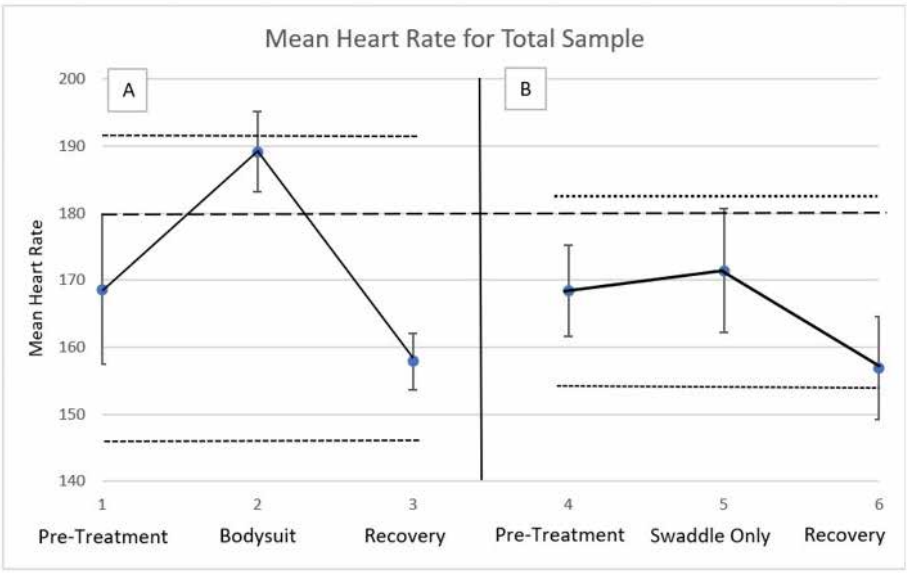
Table 2. Summary Statistics Table for Heart Rate Means

Variable	Mean	MPC	SD	2SD
HR Pretreatment Bodysuit	168.62		11.12	22.24
HR Bodysuit	189.12	+12.1%	5.99	
HR Recovery Bodysuit	157.88		4.22	
HR Pretreatment Swaddle-Only	168.38		6.82	13.82
HR Swaddle-Only	171.38	+1.5%	9.23	
HR Recovery Swaddle-Only	156.88		7.74	

Abbreviations: MPC = mean percent change, SD = standard deviation, HR = heart rate

"The HR mean was noticeably higher and outside of the normal range in the bodysuit intervention (189.12) compared to the swaddle-only intervention (171.38)."

Figure 4. Mean HR Values During Each Intervention: A) Bodysuit, B) Swaddle Only



Key: Error bars = 1 standard deviation range, horizontal dotted lines = 2 standard deviations from baseline, dashed horizontal line = above normal heart rate value

Table 3. Mean Heart Rate and Standard Deviations Between Age Groups

	32-Week M	SD	34-Week M	SD
Swd-HR1	165.75	4.92	171	8.12
Swd-HR2	166.50	8.81	176.25	7.59
Swd-HR3	155.00	5.23	158.75	10.14
BS-HR1	165.00	9.42	172.25	12.84
BS-HR2	185.25	4.35	193.00	4.97
BS-HR3	155.25	2.50	160.50	4.12

Abbreviations: PMA = postmenstrual age, M = mean, SD = standard deviation, Swd = swaddle intervention, BS = bodysuit intervention, HR = heart rate, 1 = baseline score, 2 = clothing condition score, 3 = recovery score

Mean O_2 values for both groups are in Table 4. The pretreatment and recovery periods were comparable in both conditions and for both groups (98.12 versus 97.62 and 98.38 versus 98.25, respectively). A slight decrease in the O_2 mean occurred when donning the bodysuit versus being swaddled only. This finding was influenced by the decreased O_2 of the infant on CPAP. The MPC decreased by 4.1% in the bodysuit intervention and 0.4% in the swaddle-only condition. A 2SD value based on the pretreatment mean in both conditions was used to determine the clinical significance of that intervention. Both the bodysuit and the swaddle-only interventions O_2 means were not clinically significant.

The O_2 means throughout testing were comparable between 32-week and 34-week infants, with a slight decrease in all areas for the 32-week infants (Table 5). One infant influenced this result due to CPAP removal.

Table 4. Summary Statistics Table for Oxygen Saturation Means

Variable	*Mean*	MPC	*SD*	2SD
O_2 Pretreatment Bodysuit	98.12		2.23	4.46
O_2 Bodysuit	94.00	-4.1%	6.57	
O_2 Recovery Bodysuit	98.38		2.26	
O_2 Pretreatment Swaddle-Only	97.62		3.25	6.50
O_2 Swaddle-Only	97.25	-0.4%	3.28	
O_2 Recovery Swaddle-Only	98.25		1.98	

Abbreviations: MPC = mean percent change, SD = standard deviation, O_2 = oxygen saturation

N-PASS score:

Pretreatment N-PASS scores were identical for each infant in both interventions. In the bodysuit intervention, all infants demonstrated an increase in N-PASS scores well above the pretreatment level (Figure 5). Most subjects (7/8) scored above 3 when placed in the bodysuit, indicating the need for intervention. (19) No infants scored above a 3 during the swaddle-only condition. N-PASS scores returned to 0 or 1 after the 5-minute recovery period in both groups. In this small sample, donning a bodysuit led to a considerable increase in N-PASS scores above requiring an intervention.

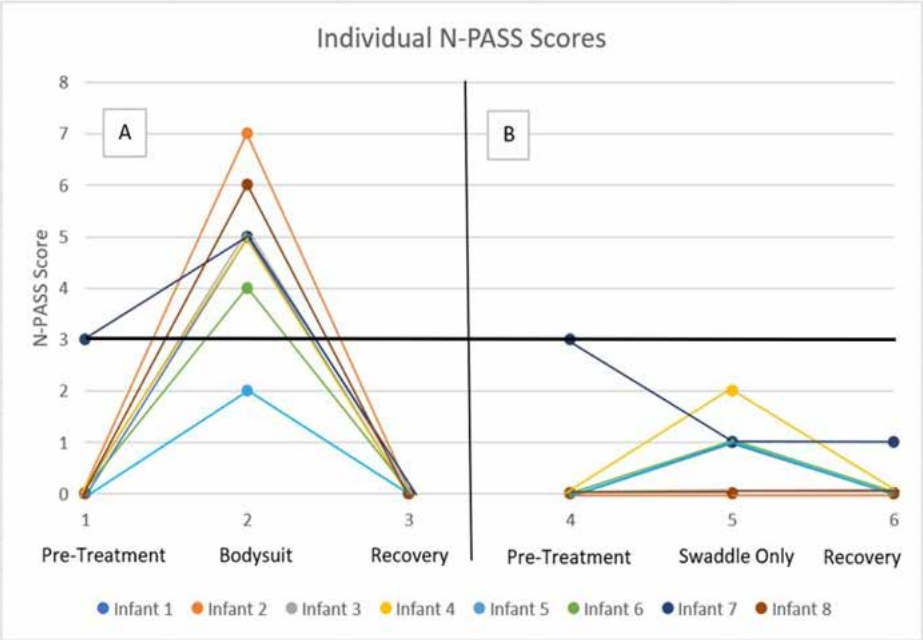
The mean N-PASS values for both groups are in Table 6. The mean N-PASS score for pretreatments was identical and nearly the same for recovery in both conditions (0.38 and 0 versus 0.12, respectively). N-PASS means were noticeably higher in the bodysuit condition than in the swaddle-only condition. The mean percent change (MPC) increased by 1,184% from pretreatment to

Table 5. Mean Oxygen Saturations and Standard Deviations Between Age Groups

	32-Week PMA: M	32-Week PMA: SD	34-Week PMA: M	34-Week PMA: SD
Swd-O_2-1	96.00	3.92	98	2.16
Swd-O_2-2	96.5	4.36	98	2.16
Swd-O_2-3	98.25	2.06	98.25	2.22
BS-O_2-1	96.75	2.50	99.5	0.58
BS-O_2-2	91.75	8.18	96.25	4.5
BS-O_2-1	98	2.83	98.75	1.89

Abbreviations: PMA = postmenstrual age, M = mean, SD = standard deviation, Swd = swaddle intervention, BS = bodysuit intervention, O_2 = oxygen saturation, 1 = baseline score, 2 = clothing condition score, 3 = recovery score

Figure 5. Neonatal Pain Agitation Sedation Score (N-PASS) Values During Each Intervention—A) Bodysuit, B) Swaddle-Only



Key: Infants 1–4 were 32–$32^{6}/_{7}$ weeks postmenstrual age; infants 5–8 were 34–$34^{6}/_{7}$ weeks postmenstrual age; solid black line = N-PASS score requiring intervention

the bodysuit intervention, compared to a 97% MPC in the swaddle-only condition. A 2SD value based on the pretreatment N-PASS mean was used to determine the clinical significance of the intervention (Figure 6). The bodysuit intervention N-PASS mean was clinically significant, while the swaddle-only intervention was not clinically significant. The bodysuit mean was above a score of 3, indicating a recommended intervention to decrease stress, whereas only the mean for swaddling did not indicate a necessary intervention.

The mean N-PASS results for 32-week and 34-week infants were similar during all data points, with a slight increase in N-PASS mean for 32-week infants when donning the bodysuit (Table 7). The 34-week infants have an N-PASS mean score in each area, indicating some degree of movement or physiologic change during

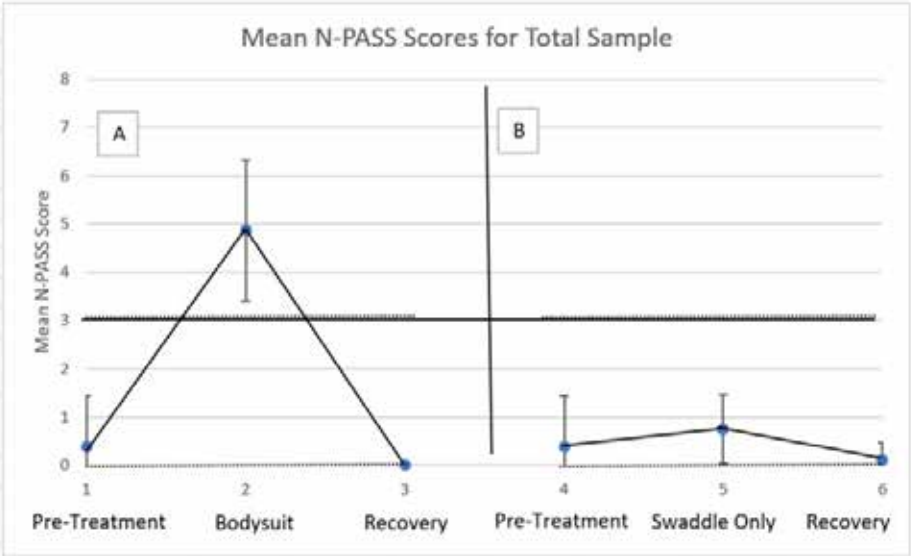
"N-PASS means were noticeably higher in the bodysuit condition than in the swaddle-only condition. The mean percent change (MPC) increased by 1,184% from pretreatment to the bodysuit intervention, compared to a 97% MPC in the swaddle-only condition."

Table 6. Summary Statistics Table for N-PASS Means

Variable	Mean	MPC	SD	2SD
NPASS Pretreatment Bodysuit	0.38		1.06	2.12
NPASS Bodysuit	4.88	+1,184%	1.46	
NPASS Recovery Bodysuit	0.00		0.00	
NPASS Pretreatment Swaddle-Only	0.38		1.06	2.12
NPASS Swaddle-Only	0.75	+97%	0.71	
NPASS Recovery Swaddle-Only	0.12		0.35	

Abbreviations: MPC = mean percent change, SD = standard deviation, NPASS = neonatal pain, agitation, and sedation scale

Figure 6. Mean Neonatal Pain, Agitation, and Sedation Scale (N-PASS) Values During Each Intervention—A) Bodysuit, B) Swaddle-Only



Key: Error bars = 1 standard deviation range, horizontal dotted lines = 2 standard deviations from baseline, dashed horizontal line = upper limit N-PASS value requiring intervention

the pretreatment, intervention, and recovery compared to the 32-week infants. This pattern is consistent with the increased heart rate mean score with the 34-week GA infants and may indicate increased arousal consistent with more mature feeding cues and arousal near the feeding time.

"The mean N-PASS results for 32-week and 34-week infants were similar during all data points, with a slight increase in N-PASS mean for 32-week infants when donning the bodysuit (Table 7). The 34-week infants have an N-PASS mean score in each area, indicating some degree of movement or physiologic change during the pretreatment, intervention, and recovery compared to the 32-week infants. This pattern is consistent with the increased heart rate mean score with the 34-week GA infants and may indicate increased arousal consistent with more mature feeding cues and arousal near the feeding time."

Discussion:

This is the first known study to assess infant physiological and behavioral stress responses during routine dressing of preterm infants in bodysuit clothing in the NICU setting. When donning the bodysuit, HR responses increased to above the normal range in 7 of 8 infants, indicating an increased stress response during dressing. In comparison, only one infant had an above-normal HR while being swaddled. The bodysuit and swaddle-only intervention, except in the infant on CPAP when it was removed to don the bodysuit, did not impact O_2 saturations. The individual and group mean for HR and O_2 in the pretreatment and recovery conditions were similar in the bodysuit and swaddle-only interventions, indicating that the dressing condition likely led to the change in physiologic status. The consistently elevated heart rate above normal limits while dressing the infants supports the recommendation to both clinical staff and parents to avoid dressing a preterm infant in a bodysuit while in the NICU.

"The consistently elevated heart rate above normal limits while dressing the infants supports the recommendation to both clinical staff and parents to avoid dressing a preterm infant in a bodysuit while in the NICU."

All infants exhibited a substantial increase in N-PASS scores when donning the bodysuit. The N-PASS mean was clinically significant in the bodysuit condition and not in the swaddle-only condition. Dressing a preterm infant in a bodysuit led to significant agitation, including an increase in crying, restlessness, painful facial expressions, and increased body tone. Even temporary increases in preterm infant stress should be avoided; therefore,

Table 7. Mean Total N-PASS Score and Standard Deviations Between Age Groups

	32-Week PMA M	32-Week PMA SD	34-Week PMA M	34-Week PMA SD
Swd-N-PASS 1	0	0	.75	1.5
Swd-N-PASS 2	0.75	0.957	.75	.5
Swd-N-PASS 3	0	0	.25	.5
BS-N-PASS 1	0	0	.75	1.5
BS-N-PASS 2	5.5	1.0	4.25	1.71
BS-N-PASS 3	0	0	0	0

Abbreviations: PMA = postmenstrual age, M = mean, SD = standard deviation, Swd = swaddle intervention, N-PASS = Neonatal Pain Agitation and Sedation Scale, BS = bodysuit intervention, 1 = baseline score, 2 = clothing condition score, 3 = recovery score

the N-PASS scores also justify the recommendation to avoid dressing the preterm infant in a bodysuit while in the NICU.

"Dressing a preterm infant in a bodysuit led to significant agitation, including an increase in crying, restlessness, painful facial expressions, and increased body tone. Even temporary increases in preterm infant stress should be avoided; therefore, the N-PASS scores also justify the recommendation to avoid dressing the preterm infant in a bodysuit while in the NICU."

The results of this study support previous findings that stress reactions vary depending on the PMA vulnerability of preterm infants. Higher HR means during dressing were seen in the older preterm infants, which may result from increased arousal prior to the feeding time. Georgoulas et al. (31) found that awake states increased with advancing GA, and stress further heightened alertness. The authors further reported that older preterm infants are more vulnerable to being awake following noxious stimuli. (31) Similarly, Green et al. (32) indicated that infants over 33 weeks PMA displayed more facial expressions in response to noxious stimuli than younger infants, leading the authors to conclude that discriminative facial expressions coincide with enhanced brain maturation near that PMA. It is possible that the immature neurodevelopment of brain structures in the preterm infant, such as the amygdala and thalamus, which control behavior, may lead to hyposensitivity to stress. (6) Both the 32-week and 34-week infants in this study demonstrated an increase in global stress responses during the bodysuit application, with the older infants having a higher HR response.

It is important to address why an infant is dressed in clothing while in the NICU. Clothing has been recommended in the NICU to reduce water and heat loss in preterm infants. (33, 34) Kjällström, Sedin, and Ågren (35) found that a layer of thin cotton fabric reduced water loss in extremely preterm infants aged 22–26 weeks gestation only during the first one to two weeks after birth and was less effective in preventing fluid loss as preterm skin matures. Similarly, support exists for dressing a preterm infant in clothing after a bath. (34) However, researchers from Turkey found no statistically significant difference in moisture loss and body temperature in infants dressed in clothing immediately after a bath compared to those swaddled in a blanket. (36) Kim and Park (37) found that placing a hat on the head and over the ears after a bath effectively recovered body temperature and stabilized oxygen saturation and heart rate in full-term infants.

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Limitations:

While feasible for NICU settings, the case series design has several limitations. The sample size was too small to be adequately powered for parametric statistical analyses, which limits the ability to confirm the effects of the intervention. Although a small sample was used in this single-site case series, various

race and gender representations enhanced external validity and represented the typical heterogeneous population consistent with the NICU population in an urban area. While one person conducted the entire study, standard objective outcome measures were used to limit the effect of examiner bias. Lastly, an infant bodysuit is only one article of clothing frequently used in NICUs in the United States and internationally. Future studies could investigate potential stress effects during clothing applications of other articles of clothing, including t-shirts, pajamas, and pants, in physiologically vulnerable infants.

"The elevated trends in HR and N-PASS scores in this study indicate that a randomized controlled trial using a large sample size of preterm infants at differing PMA and acuity is needed to explore stress reactions further when donning neonatal clothing. A larger sample size would allow for parametric statistical analysis and improve generalization of the results. Enhanced understanding of preterm infant stress reactions and behavioral stability strategies during clothing changes at varied PMA may shape future NICU caregiving practices."

Strengths:

A strength of this study was that the intervention did not disrupt the daily care of the infant because dressing preterm infants is a standard daily care practice. The randomized crossover design limited potential testing and maturation effects. In addition, parents and staff members could observe infant reactions during both clothing interventions. This study's N-PASS scores yielded clinically significant results, more than HR or O_2 alone. The N-PASS includes physiologic changes and motoric signs of stress, making it a valuable determinant of global stress responses in preterm infants. Direct observation of the infants' reactions during dressing may help caregivers understand infant stress cues and provide learning opportunities for limiting daily stressors. When caregivers recognize and respond to behavioral, social, and physical cues, they facilitate the baby's development. (38)

The elevated trends in HR and N-PASS scores in this study indicate that a randomized controlled trial using a large sample size of preterm infants at differing PMA and acuity is needed to explore stress reactions further when donning neonatal clothing. A larger sample size would allow for parametric statistical analysis and improve generalization of the results. Enhanced understanding of preterm infant stress reactions and behavioral stability strategies during clothing changes at varied PMA may shape future NICU caregiving practices.

"The most reasonable intervention to minimize excess stress associated with dressing a preterm infant in a bodysuit is to avoid dressing the infant and to swaddle only. Dressing the infant in a bodysuit is an unnecessary source of apparent stress for preterm infants in the NICU."

Conclusion:

Results of this case series suggest that preterm infants between $32^{0}/_{7}$ and $34^{6}/_{7}$ weeks PMA show an increase in physiological and behavioral stress during dressing in a bodysuit compared to swaddling only. The N-PASS mean during the bodysuit application was clinically significant, and regardless of PMA, each infant exceeded the threshold score for a stress reduction intervention. In addition, the trend in data indicated that HR was adversely impacted when dressing a preterm infant in a bodysuit. The preterm infants at 34 weeks PMA exhibited higher HR and N-PASS stress responses compared to infants at 32 weeks PMA, likely because of an increased arousal state prior to feeding and during physical handling. NICU staff and parents must reduce daily stress exposures by avoiding non-essential activities. The most reasonable intervention to minimize excess stress associated with dressing a preterm infant in a bodysuit is to avoid dressing the infant and to swaddle only. Dressing the infant in a bodysuit is an unnecessary source of apparent stress for preterm infants in the NICU.

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WiN Advocacy and Leadership Committees: WiN Webinar on Leadership and Upcoming Highlights

Clara Song, MD

"We are excited to announce an upcoming WiN Webinar, Demystifying the Pathway to External Leadership. This is a unique opportunity to gain insights from a group of exceptional women leaders in neonatology who have followed diverse career paths to achieve significant leadership roles."

-Dear WiNners,

From your WiN Advocacy & Leadership Committees:

Save the Date: WiN Webinar on Leadership

We are excited to announce an upcoming WiN Webinar, **Demystifying the Pathway to External Leadership**. This is a unique opportunity to gain insights from a group of exceptional women leaders in neonatology who have followed diverse career paths to achieve significant leadership roles. Our panel features **Dr. Theresa Grover, Dr. Alexis Davis, and Dr. Anisha Bhatia**, who are leaders in the field and have a wealth of experience to share.

- **Date & Time:** Wednesday, September 25
  12 PM PST / 1 PM MST / 2 PM CST / 3 PM EST
  No preregistration is required. Simply join the session through this link.
  Meeting Number: 2634 284 3064
  Password: WIN24

Meet the Panelists:

- **Dr. Anisha Bhatia** is an Assistant Professor of Pediatrics at Rush University Medical Center and practices neonatology at Rush Copley Medical Center. She has an impressive leadership background as the Immediate Past Chair of the AAP Trainees and Early Career Neonatologists (TECaN) Executive Council. Dr. Bhatia currently serves as Co-Lead of the Networking and Communications Team for AAP Women in Neonatology (WiN) and is part of several key AAP task forces, including the Staffing and Workload Taskforce and the Neonatal Workforce Research Group. Her areas of focus include equitable working conditions, mentorship, and workforce advocacy.
- **Dr. Alexis Davis** is a Clinical Associate Professor of Pediatrics at Stanford University, where she has served in numerous leadership roles, including NICU Medical Director and the District IX representative to the Executive Council of the AAP Section on Neonatal-Perinatal Medicine (SONPM). Dr. Davis is the incoming Chair-Elect for SONPM and continues contributing to neonatology research and quality improvement initiatives.
- **Dr. Theresa Grover** is a Professor of Pediatrics with Tenure at the University of Colorado School of Medicine. She previously served for 16 years as the Medical Director of Children's Hospital Colorado's Level IV NICU. In addition, Dr. Grover is deeply involved with the Children's Hospitals Neonatal Consortium (CHNC), serving as Associate Executive Director and leading its research and quality improvement initiatives. Her leadership extends to the US News and World Report's Best Children's Hospitals survey, where she has played a significant role since 2013.

"NCE in Orlando: For those attending the National Conference & Exhibition (NCE) in Orlando, there is a wealth of opportunities for #NeoIntensivists this year! "

Upcoming Highlights for September:

- **WiN Webinar on Leadership:** Do not miss this chance to learn from seasoned leaders and explore ways to advance your career on **September 25 at 12 PM PST / 3 PM EST**. Join here.
- **AAP Elections:** Voting is open until September 25—be sure to check your email for the link and have your say in shaping the future of neonatology!
- **NCE in Orlando:** For those attending the National Conference & Exhibition (NCE) in Orlando, there is a wealth of opportunities for #NeoIntensivists this year! Highlights include:
  - The **NRP Current Issues Seminar** on Friday, September 27. Details here.
  - The **SONPM program** will run from Friday through Sunday, September 27-29, featuring cutting-edge discussions on AI, bioethics, palliative medicine, and more. Join us for the **WiN Sunday afternoon session**.
  - **Dr. Lou Halamek** will be honored with the **2024 AAP Education Award** during the AAP Business Lunch on Monday, September 30.

SONPM Journal Club

We have several exciting upcoming SONPM Journal Clubs, each led by experts in the field with insights into neonatal research:

1. **October 31, 2024 @ 2:00 PM ET**

   Two-Year Outcomes of Umbilical Cord Milking in Nonvigorous Infants Mentors: Dr. Anup Katheria (University of San Diego) and Dr. Anna Lene Siedler (University of Sydney) Trainee Presenter: Colin Parker, MD (University of California – Irvine)

2. **November 14, 2024 @ 3:00 PM ET**

Effect of Early vs. Late Inguinal Hernia Repair on Serious Adverse Event Rates in Preterm Infants
Mentors: Dr. Martin Blakely and Dr. Matt Rysavy (University of Texas Health Science Center)
Trainee Presenter: Nikitha Gorti (Children's Hospital at Montefiore)

3. **December 12, 2024 @ 4:00 PM ET**

Nutritional Support for Moderate-to-Late-Preterm Infants
Mentors: Dr. Tanith Alexander (University of Auckland) and Dr. Ariel Salas (University of Alabama at Birmingham)
Trainee Presenter: Gretell Gomez Zaghmout (University of Miami)

You can catch past webinars here: AAP Journal Club YouTube Channel.

For more information or to connect with Journal Club leaders, feel free to reach out to Mattie Wolf, Brian King, Sai Mukthapuram, or Viral Jain.

"Join us for the next NeoGrandRounds with Dr. Michelle Starr, a Pediatric Nephrologist from Riley Children's and an NIH-funded researcher, as she discusses Systemic Hypertension in the NICU. This talk is open to all and offers ABP Part 2 MOC and CME credit for live attendees!"

NeoGrandRounds - October 15

Join us for the next **NeoGrandRounds** with Dr. Michelle Starr, a Pediatric Nephrologist from Riley Children's and an NIH-funded researcher, as she discusses **Systemic Hypertension in the NICU**. This talk is open to all and offers **ABP Part 2 MOC and CME credit** for live attendees! **Date & Time:** Tuesday, October 15 @ 12:15 PM PT / 3:15 PM ET. Join here.

ICYMI: Recordings of past NeoGrandRounds, including those from June with Dr. Satyan and July with Dr. Matt Harer, are available on Microsoft Teams. Explore more here.

For additional webinars, including **WiN Webinars** and **NeoGrandRounds**, check out the **Women Neonatologists YouTube Channel**: Watch here.

Important Links & Dates:

- View the latest **SONPM Articles of Interest**: Explore here.
- Check the **AAP Neonatal Calendar** for all upcoming events and deadlines: Calendar link.
- **Photo Gallery:** Relive recent moments from WiN events at the AAPneo SmugMug Gallery (Password: AAPneonatal).

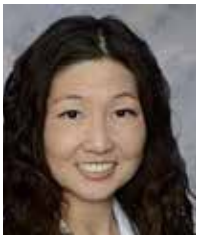
Till next month,

Your #WomenNeo and #AllPath Leaders

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

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Postnatal Steroid Use in Infants at Risk for Bronchopulmonary Dysplasia: A Retrospective Observational Study of a Level III NICU

Alejandra Valladolid, MD, Becky Micetic, BSN, RN, Christine Wade, BSN, RN, Julianna Diddle, MD, Reese Clark, MD, Kartik Mody, MD

Abstract:

Introduction: *This retrospective observational study was designed to examine early vs. late steroid use and if there was an impact on the incidence of bronchopulmonary dysplasia (BPD) and growth in our NICU.*

Methods: *Between July 2019 and August 2021, 175 infants <30 weeks gestational age and/or 1500 grams at birth were enrolled in our retrospective observational study. Infants were classified into three cohorts based on initial steroid exposure and timing: no exposure, ≤21 days of life (DOL), and >21 DOL. We classified BPD using support-based criteria at 36 weeks and evaluated differences between the steroid groups using a chi-square test.*

Results: *There were no statistical differences observed in infants who began steroids before or after DOL 21 concerning BPD or support required at discharge. ΔZ-scores from birth to DOL 42 demonstrated similar growth velocity between all cohorts (P=0.199).*

Conclusions: *No significant difference was found in BPD outcomes when comparing early (≤21) vs. late postnatal steroid initiation (>21 days). Growth velocities were not adversely impacted by steroid exposure*.

Keywords: Infant; Neonatal Intensive Care Unit; Steroids, Bronchopulmonary Dysplasia, Growth

"Bronchopulmonary dysplasia (BPD) was described initially...as the result of many factors, including artificial ventilatory measures, respiratory distress syndrome, the toxic effect of prolonged oxygen exposure, and poor bronchial drainage during intubation."

1. Introduction:

Bronchopulmonary dysplasia (BPD) was described initially by Northway et al. as the result of many factors, including artificial ventilatory measures, respiratory distress syndrome, the toxic effect of prolonged oxygen exposure, and poor bronchial drainage during intubation. (1) Ventilatory support is often required to facilitate oxygenation and ventilation of the immature lung, but it can also cause small and large airway injuries, which may negatively impact pulmonary function later in life. (2) The pathologic abnormalities associated with lung disease are alveolar simplification and delayed vascular growth, smooth muscle hypertrophy, and prominent heterogeneity with areas of fibrosis, atelectasis, and cystic changes. (2–4) These alterations increase the risk of mortality in premature infants with pulmonary hypertension. Proactive and preventative strategies are needed to decrease further lung damage in infants at risk for BPD.

"The pathologic abnormalities associated with lung disease are alveolar simplification and delayed vascular growth, smooth muscle hypertrophy, and prominent heterogeneity with areas of fibrosis, atelectasis, and cystic changes. These alterations increase the risk of mortality in premature infants with pulmonary hypertension. "

Research has proven that steroids can be beneficial for the prevention and management of infants at risk for severe BPD due to their anti-inflammatory effects. (5, 6) Unfortunately, the optimal timing of steroid initiation in reducing the incidence of BPD while also minimizing adverse neurodevelopmental outcomes remains unclear. The known short-term benefits of early systemic steroid administration during the first week of life include decreased ventilator days and increased rates of successful extubation. However, providers may be hesitant, and usage remains inconsistent in response to the associated risks. Complications may include hypertension, growth failure, hypertrophic cardiomyopathy, gastrointestinal bleeding, intestinal perforation, hyperglycemia, and cerebral palsy, according to a 2021 Cochrane meta-analysis. These findings represent the high risk-benefit ratio of steroid treatment at <7 days of life (DOL). (7)

A reciprocal systematic review by Doyle et al. (8) evaluated studies that initiated steroids between 7 and 42 DOL. It suggested that

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later steroid exposure, after the first week of life, decreases the risk of BPD or mortality without increasing the incidence of cerebral palsy. In addition to the short-term complications of hypertension and hyperglycemia, an increased incidence of severe retinopathy of prematurity was observed. A separate meta-analysis divided the timing of steroid administration into three categories (<8, 8–14, and 15–27 days). They suggested that a moderately early approach of initiating steroids between 8–14 days may be most beneficial in preventing BPD or decreasing mortality. (9)

"Unfortunately, the optimal timing of steroid initiation in reducing the incidence of BPD while also minimizing adverse neurodevelopmental outcomes remains unclear."

The objective of this study was to understand the current steroid practices used to treat premature infants in our neonatal intensive care unit (NICU) who were at risk for BPD. With widely varying practices among providers, even at the same institution, it was essential to understand the effects of our steroid treatment regimen. Measured outcomes included the incidence of BPD and other comorbidities, as well as the effect of steroids on growth.

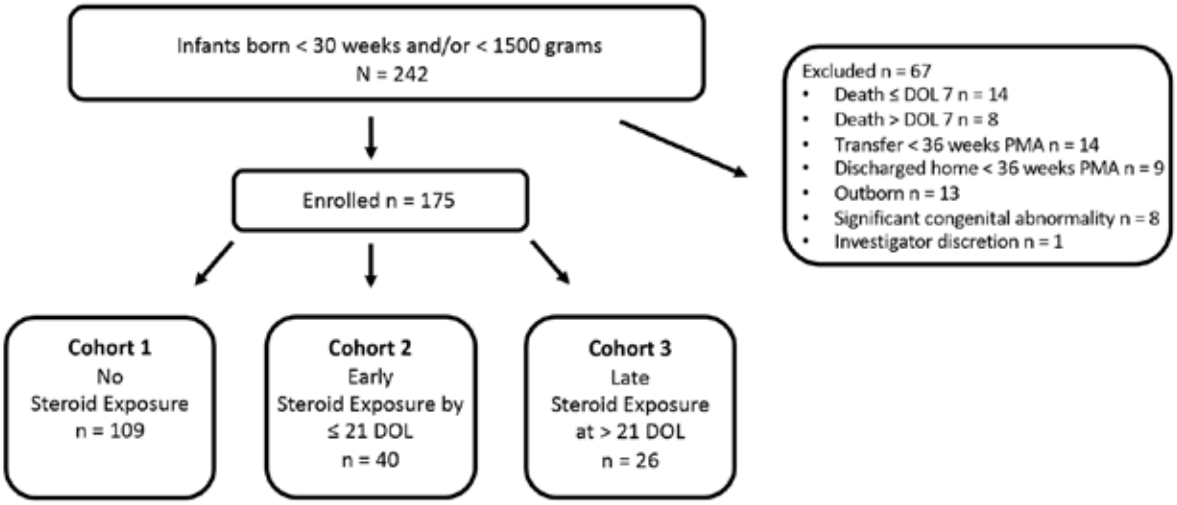
2. Materials and Methods:

This observational study collected retrospective data from a single level III NICU, including infants born <30 weeks and/or <1500 grams between July 2019 and August 2021. All infants admitted to the NICU were evaluated after obtaining a report from the BabySteps database (Pediatrix Medical Group Inc., Sunrise, FL) filtered by the study-specific gestational age and/or weight inclusion criteria. Outborn neonates, those with significant congenital abnormalities, and infants discharged or deceased before 36 weeks postmenstrual age (PMA) were excluded. A total of 242 infants were screened. One hundred seventy-five met the remaining inclusion criteria and were enrolled in the study (Figure 1).

"The objective of this study was to understand the current steroid practices used to treat premature infants in our neonatal intensive care unit (NICU) who were at risk for BPD. With widely varying practices among providers, even at the same institution, it was essential to understand the effects of our steroid treatment regimen. Measured outcomes included the incidence of BPD and other comorbidities, as well as the effect of steroids on growth."

Maternal demographic information, the use of antenatal steroids, and comorbidities were collected. Steroid administration was evaluated for completeness according to the American College of Obstetricians and Gynecologists. (10) Infant demographic data, growth, respiratory support at 36 weeks PMA, surfactant, and steroid administration, comorbidities, and outcomes at discharge were recorded (Cerner Millenium, Oracle Corporation, Austin, TX). Z-scores were calculated using the Fenton 2013 Growth Calculator for Preterm Infants at Peditools.org to assess weight gain velocities. (11) The stage of BPD at 36 weeks PMA was determined using Jensen's (12) criteria. Additionally, neurological concerns, motor/language skills, and feeding/respiratory support were gathered for all infants that participated in one or more visits at our developmental follow-up clinic (NextGen Healthcare Inc, Atlanta, GA).

Figure 1. Subject Flowchart



Subjects were divided into three groups, which consisted of those who did not receive any steroids (Cohort 1), had initial exposure to a steroid within the first 21 DOL (Cohort 2), and those who received an initial dose of steroids after DOL 21 (Cohort 3). As the usual practice in our NICU is to initiate steroids within the first 2–3 weeks of life (often using dexamethasone per the DART protocol), steroid administration on or before DOL 21 was considered early for purposes of our study. (13) Early exposure to hydrocortisone for hypotension and those exposed to chorioamnionitis (per the PREMILOC study) were included in our investigation. (14) Due to the growing evidence in the literature of prednisone/prednisolone and their impact on BPD outcomes, exposure to these steroids was also captured. (15, 16) To maintain the size of each cohort, we did not further divide infants into groups to evaluate each type of steroid received.

Human protection oversight was provided by the Banner Health Institutional Review Board (IORG #0004299) and conducted in accordance with the Declaration of Helsinki. A waiver of patient consent was approved as the use and disclosure involved no more than minimal risk to the patients, the research could not practicably be conducted without the waiver or without the use of the protected health information, and the privacy risks were reasonable in relation to the anticipated benefits. The study is registered with Clinicaltrials.gov as NCT04971694.

For our statistical analysis, categorical variables were evaluated by 2-tailed Chi-Square and Fisher's exact test. Continuous variables were compared using a three-way ANOVA for parametrically distributed data and Kruskal-Wallis analysis of variance for non-parametrically distributed data. Differences between the two steroid groups were compared using Tukey-Kramer tests.

3. Results:

3.1. Maternal/Infant Demographics and Pregnancy Course:

A total of 175 subjects were enrolled (Cohort 1, n = 109; Cohort 2, n = 40; Cohort 3, n = 26). Infants from Cohort 1 who did not receive steroids had a median age of 30 weeks and birth weight of 1230 g, vs 26 weeks/773 g and 26 weeks/795 g for Cohorts 2 and 3, respectively. In comparing the administration of antenatal steroids (85.3%, 90.0%, 92.3%, respectively) and cesarean section delivery rate (75.2%, 70.0%, 61.5%, respectively), statistically significant differences were not found between the three groups. Interestingly, in reviewing maternal comorbidities, Cohort 1 had the highest incidence of preeclampsia and diabetes. As expected, mothers from Cohort 1 had a statistically significantly lower rate of chorioamnionitis than Cohorts 2 and 3 (17.4% vs 37.5% and 30.8%, respectively, $P = 0.027$) (Table 1).

3.2. Medications, Comorbidities, and Outcomes:

Table 1. Maternal/Infant Demographics and Pregnancy Course

	No Steroids n = 109	Early Steroids n = 40	Late Steroids n = 26	*P*-Value
Maternal Age (years)[a]	29 (21.0 - 38.0)	27 (20.1 - 37.0)	27.5 (20 - 37.6)	0.371
Gravida[a]	2 (1 - 6)	2 (1 - 5)	2 (1 - 6)	0.621
Comorbidities[b]				
Chorioamnionitis	19 (17.4)	15 (37.5)	8 (30.8)	**0.027**
Preeclampsia	44 (40.4)	13 (32.5)	7 (26.9)	0.367
Diabetes	26 (23.9)	6 (15.0)	2 (7.7)	0.125
Renal Disease	2 (1.8)	0 (0)	2 (7.7)	0.109
Antenatal Steroids[b]	93 (85.3)	36 (90.0)	24 (92.3)	0.537
Complete Course of Steroids[b]*	66 (60.6)	24 (60.0)	19 (73.1)	0.468
Cesarean Section Delivery[b]	82 (75.2)	28 (70.0)	16 (61.5)	0.358
Gestational Age (weeks)[a]	30 (27 - 32)	26 (23 - 29)	26 (24 - 30)	**0.0001**
Infant Birth Weight (grams)[a]	1230 (940 - 1460)	773 (510 - 1052)	795 (582 - 1160)	**0.0001**
Infant Sex (Male)[b]	49 (45.0)	20 (50.0)	10 (38.5)	0.653
Race[b]				0.236
White	72 (66.1)	22 (55)	19 (73.1)	
Black	15 (13.8)	12 (30)	3 (11.5)	
Asian	1 (0.9)	0 (0)	0 (0)	
American Indian	16 (14.7)	6 (15.0)	2 (7.7)	
Native Hawaiian or Pacific Islander	1 (0.9)	0 (0)	0 (0)	
Other/Unknown	4 (3.7)	0 (0)	2 (7.7)	
Ethnicity[b]				0.410
Non-Hispanic	76 (69.7)	29 (72.5)	15 (57.7)	
Hispanic	33 (30.3)	11 (27.5)	11 (42.3)	

Cohort 1 = No Steroids, Cohort 2 = Early Steroids, Cohort 3 = Late Steroids; [a]Median (10 - 90th Percentile), [b]n (%)
*Complete course = two 12 mg doses of betamethasone intramuscularly 24 hours apart, or four 6 mg doses of dexamethasone intramuscularly every 12 hours, at least 24 hours prior to delivery

Table 2. Exposure to Steroids

Timing of Initial Steroid Exposure	Any Exposure to Dexamethasone	Any Exposure to Hydrocortisone	Any Exposure to Prednisone/Prednisolone
Early ≤ 21 Days[a] (Total n =40)	33 (83)	26 (65)	9 (23)
Late > 21 Days[a] (Total n = 26)	23 (85)	5 (19)	10 (38)

[a]n (%)

The median quantity of dexamethasone doses was similar between Cohorts 2 and 3. The median DOL of the first dose of dexamethasone administered in Cohort 2 was 16 vs. 27 in Cohort 3. Hydrocortisone was initiated at a median of 4.5 days in Cohort 2 and 33 days in Cohort 3. Prednisone/prednisolone was given at a median DOL 107 for Cohort 2 and DOL 94.5 for Cohort 3. Upon analysis of the initiation of all steroid types combined, infants in Cohort 2 received steroids at a median age of 11.5 days, while those in Cohort 3 began steroids at 28.5 days. A breakdown of individual steroid exposures can be found in Table 2.

The timing of initial steroid exposure and its relationship to BPD was analyzed. . Grade 1 or 2 BPD was diagnosed in less than 25% of the infants in Cohort 1. Most infants in both Cohorts 2 (82.5%) and 3 (84.6%) had Grade 1 or 2 BPD, for which statistical significance was not observed (*P* = 0.898). Neither the timing of

Table 3. Medications, Comorbidities, and Outcomes

	No Steroids n = 109	Early Steroids n = 40	Late Steroids n = 26	*P*-Value All Cohorts	*P*-Value Steroid Cohorts
Medications					
Any surfactant administration[b]	35 (32.1)	35 (87.5)	19 (73.1)	**0.0001**	0.195
Number of dexamethasone doses[a]	n/a	20.5 (0 - 47.9)	20 (0 - 41)	**0.0001**	0.185
DOL 1st dexamethasone[a]	n/a	16 (11.4 - 47.6)	27 (23 - 55.6)	**0.002**	**0.002**
Number of hydrocortisone doses[a]	n/a	13.5 (0 - 40.0)	0 (0 - 9.0)	**0.0001**	0.547
DOL 1st hydrocortisone[a]	n/a	4.5 (0 - 59.2)	33 (15.0 – 119.0)	**0.029**	**0.029**
Number of prednisone doses[a]	n/a	0 (0 - 23.0)	0 (0 - 23.0)	**0.0001**	0.349
DOL 1st prednisone[a]	n/a	107 (53 - 194)	94.5 (65.6 - 132.2)	0.350	0.350
BPD at 36 weeks PMA[b]				**0.0001**	0.898
Stage 0	85 (78.0)	4 (10.0)	3 (11.5)		
Stage 1	22 (20.2)	19 (47.5)	14 (53.8)		
Stage 2	2 (1.8)	14 (35.0)	8 (30.8)		
Stage 3	0 (0)	3 (7.5)	1 (3.8)		
Comorbidities[b]					
pHTN > 28 days	0 (0)	9 (22.5)	5 (19.2)	**0.0001**	1
Air leak syndrome	3 (2.8)	3 (7.5)	1 (3.8)	0.423	1
Severe IVH (grade III or IV)	3 (2.8)	4 (10.0)	0 (0)	0.072	0.148
Periventricular leukomalacia	2 (1.8)	1 (2.5)	0 (0)	0.737	1
Patent ductus arteriosus	27 (24.8)	36 (90.0)	22 (84.6)	**0.0001**	0.702
Necrotizing enterocolitis	4 (3.7)	4 (10.0)	1 (3.8)	0.285	0.641
Sepsis	11 (10.1)	12 (30.0)	5 (19.2)	**0.012**	0.397
Any respiratory infection	3 (2.8)	5 (12.5)	6 (23.1)	**0.001**	0.319
ROP > Stage 2	0 (0)	6 (15.0)	3 (11.5)	**0.0003**	1
Discharge Outcomes					
Home with feeding tube[b]	23 (21.1)	18 (45.0)	14 (53.8)	**0.0003**	0.224
Home on oxygen[b]	7 (6.7)	10 (32.3)	13 (54.2)	**0.0001**	0.168
GA at discharge (weeks)[a]	39 (36 - 43)	42 (38 - 49)	42 (38 - 47)	**0.0001**	0.756
NICU LOS (days)[a]	67 (41 - 103)	119 (80 - 162.3)	112.5 (78.1 - 147.3)	**0.0001**	0.433

Cohort 1 = No Steroids, Cohort 2 = Early Steroids, Cohort 3 = Late Steroids, [a]Median (10 - 90th Percentile), [b]n (%)

DOL, day of life; BPD, bronchopulmonary dysplasia; PMA, postmenstrual age; pHTN, pulmonary hypertension; IVH, intraventricular hemorrhage; ROP, retinopathy of prematurity; GA, gestational age; NICU, neonatal intensive care unit; LOS, length of stay

steroid initiation nor the number of doses impacted the incidence of BPD in our population.

"Neither the timing of steroid initiation nor the number of doses impacted the incidence of BPD in our population."

The increased severity of illness in Cohort 2 vs. 3 was exemplified by the greater need for surfactant (87.5% vs 73.1%) and the higher incidence of comorbidities. The diagnoses of pulmonary hypertension at >28 DOL (22.5% vs. 19.2%); air leak syndrome (7.5% vs. 3.8%); intraventricular hemorrhage (10% vs. 0%); necrotizing enterocolitis (10% vs. 3.8%); and sepsis (30% vs. 19.2%) were greater in Cohort 2 vs. 3 respectively. There were six infants from Cohort 2 and 1 infant from Cohort 3 that were transferred to an outside hospital for further airway management related to their BPD. Alternatively, Cohort 2 required less support upon discharge home than Cohort 3, as exemplified by the need for oxygen (32.3% vs. 54.2%) or a nasogastric tube (45% vs. 53.8%). Upon discharge or the transfer to another facility, PMA between the two cohorts exposed to steroids was similar, with a median age of 42 weeks (Table 3).

3.3. Growth and Follow-Up:

Although weight-based Z-scores were calculated at birth, DOL 28, 42, 56, and discharge, it was determined that the best growth measurement was on DOL 42 when most subjects remained hospitalized. The median Z-scores on DOL 42 were comparable (Cohort 1, −0.93; Cohort 2, −1.10; Cohort 3, −0.95; *P*=0.615) (Figure 2). Additionally, the change in Z-scores from birth to DOL 42 was nonsignificant between the three groups (*P*=0.199) (Table 4). A review of data from long-term developmental follow-up visits revealed that 41% of infants (71/175) attended at least one appointment after NICU discharge, and significance was not found.

"...it was determined that the best growth measurement was on DOL 42 when most subjects remained hospitalized. The median Z-scores on DOL 42 were comparable (Cohort 1, −0.93; Cohort 2, −1.10; Cohort 3, −0.95; P=0.615). Additionally, the change in Z-scores from birth to DOL 42 was nonsignificant between the three groups (P=0.199)."

4. Discussion:

Despite improvements in neonatal care, the rates of BPD have not decreased over the last few decades. (12) Infants now survive at the late canalicular or early saccular stages of pulmonary development, leading to an increased risk of developing BPD. (17) While understanding this disease continues to evolve, there is not a widely accepted therapeutic regimen for its prevention or management. Over the years, there have been varied criteria used in the diagnosis of BPD, many of which have seemed ineffective in clearly defining the disease. Jensen et al. (12) published a new classification system in 2019. It categorizes BPD into four stages based on support at 36 weeks PMA (no BPD,

Figure 2. Median Weight-Based Z-Score Growth Velocities

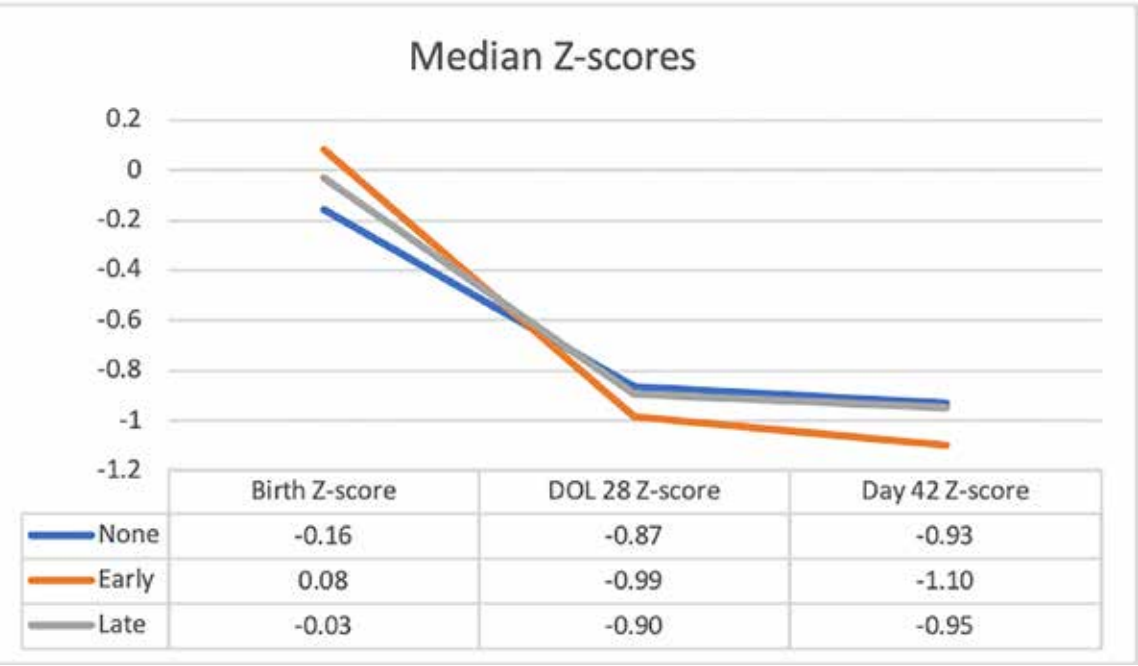


Table 4. Growth

	No Steroids	Early Steroids	Late Steroids	Total n All Co-horts	*P*-Value All Co-horts	*P*-Value Steroid Cohorts
Birth weight[a]	1230 (940 - 1460)	772.5 (510 - 1052)	795 (581.5 - 1160)	175	0.0001	0.817
Z-score[a]	−0.16 (−1.36 - 1.03)	0.08 (−1.54 - 1.48)	−0.03 (−1.73 - 1.27)	175	0.251	0.787
DOL 28 weight[a]	1672.5 (1253.5 - 2138)	990 (718 - 1393)	1060 (787 - 1574)	172	0.0001	0.472
Z-score[a]	−0.87 (−2.28 - 0)	−0.99 (−1.78 - −0.18)	−0.90 (−2.21 - 0.09)	172	0.953	0.949
DOL 42 weight[a]	2067.5 (1593.5 - 2627.5)	1277.5 (875 - 1871.5)	1432.5 (983 - 1924.5)	164	0.0001	0.261
Z-score[a]	−0.93 (−2.01 - −0.01)	−1.10 (−1.98 - −0.11)	−0.95 (−2.63 - 0.31)	164	0.615	0.835
DOL 56 weight[a]	2425 (2005 - 3125)	1625 (1111.5 - 2314.5)	1710 (1280 - 2472.5)	133	0.0001	0.656
Z-score[a]	−0.74 (−1.85 - 0.28)	−1.15 (−2.21 - 0.02)	−0.99 (−2.53 - 0.45)	133	0.078	0.559
Discharge weight[a]	2800 (2165 - 3980)	3800 (2505.5 - 4919)	3760 (2378 - 4909)	175	0.0001	0.997
Z-score[a]	−0.81 (−2.18 - 0.59)	−0.76 (−2.43 - 0.55)	−0.53 (−3.15 - 0.95)	175	0.780	0.878
DOL surpassed BW[a]	9 (2 - 15)	8 (2.1 - 14.8)	7 (2 - 18.5)	175	0.918	0.997
Δ in Z-score Birth to DOL 42[a]	−0.80 (−1.43 - −0.18)	−1.14 (−1.72 - −0.05)	−0.75 (−1.86 - −0.02)	164	0.199	n/a

Cohort 1 = No Steroids, Cohort 2 = Early Steroids, Cohort 3 = Late Steroids, [a]Median (10 - 90th Percentile), DOL, day of life; BW, birthweight

no support needed; grade 1, nasal cannula ≤2 liters per minute; grade 2, nasal cannula >2 liters per minute or nasal intermittent positive pressure ventilation; and grade 3, invasive mechanical ventilation). Jensen's method has proven to be the most accurate predictor of childhood morbidity outcomes such as death after 36 weeks of PMA or comorbidities of adverse respiratory and neurodevelopmental outcomes. (12) Fortunately, as the methodology and classifications of BPD have evolved, so has the treatment.

"Many studies have defined early steroid usage as administration within the first week of life. A recent comprehensive meta-analysis suggested that early postnatal use (<DOL 7) of dexamethasone is the most beneficial in reducing mortality or BPD, but it is also associated with significant risks."

4.1. Early Steroid Use:

Many studies have defined early steroid usage as administration within the first week of life. (7, 18) A recent comprehensive meta-analysis suggested that early postnatal use (<DOL 7) of dexamethasone is the most beneficial in reducing mortality or BPD, but it is also associated with significant risks. (7) The early use of hydrocortisone alone may carry less risk than dexamethasone; however, studies have shown that it lacks efficacy in reducing BPD, and further research is underway. (7, 19) Hydrocortisone is also often used shortly after birth in premature infants for treatment of vasopressor-resistant hypotension and in select infants exposed to chorioamnionitis in efforts to prevent BPD.(14) These two postnatal corticosteroids have considerable physiologic variations which may explain the differences in their mechanisms of action, potency, and side effects. (20–22)

"The use of corticosteroids after DOL 7 has been shown to decrease BPD and death, but further information is needed related to long-term outcomes. Research supports treatment with dexamethasone for infants who cannot be weaned or extubated from mechanical ventilation, but its use for infants who are not intubated is unclear. The current recommendation is to administer steroids after DOL 7 at the lowest dose and shortest duration possible and to reserve treatment for infants who cannot tolerate extubation."

4.2. Late Steroid Use:

The use of corticosteroids after DOL 7 has been shown to decrease BPD and death, but further information is needed related to long-term outcomes. Research supports treatment with

dexamethasone for infants who cannot be weaned or extubated from mechanical ventilation, but its use for infants who are not intubated is unclear. The current recommendation is to administer steroids after DOL 7 at the lowest dose and shortest duration possible and to reserve treatment for infants who cannot tolerate extubation. (8) Prednisone/prednisolone is often used later in life for infants with established BPD to facilitate a reduction in respiratory support and/or an improvement in oral feedings. (19) Benefits of these steroids published in the literature have been from retrospective studies which caution against repetitive courses or prolonged use. (15, 16)

"In our evaluation of the three cohorts, the infants that did not receive any steroids (Cohort 1) were born at a later gestational age and had a higher birth weight. This group also had a statistically lower chorioamnionitis incidence than Cohorts 2 and 3. Some studies have associated prenatal inflammation secondary to chorioamnionitis exposure with an increased risk of BPD in preterm infants."

4.3. Comparison of All Cohorts (1, 2, & 3):

In our evaluation of the three cohorts, the infants that did not receive any steroids (Cohort 1) were born at a later gestational age and had a higher birth weight. This group also had a statistically lower chorioamnionitis incidence than Cohorts 2 and 3. Some studies have associated prenatal inflammation secondary to chorioamnionitis exposure with an increased risk of BPD in preterm infants. (23, 24) This may have been another factor contributing to the decreased steroid requirements and BPD seen in Cohort 1. The other significant findings in areas of medication administration, comorbidities, and outcomes at discharge may be attributed to the intrinsic advantages of this older and larger group. Interestingly, 24 infants from Cohort 1 were diagnosed with BPD at 36 weeks PMA, 7 of which required oxygen at discharge. These findings may represent infants who may have benefitted from postnatal corticosteroids but did not receive them.

4.4. Comparison of Steroid Cohorts (2 & 3):

Statistical differences were not found in comorbidities or outcomes at discharge between the two cohorts who received steroid treatment. However, it is believed that steroids may be the most beneficial during the earlier stages of pulmonary disease within the first few weeks of life before chronic inflammation and scar tissue develop. (25) A study with a similar methodology by Harmon et al. (26) found nonsignificant results when comparing comorbidities between early (≤28 days) and late (>28 days) administration of postnatal steroids. However, when they evaluated the timing of exposure at different intervals (2–7 weeks vs >8 weeks of life), the odds of severe BPD increased when steroids were initiated beyond eight weeks of life. These results support the growing concern of decreased efficacy with delayed steroid administration. (26, 27)

"Infants in our early steroid cohort may have had a higher acuity at birth as compared to the later cohort, which could have influenced the decision to begin steroid treatment sooner. There was also a trend of more comorbidities in Cohort 2, possibly increasing the risk of poor outcomes."

Infants in our early steroid cohort may have had a higher acuity at birth as compared to the later cohort, which could have influenced the decision to begin steroid treatment sooner. There was also a trend of more comorbidities in Cohort 2, possibly increasing the risk of poor outcomes. In our study, infants may have experienced a protective effect from the early steroid exposure as outcomes between both steroid cohorts were comparable. Additionally, infants who received steroids earlier had decreased support required upon discharge home. More infants from Cohort 2 were transferred to an outside facility for management of their severe BPD than from Cohort 3, which further supports the inferred severity of the illness.

"In our study subjects, the total number of steroid doses did not impact the occurrence or severity of BPD among the early vs. late steroid administration groups. Although our research was not designed to allow a total dose exposure analysis, both steroid cohorts received a median of 20 doses, similar to Doyle's low-dose dexamethasone trial. A literature review suggests that cumulative dosing impacts outcomes when comparing low and high dexamethasone exposure."

4.5. Dexamethasone Dosing:

In our study subjects, the total number of steroid doses did not impact the occurrence or severity of BPD among the early vs. late steroid administration groups. Although our research was not designed to allow a total dose exposure analysis, both steroid cohorts received a median of 20 doses, similar to Doyle's (13)

low-dose dexamethasone trial. A literature review suggests that cumulative dosing impacts outcomes when comparing low and high dexamethasone exposure. (28)

In 2009, Onland et al. (28) reviewed 16 trials, and their findings supported a higher cumulative dose (>4 mg/kg) of dexamethasone to reduce BPD without increasing the risk for poor neurodevelopmental outcomes when given moderately early (between 7 and 14 days). This systematic review raised concerns about an increased risk of neurodevelopmental outcomes with delayed initiation and lower cumulative dosing. More recently, in 2021, another meta-analysis concluded, with a low quality of evidence, that the most appropriate regimen to prevent BPD is moderately early (8–14 days) administration of dexamethasone with a medium cumulative dose of 2–4 mg/kg. (9) With increasing age, inflammation sustained from continued ventilation measures may promote the severity of BPD, necessitating higher steroid doses than if treatment had begun earlier. (9, 29)

"There is emerging evidence for the use of hydrocortisone in infants at risk for BPD with various indications, including early physiologic replacement of cortisol, hemodynamic support, and prophylactic treatment of BPD in the setting of chorioamnionitis (PREMILOC). We use hydrocortisone similarly in our population of extremely premature infants. Due to limitations on its effectiveness and possible adverse outcomes, including gastrointestinal perforation, dosing regimens have not been established or studied rigorously."

4.6. Hydrocortisone Dosing:

There is emerging evidence for the use of hydrocortisone in infants at risk for BPD with various indications, including early physiologic replacement of cortisol, hemodynamic support, and prophylactic treatment of BPD in the setting of chorioamnionitis (PREMILOC). (14, 30) We use hydrocortisone similarly in our population of extremely premature infants. Due to limitations on its effectiveness and possible adverse outcomes, including gastrointestinal perforation, dosing regimens have not been established or studied rigorously. (31) Cumulative dosing from 8.5 to 13.5 mg/kg have been investigated. (14, 31–33) Further research is needed to determine the role of hydrocortisone in BPD outcomes, but the PREMILOC trial showed a reduced rate of BPD or mortality at 36 weeks of PMA without an increase in cerebral palsy. (14)

4.7. Steroids and Growth:

Postnatal corticosteroids may inhibit weight gain or cause weight loss in premature infants. Aside from steroid exposure, the severity of BPD itself is a known factor in determining growth. (34) There are specific concerns regarding delayed growth during active steroid treatment. (13, 35, 36) When given early, dexamethasone and hydrocortisone use have been shown to decrease growth velocity. (37, 38) Doyle et al. (13) found decreased weight gain during their study of a 10-day course of low-dose dexamethasone, but the same infants nearly caught up to the placebo group by the time of discharge. However, our study did not find any statistically significant differences in growth velocity (as converted to standardized Z-scores) between steroid-exposed and non-exposed infants in conjunction with varying time points throughout their hospitalizations. Similarly, findings by Zozaya et al. (38) did not find a substantial difference in growth when comparing over 15,000 preterm infants <32 weeks who received steroids for BPD before or after DOL 28. Both Baud et al. (14) and Wattenberg et al. (39) found no substantial differences in Z-scores at 36 weeks PMA with the use of hydrocortisone vs. a placebo.

"...our study did not find any statistically significant differences in growth velocity (as converted to standardized Z-scores) between steroid-exposed and non-exposed infants in conjunction with varying time points throughout their hospitalizations."

4.8. Advantages and Limitations:

A strength of our study is that by not combining the outcomes of BPD and death, we were able to review the effect of steroids directly without mortality confounding the results. Another advantage of our study design is the usage of Jensen's (12) recently published criteria for determining the stage of BPD. Yet, these factors created a limitation as we were unable to directly compare our results to other studies diagnosing BPD based on oxygen usage or those including mortality. As there were not many infants that received an initial dose of steroids prior to DOL 7, we defined early steroid exposure as ≤ DOL 21 to support the standard practice in our unit adequately. This limited us from directly comparing the widely used early vs late stratifications present in the literature. In this study, we included any exposure to steroids and recognized that the small size of the cohorts rendered us unable to further delineate findings by the individual type of steroid or its intended use, i.e., early hydrocortisone for hypotension vs BPD prophylaxis.

"In this study, we included any exposure to steroids and recognized that the small size of the cohorts rendered us unable to further delineate findings by the individual type of steroid or its intended use, i.e., early hydrocortisone for hypotension vs BPD prophylaxis."

Another barrier was the inability to gather the final discharge information on infants transferred to an outside hospital, which may have influenced our results. Lastly, this study could not fully assess long-term outcomes as less than half (41%) of the infants followed up in our developmental practice. Many encounters completed were via telehealth due to the Coronavirus Disease 2019 pandemic. This limited the ability to perform standard developmental testing and draw meaningful conclusions.

"In our study, there was not an observed statistical difference in the diagnosis of BPD among infants who began steroids before or after DOL 21. Reassuringly, growth velocity was not altered with the use of postnatal steroids in our population. The neonatal community continues to search for an understanding of the benefits and risks of using postnatal corticosteroids. It has yet to be firmly established the best criteria in determining those eligible for steroid therapy and the most efficacious dosing regimens. Further studies are thus warranted."

4.9. Conclusions:

Steroids have been used frequently in the NICU over the past two decades in the treatment and prevention of BPD in the extremely premature infant population, but their use is not without inherent risk. Based on current literature, caution is used when making decisions regarding postnatal steroid use due to the potential for detrimental effects on growth, the cardiovascular and gastrointestinal systems, glucose regulation, and neurodevelopmental outcomes. Nevertheless, the restriction of early steroid administration and the limitation of doses might impact neonatal outcomes negatively. In our study, there was not an observed statistical difference in the diagnosis of BPD among infants who began steroids before or after DOL 21. Reassuringly, growth velocity was not altered with the use of postnatal steroids in our population. The neonatal community continues to search for an understanding of the benefits and risks of using postnatal corticosteroids. It has yet to be firmly established the best criteria in determining those eligible for steroid therapy and the most efficacious dosing regimens. Further studies are thus warranted.

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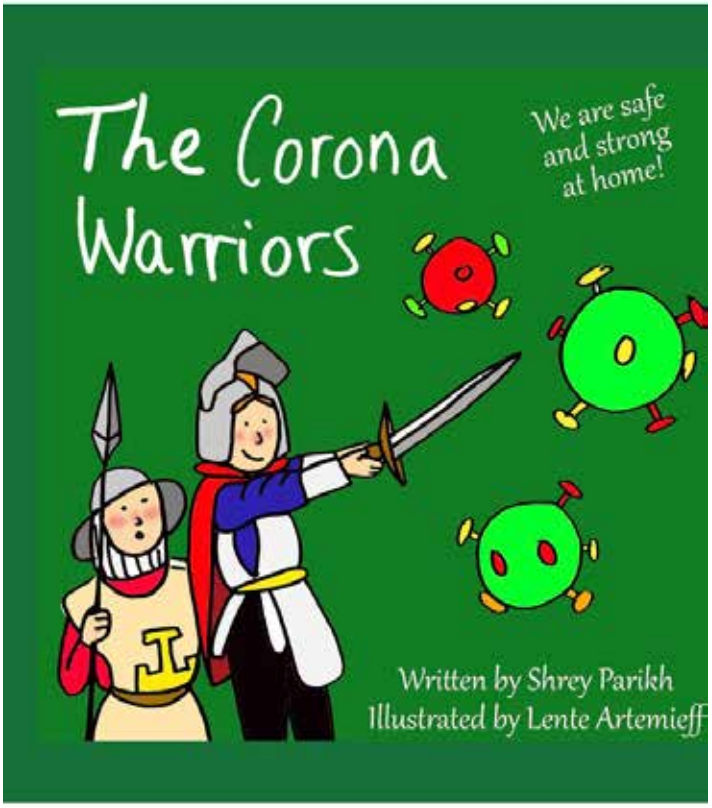
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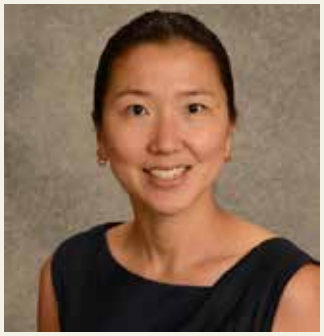
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Information Overload

Minesh Khashu, MD

"I am going to speak about the fastest-growing problem in this world. You don't think you know what it is? I'm sure you do because it's an all-pervading problem that affects us at the individual, organizational, societal, national, and global levels."

I am going to speak about the fastest-growing problem in this world. You don't think you know what it is? I'm sure you do because it's an all-pervading problem that affects us at the individual, organizational, societal, national, and global levels. This problem permeates everyone, yet we don't seem to be thinking much about it. Interestingly, it's a relatively new problem, but it doubles daily. Did you get it? It is the problem of information overload.

In the world we live in today, information is doubling daily, and commensurate with that rate of increase is a substantial negative impact on our decision-making capacity and many other aspects of our daily lives. Think about it, and later this week, I will talk about some specific elements of this problem that impact us deeply.

Till then. Thank you.

Last week, I discussed information overload. I mentioned mind-boggling numbers, such as the fact that the amount of data and information in this world is doubling daily. Let's hear that again: that data and information are doubling daily. I talked briefly about what this information overload does to us. It has a significant impact on how we lead our lives. It has a big impact on our decision-making, and sometimes, it generates decision paralysis because there is too much data that our minds still need to learn to manage.

Today, I will talk about a particular aspect of this problem and coin a term that has not been used before: "comparison overload." In human civilization, before, say, the advent of the radio or TV, each one of us knew a handful of people in our neighborhood. Since mobility improved through motor vehicles, we perhaps moved around a bit more, but still, there was a limited number of people we knew we could compare our lives with. Then, with radio and TV, that increased to some extent. However, now, with the social media explosion, what has happened is we now come across thousands of other people whose lives we see in some shape or form and whose lives, primarily social media lives, may not be their real lives. Still, these social media live as snapshots we use consciously or subconsciously to compare ourselves with.

"This comparison overload is having a very negative effect on our lives, on our peace of mind, and on our mental well-being, and it is something that we all need to think about."

This comparison overload is having a very negative effect on our lives, on our peace of mind, and on our mental well-being, and it is something that we all need to think about. We are, either consciously or subconsciously, comparing ourselves with many people on a daily basis, which we were not even 100 years ago. This has an impact on our social fabric. It impacts us as individuals and may need more attention than has been given. So again, a newly coined term is comparison overload. Think about it and share your thoughts.

Thank you.

Video Day 1

Video Day 2

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Pediatric Virtual Care Platform Boosts Pediatric Engagement and Elevates Clinical Outcomes

Cierra Gromoff, MD, Christie Sander

Kismet Health, a HIPPA-compliant pediatric collaborative care platform, was created to enable families everywhere to have access to quality care by building the pediatric telehealth solution of the future.

According to the American Academy of Pediatrics (1), 17+ million children live more than a 1-hour drive from a regional children's hospital. Kismet Health is redefining what access looks like for future generations by offering a video technology solution created for providers by providers, specifically with the unique needs of families and children in mind. This paper will further highlight the challenges in the fields of pediatrics and telehealth, the early successes of the platform, and the future of pediatric healthcare.

"According to the American Academy of Pediatrics, 17+ million children live more than a 1-hour drive from a regional children's hospital."

The Digital Landscape:

The digital healthcare landscape has evolved significantly due to the global COVID-19 pandemic. As a society, we were catapulted into the virtual world when everything was shut down in 2020. Suddenly, classrooms, boardroom meetings, doctor appointments, piano lessons, and family visits were moved online. While telehealth existed before the pandemic, there was a rapid shift as it became the primary option for receiving care.

The Challenge:

Telehealth has remained a standard part of hybrid care post-pandemic. However, the problem of lack of access and engagement in the pediatric population is still an issue, particularly in rural and underserved communities.

Current video communication platforms, like Skype, FaceTime, and Zoom, were built for adults. No one could have predicted that there would be an immediate need for a telecommunications solution for pediatrics. Providers faced the challenge of rapid adjustment without access to optimal technology solutions. Unfortunately, even after a few years, there remains a gap in technology tailored to the unique needs of children. While telehealth continues to gain recognition for enhancing healthcare accessibility and breaking down physical barriers, pediatric telehealth platforms lag behind their adult counterparts in evolution. This discrepancy forces many providers to rely on adult-centric solutions for pediatric patients.

Traditionally, telehealth has predominantly targeted adults and workplaces. However, we must acknowledge that children are not simply miniature adults; they have dedicated hospitals, specialized providers, and medical instruments. This prompts the question: Should technology for children not be purpose-built for their unique requirements?

Researchers at Nationwide Children's Hospital have shown that one of the top reasons for cancellations and rescheduling of telehealth appointments is the lack of engagement in the health field. Specifically, engagement constituted 25% of cancellations and rescheduling due to the inability to engage a child to complete the telehealth session (2). Given that the average cost of a pediatric visit is $169 (3) over the past year, and 12.6M children aged 0–17 used telehealth over the past year (4) with an average of two visits per year, this results in an estimated $630M lost annually due to cancellations or rescheduling from poor engagement, not to mention poorer outcomes.

"Researchers at Nationwide Children's Hospital have shown that one of the top reasons for cancellations and rescheduling of telehealth appointments is the lack of engagement in the health field. Specifically, engagement constituted 25% of cancellations and rescheduling due to the inability to engage a child to complete the telehealth session."

In response to this challenge, Kismet Health has recognized the urgent need for innovative solutions to enhance pediatric telehealth engagement. After surveying 200+ providers, the Kismet Health team found that most providers were also experiencing the same pain points in their practice. These providers reported needing a solution that boosts patient engagement, streamlines their workflows, and improves clinical outcomes while also being HIPAA-compliant, easy to use, and cost-effective.

The Solution:

Kismet Health aims to bridge this gap by offering a specialized purpose-built telehealth platform focusing on children aged

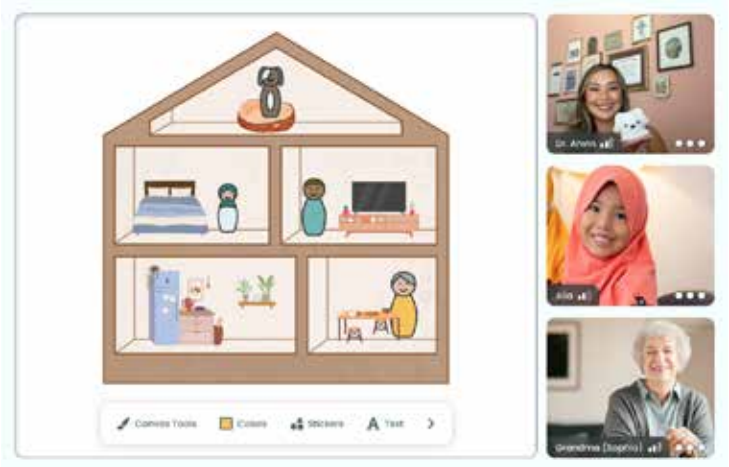
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0–18 and addressing providers' needs. The platform is uniquely designed by providers for providers, understanding the nuanced needs of pediatric patients and the professionals who care for them. This platform goes beyond basic video conferencing by integrating features like a built-in canvas and clinician-controlled focus tools, crucial for maintaining children's engagement during sessions. By addressing the unique needs of children during telehealth sessions, Kismet Health aims to significantly reduce the 25% engagement-related cancellations and rescheduling reported earlier by researchers at Nationwide Children's Hospital while driving improved outcomes.

"After surveying 200+ providers, the Kismet Health team found that most providers were also experiencing the same pain points in their practice. These providers reported needing a solution that boosts patient engagement, streamlines their workflows, and improves clinical outcomes while also being HIPAA-compliant, easy to use, and cost-effective."

Figure 1. Example of Kismet Health Platform



"We know children are not tiny adults. They have their own hospitals, specialty providers, and medical instruments. They also need their own technology. I realized that the only option was to create a telehealth platform built for children with all the providers' needs in mind to help bridge this gap. Telehealth can be effective for children, but only with the right tools in hand."

- Dr. Cierra Gromoff, CEO/Co-Founder Kismet Health

Built by Providers for Providers

In 2022, Dr. Gromoff connected with Christie Sander, a seasoned Silicon Valley leader, and brought this idea to life. In collaboration with leading pediatricians from top children's hospitals, Kismet Health combined clinical expertise with cutting-edge technology to launch the company's initial product in the fall of 2023. The innovative product marks a significant leap forward in pediatric healthcare by providing accessible and high-quality care specifically designed for children and their families while simultaneously supporting the clinical needs of providers.

With its proprietary technology and engaging digital playroom, Kismet provides a cost-efficient and accessible solution while enhancing the standard of care. Kismet is easy to use; with a few clicks, one can access this HIPAA-compliant, browser-based platform from anywhere.

Enhanced Patient Engagement with Kismet

Figure 2. Example of Kismet Health Platform



One of the primary objectives of Kismet Health is to boost patient engagement, a critical factor in delivering effective healthcare. Increased engagement through play leads to better clinical outcomes.

"At Kismet, we know that children don't yet have the language to express themselves and often act out their thoughts metaphorically through play, which is why Kismet is the first platform that meets children where they are. Play is our children's natural language that they use to explore, express, and experience our world."

- Kismet Health Co-Founders.

As noted in the pilot study data below, children demonstrated remarkable levels of engagement when using Kismet compared to other platforms.

Streamlined Workflows and Improved Clinical Outcomes with Kismet:

The ultimate goal of Kismet Health is to drive equitable health outcomes across families everywhere, starting with access and engagement. During Kismet's 2023 pilot study, children exceeded their expected participation time, indicating that children are engaged and responsive to the treatment provided via Kismet.

In addition, Kismet's efficiency and ease of use are vital for healthcare providers. They streamline workflows by offering user-friendly interfaces to provide secure communication tools. These elements significantly contribute to providers' productivity and enhance the overall quality of care. As a platform built by providers, Kismet went out of its way to ensure the platform was easy to use and access and that providers could focus their time on the patient.

Improved Parental Attitudes with Kismet:

Providers were not the only group the Kismet team had in mind when creating the platform, and Kismet Health recognized the importance of involving parents in pediatric care. The platform allows parents to participate in sessions and offers valuable resources and information to empower them to help support their children. The 2023 pilot study noted below showed a significant shift in parental attitudes. Negative attitudes decreased, while positive attitudes increased in this user group.

Access with Kismet:

Access with Kismet Health extends beyond convenience; it addresses a critical disparity in healthcare access for children in rural and underserved communities—especially for the over 17 million children who reside more than an hour away from a regional children's hospital, significantly limiting their access to specialized pediatric care. Traveling long distances for routine check-ups or consultations can be burdensome and financially prohibitive for these families. Kismet Health's HIPAA-compliant telehealth platform is specifically engineered to bridge this gap. By offering a browser-based solution accessible from any device with internet connectivity, Kismet Health ensures that geographical barriers do not hinder a child's ability to receive timely and high-quality healthcare services. This accessibility empowers families to schedule appointments without the logistical challenges of travel, thereby reducing missed appointments and improving overall health outcomes.

Moreover, Kismet Health's commitment to accessibility extends to its user-friendly interface, which requires minimal technical expertise to navigate. This simplicity enhances usability for providers and families, allowing them to focus on the healthcare experience rather than dealing with complex technology. By democratizing access to pediatric healthcare, Kismet Health enhances convenience and promotes equity in healthcare delivery. Families in remote or underserved areas can now access specialized care that matches the quality available in metropolitan areas, thereby narrowing the healthcare divide and fostering healthier communities nationwide.

"...it addresses a critical disparity in healthcare access for children in rural and underserved communities—especially for the over 17 million children who reside more than an hour away from a regional children's hospital, significantly limiting their access to specialized pediatric care. Traveling long distances for routine check-ups or consultations can be burdensome and financially prohibitive for these families."

Enhanced Mental Health with Kismet:

Lastly, it was crucial for the Founders of Kismet to consider the whole person. The impact of pediatric healthcare extends beyond physical health. Dr. Cierra Gromoff is a Clinical Child Psychologist, who dedicated her career to building high-quality telehealth programs long before the pandemic, specializing in early childhood mental health. The emotional well-being of Kismet's users was a top priority for the team. Mental health can be a primary or underlying factor and contribute significantly to the success of patient outcomes. In the 2023 Kismet pilot study, all parents either maintained their own anxiety and depression symptoms or showed significant reductions in these symptoms.

"We believe fostering a positive and engaging healthcare experience for children is integral to achieving optimal clinical outcomes. Kismet is not only bridging a technological gap but actively contributing to whole-child wellness for the next generation by providing quality access through our seamless collaborative care technology."

- Christie Sander, COO/ Co-Founder of Kismet Health.

Kismet Health Pilot Study:

Background and Objective:

Kismet launched a pilot program in June 2023 before launching it to the general public. This included tracking the results of multiple families using the platform in their telehealth appointments, explicitly focusing on the clinician-controlled focus controls and a built-in canvas. The Kismet team hypothesized that children could engage for more extended periods than expected for their developmental age due to these features.

Methods:

Seven families were tracked for 12 weeks, and in-session comments and post-user feedback were documented in real-time for 53 sessions.

"Moreover, Kismet Health's commitment to accessibility extends to its user-friendly interface, which requires minimal technical expertise to navigate. This simplicity enhances usability for providers and families, allowing them to focus on the healthcare experience rather than dealing with complex technology."

The Results:

While most child pediatric symptoms remained the same after 12 sessions, there have been significant changes in parental attitudes toward their children. Across all parents, negative attitudes have decreased, and positive attitudes have increased. 83% of parents have reported a reduction in their levels of caregiver strain, and the remaining parents reported no change (Figure 3). All parents have either maintained their own anxiety and depression symptoms or have shown significant reductions in these symptoms.

The cancellations and reschedules for Kismet sessions were primarily due to vacation and school schedule conflicts. No families have canceled sessions due to a lack of child engagement, compared to the 25% industry standard of cancellations and rescheduling due to engagement or inability to complete a

session. When asked, 83% of families would recommend Kismet to a friend.

The pilot's results also show that children have been able to stay in session for their expected amount of time per age group for 98% of total sessions (Figure 4), almost three times the industry baseline, according to large payers.

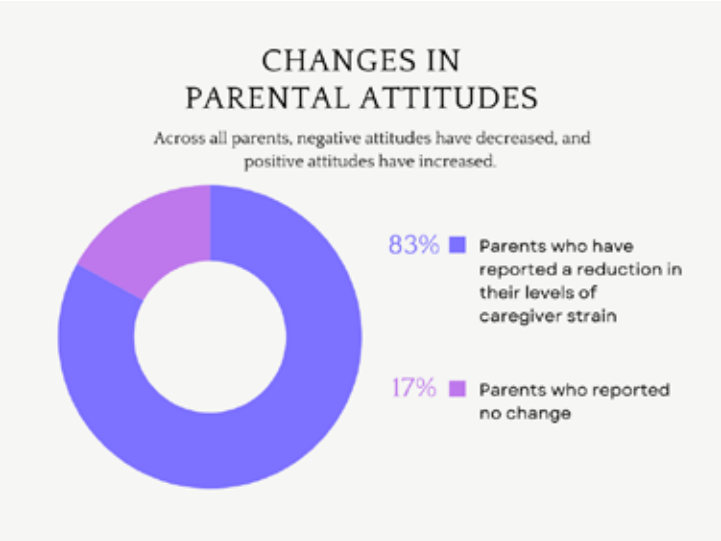
Notably, children have exceeded their expected participation time in sessions (20–30 minutes) at 70% of all sessions by as much as 2.5 times. 86% of children surveyed also reported a smiley face for their experience with Kismet.

"It was truly an exciting experience to witness our hypothesis come to life. I was amazed to see children as young as five staying in sessions for 45 minutes or more! It's a true testament to how having technology built specifically for children can make sessions more productive, fun, and engaging. It was heartwarming to hear parents say that children were looking forward to their sessions and to hear the children asking to draw on our canvas."

- Dr. Arwin Cotas-Girard, Head of Clinical at Kismet Health and Pilot Study Lead.

Preliminary results indicate promising outcomes for telehealth platforms explicitly designed for children. Children can engage better and enjoy technology that is built for them. In return, parents are experiencing less stress and more joy in their relationships with their children. As we know, parental stress significantly impacts their children's mental health, and reducing caregiver strain and symptoms will have a positive impact on the whole family. Of the 53 sessions held during the pilot with children present, only once could a child not complete a session. Children stayed in sessions longer than developmentally expected.

Figure 3. Changes in Parental Attitudes

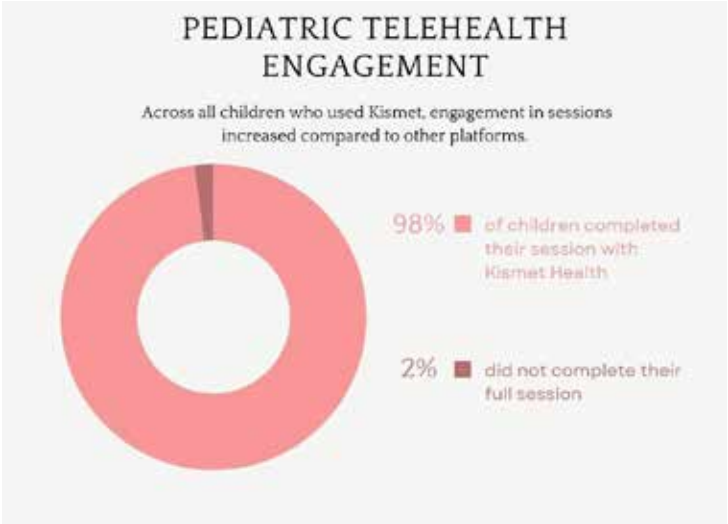


Clinical Provider Survey:

Background and Objective: In 2023, Kismet Health conducted a virtual survey to discover how providers use telehealth and the challenges they face with their current platforms.

Method: A survey was disseminated to therapy provider networks across the United States through various channels, including university listservs, social media posts, word-of-mouth, and professional associations. The target population for the survey included master's and doctoral-level therapists and therapy students. The survey was conducted via SurveyMonkey over one month in March 2023. A total of 215 responses were received. 30% of providers see telehealth patients that are pediatrics only, 20% of providers see telehealth patients that are adults only, and 46% of providers see patients of all ages.

Figure 4. Pediatric Telehealth Engagement



Results:

The Kismet Health team found that most providers were experiencing the same pain points in their practice. These providers reported needing a solution that boosts patient engagement, streamlines their workflows, improves clinical outcomes, and is HIPAA-compliant, easy to use, and cost-effective.

46% of providers used Zoom as their primary telehealth platform, a virtual meeting room platform created for the adult community (Figure 5).

When asked what the most important telehealth feature they would like to see, most providers said they wanted embedded games and interactive whiteboard capabilities, key features of Kismet Health's platform (Figure 6).

When looking at pain points, the engagement of patients is a top pain point within the provider population (Figure 7).

INTERNATIONAL CHILDREN'S ADVISORY NETWORK (ICAN) FOCUS:

Group Study with Kismet Health:

Background and Objective:

Kismet Health partnered with the International Children's Advisory Network (iCAN) to conduct four focus groups on the effectiveness of the Kismet Health platform with the pediatric population. Three focus groups and one post-focus group survey were conducted.

Methods:

An initial survey was sent to the iCAN network to garner interest for the focus groups. This survey polled iCAN's chapters over a range of a month. The population asked to participate in the survey was the 8–10 age range and the 12– 18 age range. There were three focus groups conducted: Group One: 3 participants (12–18), Group Two: 3 participants (12–18), and Group Three: 17 participants (8–10). There was a focus on participant populations that were neurodiverse and/or had physical, speech, and/or learning disabilities. However, the focus group and survey were open to all participants that fit the age range—30% of participants identified as Neurodiverse, and 63% identified as having no

Figure 5. Other Telehealth Platforms



disabilities. The purpose of the focus group and post-focus group survey was to evaluate aspects of the Kismet telehealth platform. For the post-focus group survey, respondents were asked to give their input on Kismet's platform mechanics, ease of use, and interactive features.

The Results:

Most participants either agreed or somewhat agreed that Kismet was better than other platforms they had used. Most participants also found the platform easy to use and enjoyed using it. 49% of participants indicated that they would "rather use Kismet than meet in person" when asked how they would feel if their doctor, nurse, or therapist used Kismet. The most mentioned feature that participants did not like was the locking feature; they felt it was constricting and did not like that they were not in control. Following the locking feature was the blur feature. Multiple participants in the 8–10 age range found the blur distracting or wished they could turn it off. Kismet has already been continuously taking strides to improve the product and experience based on the iCAN study results.

For notable results, 87% of the post-focus group survey participants agreed that Kismet is better than other platforms they have used for telehealth appointments (Figure 8).

In addition, 83% of participants found Kismet neutral to extremely easy to use, as seen in (Figure 9*)*:

78% of participants said they preferred using Kismet over in-person meetings or felt neutral about the preference (Figure 10).

The Future of Pediatric Telehealth:

ˆ**Figure 6.** Most important telehealth feature providers would like

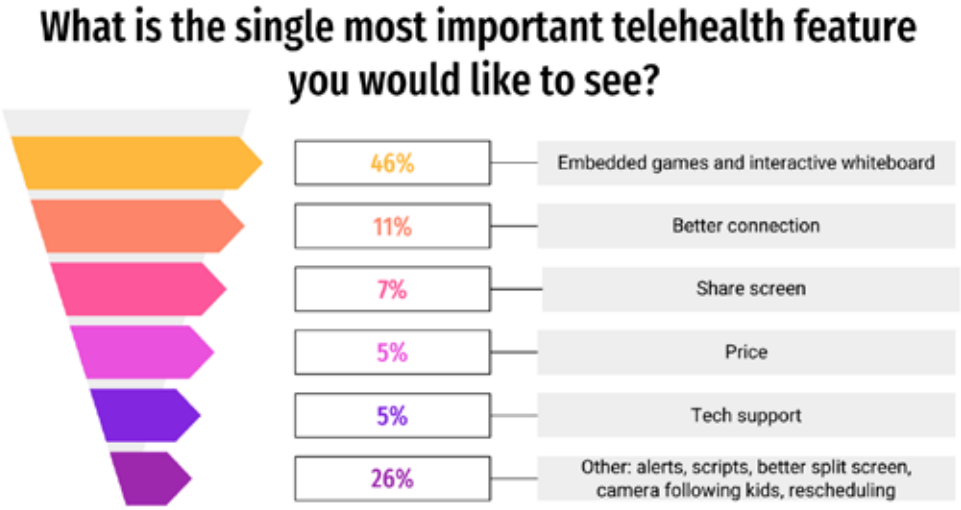


Figure 7. Top pain points when administering telehealth

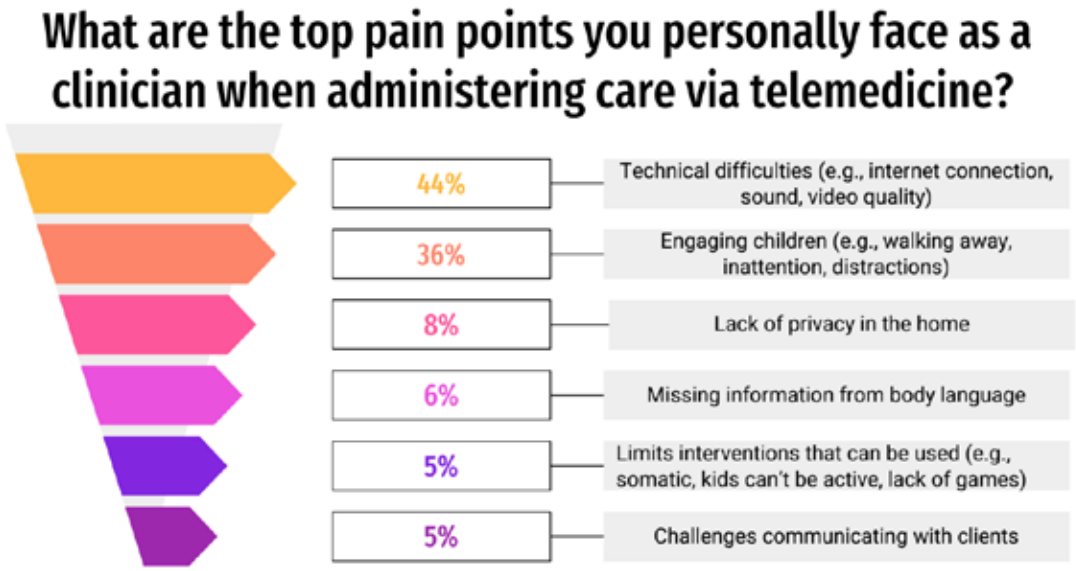


Figure 8. Kismet platform comparison

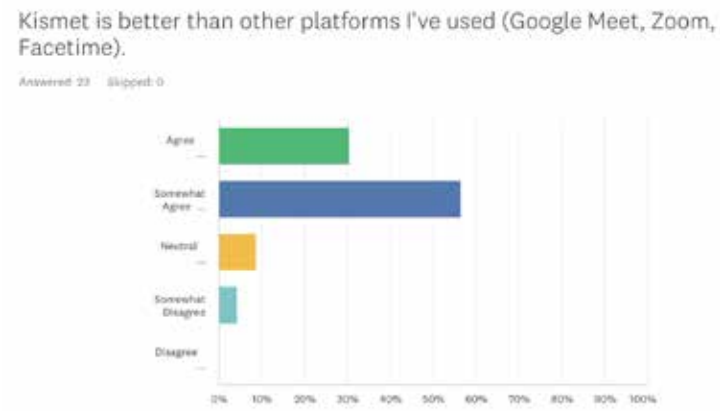


Figure 9. Ease of use of Kismet

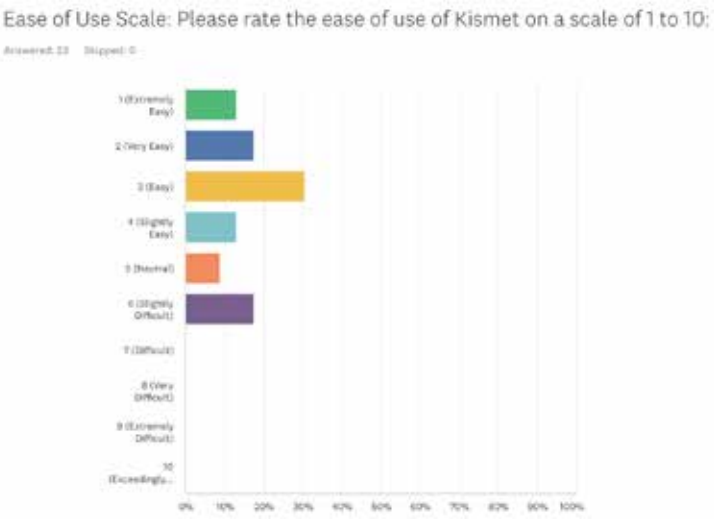
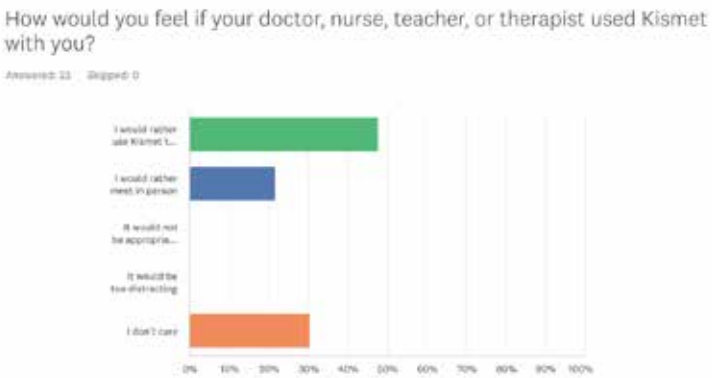


Figure 10. Using Kismet preference



The future of pediatric telehealth holds tremendous promise, propelled by innovative platforms like Kismet Health. Historically, pediatric telehealth has lagged behind adult-focused counterparts, primarily due to the unique needs of children and adolescents that are often not adequately addressed by existing telecommunication tools designed for adults. The COVID-19 pandemic accelerated the adoption of telehealth across all demographics, exposing gaps in pediatric care delivery and underscoring the need for tailored solutions. By meeting children at their developmental level, tailored telehealth solutions like Kismet Health improve session outcomes and address broader systemic issues by increasing accessibility to quality pediatric care, particularly for families in rural or underserved communities. Kismet Health ensures that geographical distance does not hinder access to specialized pediatric care, thus leveling the healthcare playing field for all children.

Looking forward, Kismet is integrating advanced technologies with input from its advisory board (including renowned pediatricians and healthcare informaticists), ensuring the platform meets the highest standards of care and usability. As telehealth evolves, Kismet Health remains committed to refining its platform to meet the evolving needs of providers, parents, and, most importantly, the children they serve.

Kismet Health exemplifies the transformative potential of pediatric telehealth, setting a new standard for collaborative care technology that prioritizes accessibility, engagement, and clinical outcomes.

"By meeting children at their developmental level, tailored telehealth solutions like Kismet Health improve session outcomes and address broader systemic issues by increasing accessibility to quality pediatric care, particularly for families in rural or underserved communities. Kismet Health ensures that geographical distance does not hinder access to specialized pediatric care, thus leveling the healthcare playing field for all children."

Conclusion:

Kismet Health is poised to redefine pediatric healthcare delivery with its innovative platform, driven by real-time feedback from users and providers who understand the specific needs of pediatric patients. With an average NPS score of 8.5 and strong responses from pilot studies, provider surveys, and joint iCAN studies, Kismet Health is confident in the future of pediatric telehealth. By addressing critical accessibility issues, Kismet Health ensures that families in rural and underserved areas can access quality care through its HIPAA-compliant telehealth solution designed for children. Kismet Health reduces appointment cancellations and enhances engagement, a challenge often seen with adult-centric platforms.

Furthermore, Kismet Health streamlines provider workflows with its intuitive interface and secure communication tools, improving efficiency and care quality. Kismet Health enhances treatment effectiveness by keeping children engaged for longer during sessions, contributing to positive patient and parental experiences. These outcomes underscore their commitment to supporting physical and emotional well-being, positioning it as a transformative leader in pediatric telehealth.

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Disclosure: Kismet Health (www.kismethealth.com) is a pediatric technology company with a vested interest in improving quality healthcare access and care for all families. This whitepaper discusses the shifts in pediatric healthcare delivery following the COVID-19 pandemic, and how tailored solutions such as Kismet improve pediatric engagement and clinical outcomes for the entire family.

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Kismet Health also partnered with the International Children's Advisory Network (iCAN) through a paid and collaborative user research study. This partnership ensures the platform's development aligns with the specific needs and perspectives of children, fostering an objective and user-centric approach.

Despite the above disclosures, the authors have strived to present an objective and evidence-based discussion of the topic. For further information or to learn more about Kismet Health, please visit our website at www.kismethealth.com.

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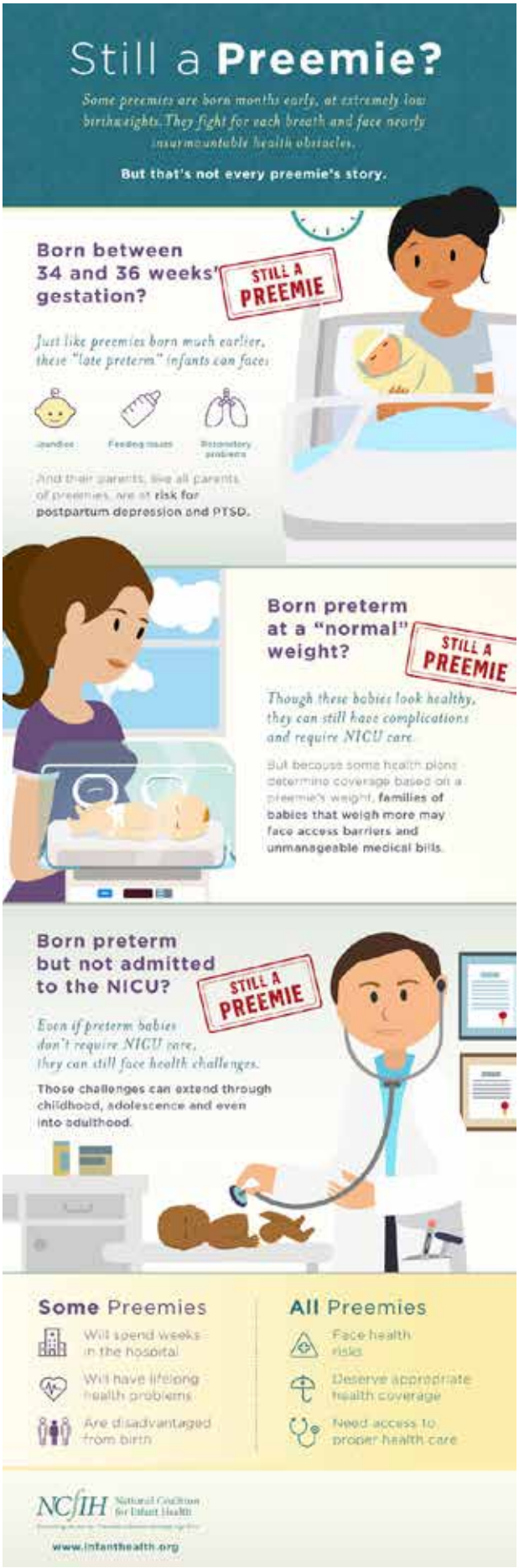
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4. Identify families' needs and apply strategies to successfully achieve support when they have a newborn with a life-limiting condition.

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Airway Pressure Release Ventilation (APRV) in the Management of Respiratory Distress Syndrome (RDS): A Protocol and Call for Further Research

Noel Tan, MD

Abstract

Respiratory Distress Syndrome (RDS) remains a significant challenge in neonatal intensive care, particularly in preterm infants who suffer from surfactant deficiency, leading to alveolar collapse, decreased lung compliance, and impaired gas exchange. While conventional mechanical ventilation (CMV) is the current standard of care, it often involves cyclic alveolar recruitment and derecruitment, which can contribute to ventilator-induced lung injury (VILI). Airway Pressure Release Ventilation (APRV) is a mode of ventilation that maintains continuous alveolar recruitment through prolonged high-pressure phases while allowing spontaneous breathing, potentially reducing VILI. This protocol outlines the rationale, initial settings, adjustments, monitoring, and weaning strategies for using APRV to manage RDS in preterm infants. The paper also emphasizes the importance of adjusting T_{low} (time at low pressure) to maintain the T-PEFR (peak expiratory flow rate termination point) at 75% with changes in lung compliance to prevent overinflation and underinflation, highlighting the need for further studies to validate APRV's safety, efficacy, and optimal use in this population.

Introduction:

Respiratory Distress Syndrome (RDS) is a leading cause of morbidity and mortality in preterm infants, particularly those born before 28 weeks of gestation. The condition arises primarily due to a deficiency in surfactant production, which is crucial for reducing surface tension in the alveoli and preventing their collapse. The resulting atelectasis leads to impaired gas exchange, hypoxemia, and increased work of breathing.

Conventional mechanical ventilation (CMV) has been the cornerstone of RDS management, often coupled with exogenous surfactant administration. However, CMV involves repeated cycles of alveolar collapse and reopening, contributing to ventilator-induced lung injury (VILI), a significant concern in the fragile lungs of preterm infants. This has prompted exploring alternative ventilation strategies that may offer better lung protection.

"Conventional mechanical ventilation (CMV) has been the cornerstone of RDS management, often coupled with exogenous surfactant administration. However, CMV involves repeated cycles of alveolar collapse and reopening, contributing to ventilator-induced lung injury (VILI), a significant concern in the fragile lungs of preterm infants."

Airway Pressure Release Ventilation (APRV) is one such strategy. APRV maintains prolonged periods of high airway pressure (P_{high}) to recruit and stabilize alveoli, with intermittent brief releases to lower pressure (P_{low}) to facilitate exhalation. This approach can minimize alveolar collapse and promote continuous gas exchange. Additionally, APRV allows for spontaneous breathing throughout the respiratory cycle, which may reduce the need for sedation, support better diaphragmatic function, and improve ventilation-perfusion matching.

"APRV maintains prolonged periods of high airway pressure (P_{high}) to recruit and stabilize alveoli, with intermittent brief releases to lower pressure (P_{low}) to facilitate exhalation. This approach can minimize alveolar collapse and promote continuous gas exchange. Additionally, APRV allows for spontaneous breathing throughout the respiratory cycle, which may reduce the need for sedation, support better diaphragmatic function, and improve ventilation-perfusion matching."

Despite these theoretical benefits, the use of APRV in the neonatal population, particularly in preterm infants with RDS, remains underexplored. Most of the current evidence and clinical experience with APRV is derived from adult and pediatric populations, where the underlying lung pathophysiology differs significantly from that of preterm infants. As such, there is a critical need for well-designed clinical studies to evaluate the safety, efficacy, and optimal application of APRV in this unique and vulnerable population.

"This paper presents a protocol for using APRV in preterm infants with RDS, including initial settings, adjustments, monitoring, and weaning strategies."

This paper presents a protocol for using APRV in preterm infants with RDS, including initial settings, adjustments, monitoring, and weaning strategies. Additionally, it highlights the importance of adjusting T_{low} (time at low pressure) to maintain T-PEFR (peak expiratory flow rate termination point) at 75% with changes in lung compliance to prevent overinflation and underinflation. The

need for further research to establish standardized guidelines and investigate the potential role of APRV in improving outcomes for preterm infants with RDS is also discussed.

Protocol for Using APRV in RDS of Prematurity:

Objective: To provide a structured approach to using Airway Pressure Release Ventilation (APRV) in preterm infants with Respiratory Distress Syndrome (RDS), considering the specific pathophysiology of surfactant deficiency, alveolar collapse, and lung immaturity. This protocol also highlights the potential role of APRV in this population and the need for further research.

1. Background and Rationale for APRV in RDS of Prematurity.

Respiratory Distress Syndrome (RDS) in preterm infants is primarily due to surfactant deficiency, leading to alveolar collapse, decreased lung compliance, and impaired gas exchange. Conventional mechanical ventilation (CMV) strategies have been the mainstay of treatment; however, these strategies often involve cyclic opening and closing of alveoli, which can contribute to ventilator-induced lung injury (VILI).

Role of APRV:

- **Sustained Alveolar Recruitment:** APRV maintains prolonged periods of high airway pressure (P_{high}), which can help recruit and stabilize alveoli, reducing the risk of atelectasis and improving oxygenation. This is particularly important in RDS, where alveolar collapse is crucial.
- **Spontaneous Breathing:** APRV encourages spontaneous breathing throughout the respiratory cycle, potentially reducing the need for sedation, preserving diaphragmatic function, and improving ventilation-perfusion matching. Supporting spontaneous breathing can be crucial for preterm infants' overall respiratory development.
- **Lung Protective Strategy:** By minimizing the cyclic opening and closing of alveoli, APRV could reduce the incidence of VILI, a significant concern in the fragile lungs of preterm infants.

Need for Further Study:

- **Limited Evidence:** Despite the theoretical advantages of APRV in managing RDS of prematurity, there is limited evidence and research specifically focusing on its use in this population. Most existing studies and clinical experience with APRV are based on adult and pediatric populations, where the pathophysiology and lung mechanics differ significantly from those in preterm infants.
- **Potential Benefits vs. Risks:** The potential benefits of APRV in reducing VILI and improving outcomes in preterm infants with RDS need to be balanced against the risks, such as hyperinflation or inadequate CO_2 clearance. A well-designed clinical study could provide valuable insights into the safety, efficacy, and optimal settings of APRV in this vulnerable population.

2. Initial APRV Settings

***P_{high}* (High Pressure):**

- **Initial Setting:** Start with P_{high} at 20–25 cmH_2O, considering the delicate nature of preterm lungs. This pressure should be sufficient to recruit alveoli and keep them open.
- **Rationale:** A lower P_{high} is chosen to reduce the risk of barotrauma while still promoting alveolar recruitment.

***P_{low}* (Low Pressure):**

- **Initial Setting:** Set P_{low} at 0 cmH_2O.
- **Rationale:** This pressure allows for pressure release and exhalation without allowing alveolar collapse. Setting it at 0 cmH_2O ensures that End-Release Lung Volume (ERLV) is controlled solely by time. P_{low} should only be raised above 0 if there is a concern for hyperinflation due to expiratory flow limitation.

***T_{high}* (Time at High Pressure):**

- **Initial Setting:** Start with T_{high} at 1–3 seconds, depending on the desired respiratory rate.
- **Rationale:** A shorter T_{high} in the 1–3 seconds range, rather than the ones used in adults of 4–6 seconds, allows for a higher respiratory rate while maintaining adequate alveolar recruitment. This setting is more appropriate for preterm infants, whose smaller lung volumes and higher respiratory rates require careful balancing to optimize gas exchange and prevent overinflation.

***T_{low}* (Time at Low Pressure):**

- **Initial Setting:** Set T_{low} based on the infant's T-PEFR, typically at 75%, corresponding to 0.2 seconds for an initial time constant.
- **Rationale:** T_{low} should be adjusted dynamically to maintain the T-PEFR at 75%, ensuring optimal alveolar emptying while preventing overinflation or underinflation.

FiO_2 (Fraction of Inspired Oxygen):

- **Initial Setting:** Adjust FiO_2 to maintain target oxygen saturation (SpO_2) levels between 90-95%, typical for preterm infants.
- **Rationale:** Adequate oxygenation should be maintained while avoiding hyperoxia.

3. Adjustments

Oxygenation:

- **If PaO_2 is low:** Increase P_{high} in 1–2 cmH_2O increments or increase T_{high} by 0.5–1 second to enhance alveolar recruitment.
- **If PaO_2 is high:** Decrease FiO_2 first, then consider reducing P_{high} if oxygenation remains high.

Ventilation (CO_2 Clearance):

- **If $PaCO_2$ is high:** Shorten T_{high} in increments of 0.2 seconds to increase the frequency of pressure releases. This leads to more frequent breaths, thereby enhancing CO_2 clearance.
- **If $PaCO_2$ is low:** Lengthen T_{high} in increments of 0.2 seconds to reduce the frequency of pressure releases. This allows more time for alveolar gas exchange, reducing minute ventilation and potentially increasing $PaCO_2$.

Spontaneous Breathing:

- Monitor for spontaneous breathing during T_{high}. If spontaneous breathing is minimal, consider adjusting sedation levels or weaning P_{high} to encourage more spontaneous efforts.

Adjusting T_{low} to Maintain T-PEFR at 75%:

- **Increased Compliance (Longer Time Constant):**
  - **Adjustment Needed:** If lung compliance increases, leading to a longer time constant, T_{low} should be increased to maintain T-PEFR at 75%. This prevents overinflation by allowing more time for the lungs to empty adequately before the next inspiratory phase.
  - **Consequence of No Adjustment:** If T_{low} remains fixed at 0.2 seconds despite increased compliance, the expiratory flow will not decay sufficiently, leading to T-PEFR > 75%. This results in air trapping and progressive overinflation, increasing the risk of barotrauma.
- **Decreased Compliance (Shorter Time Constant):**
  - **Adjustment Needed:** If lung compliance decreases, leading to a shorter time constant, T_{low} should be decreased to maintain T-PEFR at 75%. This prevents underinflation by ensuring the lungs do not empty too quickly, preserving adequate lung volume for the next inspiratory phase.
  - **Consequence of No Adjustment:** If T_{low} remains fixed at 0.2 seconds despite decreased compliance, the expiratory flow will decay too much, leading to T-PEFR < 75%. This results in excessive lung emptying, potentially causing underinflation and atelectasis.

4. Clinical Monitoring for Underinflation and Overinflation

Work of Breathing:

- **Increased Work of Breathing:** Signs such as subcostal, intercostal, or suprasternal retractions, nasal flaring, and grunting may indicate underinflation as the infant struggles to maintain adequate lung volumes and oxygenation.
- **Paradoxical Breathing:** Overinflation may lead to paradoxical breathing, where the abdomen moves in the opposite direction of the chest during respiration, suggesting restricted diaphragm movement and poor lung compliance.

Tachypnea:

- **Respiratory Rate:** Tachypnea can be a sign of underinflation and overinflation. In underinflation, it reflects the infant's effort to increase ventilation. Overinflation may indicate air trapping and the infant's attempt to expel trapped air.

Prolonged Expiration:

- **Expiratory Phase:** A prolonged expiratory phase may suggest air trapping and overinflation, where the infant has difficulty fully exhaling.

Breath Sounds and Chest Assessment:

- **Decreased Breath Sounds:** In both underinflation and overinflation, breath sounds may be diminished. In underinflation, this is due to reduced lung volumes, whereas in overinflation, it may result from excessive lung expansion, limiting air movement.
- **Hyperresonance:** Percussion may reveal hyperresonance in cases of overinflation, indicating trapped air within the lungs.
- **Barrel Chest:** Overinflation can lead to an increased anteroposterior diameter of the chest, although this is more commonly seen in chronic cases.

Blood Gas Analysis:

- **Hypoxemia and Hypercapnia:** Blood gas analysis is critical for assessing respiratory function. Low PaO_2 may indicate underinflation and poor oxygenation, while elevated $PaCO_2$ may suggest overinflation and inadequate CO_2 clearance due to air trapping.
- **Regular Monitoring:** Regular arterial blood gas (ABG) analysis should be performed to monitor PaO_2, $PaCO_2$, and pH. Capillary or venous blood gases can be used if arterial access is unavailable.

Ventilator Parameters:

- Monitor ventilator waveforms for signs of hyperinflation (flattened expiratory curve) or inadequate exhalation (incomplete exhalation before the next cycle).
- Ensure that T_{low}, guided by T-PEFR at around 75%, consistently captures peak expiratory flow without unnecessarily extending, preventing derecruitment.

Imaging:

- Periodic chest X-rays should be performed to assess lung expansion, detect signs of hyperinflation, or identify any complications such as pneumothorax.

5. Weaning from APRV

Weaning P_{high}:

- Gradually reduce P_{high} in 1–2 cmH_2O increments as the infant's oxygenation and compliance improve, ensuring that alveolar stability is maintained during the weaning process.
- Monitor for signs of alveolar derecruitment and adjust the weaning pace accordingly.

Maintaining T_{low}:

- Continue using T-PEFR to guide T_{low} settings during weaning, ensuring that T_{low} remains optimal for alveolar emptying while preventing collapse.

Transition to Conventional Ventilation:

- Once P_{high} is reduced to 10–15 cmH_2O and T_{high} is adjusted for adequate CO_2 clearance, consider transitioning to conventional modes like SIMV or pressure support ventilation (PSV).
- Alternatively, consider extubation to CPAP or nasal intermittent positive pressure ventilation (NIPPV) if the infant demonstrates sufficient respiratory effort.

6. Comparison with Conventional Mechanical Ventilation

Alveolar Recruitment:

- **APRV:** Better sustained alveolar recruitment due to prolonged high-pressure phases (P_{high}) and brief low-pressure releases (P_{low}). The continuous high pressure helps keep alveoli open throughout the respiratory cycle, reducing the risk of atelectasis and minimizing cyclic recruitment and derecruitment.
- **CMV:** More cyclic recruitment and derecruitment, with alveoli opening and closing with each breath. This cyclic

nature can increase the risk of ventilator-induced lung injury (VILI), including barotrauma and atelectrauma.

Spontaneous Breathing:

- **APRV:** Encourages spontaneous breathing throughout both the high and low-pressure phases, which can reduce the need for sedation, support better diaphragmatic function, and improve ventilation-perfusion matching.
- **CMV:** Spontaneous breathing may be limited depending on the mode. Spontaneous breathing is allowed in some modes (e.g., SIMV), but the patient's ability to breathe spontaneously is often restricted in pure volume or pressure control modes.

Mechanical Breath Profile:

- **APRV:** Utilizes a biphasic pressure approach with continuous positive airway pressure at two levels (P_{high} and P_{low}). Tidal volume is not directly controlled and depends on the difference between P_{high} and ERLV and the patient's spontaneous breathing effort. The brief pressure release (T_{low}) allows partial exhalation while maintaining sufficient lung volume to prevent alveolar collapse.
- **CMV:** Delivers set breaths at predetermined tidal volumes or inspiratory pressures. The breaths are cyclic, with full exhalation between them unless PEEP is applied. This leads to more variable lung volumes between breaths and the potential for alveolar collapse and reopening. Tidal volume is directly controlled, which ensures consistent breath size but may increase the risk of barotrauma.

Ventilator-Induced Lung Injury (VILI):

- **APRV:** A lower risk of VILI due to the minimized cyclic opening and closing of alveoli and the promotion of spontaneous breathing, contributing to more natural and protective lung ventilation.
- **CMV:** A higher risk of VILI, particularly in volume or pressure control modes, where cyclic alveolar opening and closing can cause repetitive lung injury, leading to barotrauma, volutrauma, and atelectrauma.

CO_2 Clearance:

- **APRV:** Managed by adjusting T_{high}, with spontaneous breathing contributing to overall ventilation. This allows for a more flexible and adaptive approach to maintaining appropriate CO_2 levels.
- **CMV:** CO_2 clearance is managed by setting the respiratory rate, tidal volume, or inspiratory pressure. In modes where spontaneous breathing is limited, achieving adequate CO_2 clearance may require higher settings, which could increase the risk of lung injury.

7. Special Considerations in RDS Pathophysiology

Surfactant Deficiency:

- While APRV helps maintain alveolar stability, it does not address the primary issue of surfactant deficiency in RDS. Exogenous surfactant therapy should be administered as indicated, regardless of the ventilation mode.

Lung Maturity:

- Preterm lungs are more susceptible to barotrauma and volutrauma, so careful titration of APRV settings is essential to avoid overdistension.

Conclusion:

APRV could offer theoretical advantages in managing severe RDS in preterm infants, mainly when T_{low} is set using T-PEFR at around 75% as a guide, and P_{low} is set at 0 to allow ERLV to be controlled by time. This approach helps maintain alveolar recruitment while optimizing CO_2 clearance through adjustments to T_{high}. However, due to the delicate nature of neonatal lungs and the lack of extensive evidence in this population, APRV should be used cautiously, with close monitoring and readiness to adjust or revert to conventional ventilation as needed. Failure to adjust T_{low} in response to changes in lung compliance can lead to either overinflation or underinflation, which can have severe consequences for the infant's lung health. Further research is necessary to establish standardized protocols and confirm the safety and efficacy of APRV in this vulnerable population. A well-designed clinical study is needed to investigate the role of APRV in preterm infants with RDS, its impact on outcomes, and to optimize its use in this unique patient population.

Summary:

- **APRV** offers a more flexible and lung-protective approach by maintaining continuous alveolar recruitment, allowing spontaneous breathing, and minimizing cyclic atelectasis. However, careful adjustment of timing and pressures is required to optimize gas exchange.
- **CMV** provides controlled and consistent ventilation through set tidal volumes or pressures but may lead to higher risks of ventilator-induced lung injury due to the cyclic nature of breath delivery and the potential for alveolar collapse and reopening.

This comparison highlights the differences in mechanical breath profiles between APRV and CMV, emphasizing the potential advantages of APRV in maintaining alveolar stability and supporting spontaneous breathing.

Spontaneous Breathing in Airway Pressure Release Ventilation (APRV)

Airway Pressure Release Ventilation (APRV) allows for spontaneous breathing throughout the entire respiratory cycle without synchronization, unlike Conventional Mechanical Ventilation (CMV). Here is how this works:

Continuous Positive Pressure:

- APRV maintains continuous positive airway pressure at two levels: higher (P_{high}) and lower (P_{low}). The patient can breathe spontaneously during both the high and low-pressure phases.

No Need for Synchronization:

- Because the airway pressure is continuously applied and the patient can breathe spontaneously throughout, there is no need to synchronize the ventilator-delivered breaths with the patient's spontaneous breaths. This contrasts with CMV, where synchronization is often required to match the ventilator's breaths with the patient's breathing effort, especially in modes like Assist-Control (A/C) or Synchronized Intermittent Mandatory Ventilation (SIMV).

Unrestricted Breathing:

- In APRV, the patient can take spontaneous breaths at

any time, independent of the set ventilator cycle. This spontaneous breathing occurs during both the high-pressure phase (P_{high}) and the brief release to the low-pressure phase (P_{low}). This can help maintain more natural breathing patterns and reduce the need for sedatives or paralytics, often used in CMV, to achieve synchronization and control breathing.

Improved Diaphragmatic Function:

- Allowing spontaneous breathing throughout the cycle can support better diaphragmatic function and prevent diaphragm atrophy, a risk when patients are fully ventilated in CMV modes without the opportunity to breathe spontaneously.

Better Ventilation-Perfusion Matching:

- Spontaneous breathing in APRV can improve ventilation-perfusion matching by enhancing alveolar ventilation and maintaining consistent lung volumes. This can lead to more efficient gas exchange than CMV, where breaths are often controlled and may not align with the patient's natural respiratory drive.

Contrast with CMV:

CMV and Synchronization:

- In CMV, particularly in modes like Assist-Control or SIMV, the ventilator delivers a set number of breaths per minute, and these breaths must often be synchronized with the patient's spontaneous efforts to prevent patient-ventilator dyssynchrony. If not adequately synchronized, this can lead to discomfort, increased work of breathing, and potential complications such as barotrauma or volutrauma.
- In some CMV modes, spontaneous breathing is limited or only allowed during specific phases of the ventilator cycle, which can disrupt natural breathing patterns and necessitate more precise synchronization.

Summary:

- APRV allows spontaneous breathing without synchronization because it provides continuous positive airway pressure at two levels, freeing the patient to breathe at any point in the cycle. This contrasts with CMV, where synchronization between the ventilator and the patient's spontaneous efforts is often necessary to avoid dyssynchrony and associated complications. The ability of APRV to accommodate spontaneous breathing throughout the entire cycle can lead to more natural respiratory patterns, improved diaphragmatic function, and better overall ventilation-perfusion matching.

Mechanism of Airway Pressure Release Ventilation (APRV):

Airway Pressure Release Ventilation (APRV) allows for spontaneous breathing throughout the respiratory cycle while generating the necessary pressure to achieve the set P_{high} through specialized ventilator mechanisms, particularly an open exhalation valve.

Mechanism of APRV:

Open Exhalation Valve:

- APRV utilizes an open exhalation valve system. This means that the exhalation valve remains open throughout both the high-pressure phase (P_{high}) and the low-pressure phase (P_{low}). The patient can breathe spontaneously during the respiratory cycle because the open exhalation valve allows the patient to inhale and exhale freely against the set pressures.

Adjustment Guidelines for APRV in Preterm Infants with RDS

Here is a table outlining the adjustments for APRV settings in preterm infants with Respiratory Distress Syndrome (RDS):

Parameter	Adjustment	Indication	Rationale
P_{high}	Increase by 1–2 cmH_2O	Low PaO_2 (hypoxemia)	Enhances alveolar recruitment to improve oxygenation.
	Decrease by 1–2 cmH_2O	High PaO_2	Reduces risk of barotrauma and overdistension
T_{high}	Increase by 0.2 seconds	Low PaO_2 (hypoxemia)	Prolongs alveolar recruitment phase for better oxygenation.
	Decrease (shorten) T_{high} by 0.2 seconds	High $PaCO_2$ (hypercapnia)	Increases frequency of releases to enhance CO_2 clearance.
T_{low}	Typically set at 0.2 seconds	Adjustments guided by expiratory flow	Ensures optimal alveolar emptying while preventing collapse.
FiO_2	Increase FiO_2	Low SpO_2	Increases oxygen delivery to maintain target SpO_2 levels (90–95%).
	Decrease FiO_2	High SpO_2	Reduces risk of hyperoxia and potential oxygen toxicity

This table summarizes key adjustments to APRV settings based on specific clinical indicators in preterm infants with RDS. Each parameter adjustment is guided by the infant's oxygenation and ventilation needs.

Respiratory Distress Syndrome (RDS) in Preterm Infants: APRV Adjustments

This table provides an overview of adjusting APRV settings based on oxygenation and ventilation needs, ensuring optimal respiratory support for preterm infants with RDS:

Adjustment Category	Condition	Adjustment	Rationale
Oxygenation	**Low PaO_2**	Increase P_{high} by 1–2 cmH_2O or increase T_{high} by 0.2 seconds	Enhances alveolar recruitment to improve oxygenation
	High PaO_2	Decrease FiO_2 first, then consider reducing P_{high} if oxygenation remains high.	Prevents hyperoxia and reduces the risk of oxygen toxicity and barotrauma
Ventilation (CO_2 Clearance)	**High $PaCO_2$**	Shorten (lower) T_{high} by 0.2 seconds to increase the frequency of pressure release.	Enhances CO_2 clearance by increasing the number of pressure releases
	Low $PaCO_2$	Lengthen (raise) T_{high} by 0.2 seconds to reduce the frequency of pressure releases.	Allows more time for alveolar gas exchange and reduces minute ventilation

Clinical Signs of Underinflation and Overinflation in Preterm Infants

Clinical Sign	Underinflation	Overinflation
Work of Breathing	**Increased Work of Breathing:** Subcostal, intercostal, or suprasternal retractions, nasal flaring, grunting	**Paradoxical Work of Breathing:** Opposing movements of the chest and abdomen during respiration
Tachypnea	**Increased Respiratory Rate:** The infant may breathe more rapidly to increase oxygen intake and ventilation	**Increased Respiratory Rate:** Tachypnea due to air trapping and the infant's attempt to expel trapped air
Cyanosis	**Low Oxygen Saturation:** Central cyanosis indicating inadequate oxygenation	Not typically a primary sign
Air Entry	**Poor Air Entry:** Decreased breath sounds, particularly in the bases of the lungs	**Decreased breath Sounds:** Hyperinflation leads to diminished breath sounds throughout the lung fields.
Blood Gas Analysis	**Hypoxemia:** Low PaO_2 due to inadequate ventilation	**Hypercapnia:** Elevated $PaCO_2$ due to inadequate exhalation of CO_2
Expiration	Not typically a primary sign	**Prolonged Expiration:** Difficulty exhaling due to air trapping and reduced lung compliance
Chest Configuration	Not typically a primary sign	**Barrel Chest:** Increased anteroposterior diameter due to chronic overinflation
Percussion	Not typically a primary sign	**Air Trapping:** Hyperresonance on chest percussion indicative of trapped air within the lungs

Key Points:

Underinflation is often associated with signs of increased respiratory effort as the infant struggles to maintain adequate oxygenation and ventilation.

Overinflation may present with signs of air trapping, decreased adequate ventilation, and possibly hypercapnia, as the lungs are excessively expanded, impairing gas exchange efficiency.

Recognition of these signs is critical in managing the ventilation strategy for preterm infants, ensuring that lung volumes are optimized to prevent underinflation and overinflation, which can harm lung function and overall health.

Comparison of Mechanical Breath Profiles: APRV vs. CMV

This section provides a comparison between Airway Pressure Release Ventilation (APRV) and Conventional Mechanical Ventilation (CMV) in terms of their mechanical breath profiles:

Aspect	APRV (Airway Pressure Release Ventilation)	CMV (Conventional Mechanical Ventilation)
Breath Delivery	**Biphasic:** Two levels of continuous positive airway pressure (P_{high} and P_{low}) with spontaneous breathing allowed at any phase	**Cyclic:** Set breaths delivered at predetermined tidal volumes or pressures, typically without spontaneous breathing unless in a mode that supports it.
Pressure Phases	P_{high}**:** Prolonged high pressure for alveolar recruitment. P_{low}**:** Brief low pressure for gas release.	**Inspiratory Pressure:** Delivered during the inspiratory phase. **PEEP:** Maintained during the expiratory phase to keep alveoli open.
Spontaneous Breathing	**Encouraged:** Can occur during both the high and low-pressure phases, reducing the need for sedation.	**Dependent on Mode:** May or may not be allowed, depending on the specific mode (e.g., SIMV allows, but pure volume control may not).
Alveolar Stability	**Continuous Recruitment:** High-pressure phases keep alveoli open throughout the cycle, minimizing cyclic recruitment and derecruitment.	**Cyclic Recruitment:** Alveoli open and close with each breath, which can lead to ventilator-induced lung injury (VILI).
Tidal Volume	**Not Directly Controlled:** Depends on the patient's effort and the difference between P_{high} and P_{low}	**Directly Controlled:** Set in volume control modes, ensuring consistent breath size but potentially leading to barotrauma.
Pressure Release	T_{low}**:** Short duration, allowing partial exhalation, set to maintain lung volume without full alveolar collapse.	**Full Exhalation:** Occurs between breaths unless PEEP is applied; potentially more variable lung volume between breaths.
Ventilator- Induced Lung Injury (VILI)	**Lower Risk:** Minimized cyclic atelectasis and promotion of spontaneous breathing reduce the risk.	**Higher Risk:** Cyclic opening and closing of alveoli can cause barotrauma and atelectrauma.
CO_2 Clearance	**Managed by T_{high} and T_{low}:** Spontaneous breathing also contributes to ventilation.	**Controlled by Settings:** Managed by setting the respiratory rate and tidal volume or inspiratory pressure; may require higher settings as spontaneous breathing is often limited

Continuous Positive Airway Pressure:

- The ventilator continuously maintains the airway pressure at P_{high} for a set duration (T_{high}). During this time, the patient can breathe spontaneously, and the ventilator provides the necessary support to maintain P_{high} without interrupting or conflicting with the patient's breathing efforts.
- When the ventilator transitions to P_{low}, the pressure briefly drops to allow partial exhalation (release), but the exhalation valve remains open so the patient can continue to breathe spontaneously.

Floating Valve or Similar Mechanisms:

- Some ventilators may use a floating exhalation valve or similar mechanisms that adjust dynamically to the patient's breathing efforts. These valves ensure that the ventilator can maintain the set P_{high} while accommodating spontaneous breaths. The valve responds to changes in pressure caused by the patient's breathing, allowing for the modulation of flow and pressure as needed.

Pressure Support (Not Recommended):

- Although some ventilators may offer pressure support during spontaneous breathing in APRV, this practice is generally not recommended. Pressure support can interfere with the natural breathing patterns of the patient and may reduce the

benefits of APRV in promoting spontaneous breathing and reducing ventilator-induced lung injury (VILI).

Dynamic Adaptation:

- The open exhalation valve system in APRV dynamically adapts to the patient's spontaneous breathing efforts. As the patient inhales, the ventilator maintains the set P_{high}, and as the patient exhales, the open valve allows for smooth exhalation without causing significant drops in pressure that could lead to alveolar collapse.

In Summary:

APRV allows spontaneous breathing throughout the respiratory cycle by using an open exhalation valve system that remains open during both the P_{high} and P_{low} phases. This mechanism enables the ventilator to maintain the necessary airway pressures while allowing the patient to breathe freely. While some ventilators offer pressure support during spontaneous breaths, it is generally not recommended in APRV, as it may interfere with the spontaneous breathing pattern that APRV is designed to promote. The open exhalation valve, sometimes aided by a floating valve mechanism, ensures that the patient's spontaneous breathing efforts are accommodated without compromising the set pressures, providing continuous support that aligns with the patient's natural respiratory patterns.

Comparison of Valve Systems in APRV and CMV:

Respiratory Distress Syndrome (RDS) often requires mechanical ventilation, and the valve systems used in different ventilation modes play a crucial role in how these systems manage exhalation and accommodate spontaneous breathing. Here is how the valve systems in Conventional Mechanical Ventilation (CMV) and Airway Pressure Release Ventilation (APRV) differ:

Valve Systems in CMV:

Exhalation Valve in CMV:

- In CMV, the exhalation valve is usually closed during the inspiratory phase to ensure that the set tidal volume or pressure is delivered to the lungs without any loss. During exhalation, this valve opens to allow the patient to exhale fully.
- The valve opens and closes in sync with the ventilator's cycles, determined by the set respiratory rate and ventilation mode (e.g., volume-controlled or pressure-controlled modes).

Spontaneous Breathing and Synchronization:

- In many CMV modes, the patient's ability to breathe spontaneously is limited or needs to be synchronized with the ventilator's mandatory breaths. The ventilator cycles between inspiration and expiration based on preset parameters may not align with the patient's natural breathing efforts.
- To manage spontaneous breathing, CMV often uses **trigger mechanisms** that detect when a patient attempts to initiate a breath. The ventilator then delivers a synchronized breath based on this trigger. However, this synchronization is imperfect, leading to potential patient-ventilator dyssynchrony.

Pressure Control in CMV:

- CMV relies on precise control of airway pressures or volumes, with the ventilator taking over much of the work of breathing. The closed nature of the exhalation valve during inspiration ensures that the delivered breath is consistent, but it limits the patient's ability to breathe spontaneously unless specifically allowed by the mode (e.g., SIMV).

Valve Systems in APRV:

Open Exhalation Valve:

- APRV uses an **open exhalation valve** system throughout the phases of the inspiratory (high pressure) and expiratory (low pressure). This allows the patient to breathe spontaneously at any point during the respiratory cycle without needing synchronization.
- The open valve system in APRV enables continuous positive airway pressure and supports the patient's spontaneous breathing efforts, adapting dynamically to the patient's respiratory needs.

Continuous Positive Pressure:

- In APRV, the continuous positive pressure maintained by the ventilator during P_{high} allows for spontaneous breathing without interrupting the ventilator's support. The patient can breathe in and out freely, with the ventilator providing the necessary background pressure to keep the lungs open.

Key Differences:

- **Synchronization Requirement:**

  In CMV, synchronization is often required to align the ventilator's mandatory breaths with the patient's spontaneous efforts. This is particularly true in modes like Assist-Control (A/C) or Synchronized Intermittent Mandatory Ventilation (SIMV).

  APRV, however, does not require synchronization because the patient can breathe spontaneously throughout the entire cycle due to the open exhalation valve.

- **Valve Functionality:**

  The exhalation valve in CMV is primarily closed during inspiration to ensure that the delivered breath meets the set parameters, only opening during expiration. This limits spontaneous breathing to specific phases or requires synchronization.

  In contrast, APRV's open exhalation valve allows continuous spontaneous breathing, with the ventilator maintaining the necessary pressures without restricting the patient's natural breathing efforts.

Summary:

While CMV does have exhalation valves, they function differently from those in APRV. CMV valves are typically closed during the inspiratory phase to control the delivery of breaths and require synchronization to accommodate spontaneous breathing. APRV, with its open exhalation valve system, allows continuous, spontaneous breathing throughout the respiratory cycle without the need for synchronization, making it distinct from the valve systems used in CMV.

Table of Rate, I to E Ratio, and T_{high} in Increments of 0.2 Seconds

This table outlines the relationship between the inspiratory time (T_{high}), the I to E ratio, and the corresponding respiratory rate in breaths per minute, with T_{low} fixed at 0.2 seconds.

T_{high} (seconds)	I to E Ratio	Rate (breaths per minute)
0.2	1 to 1	150
0.4	2 to 1	100
0.6	3 to 1	75
0.8	4 to 1	60
1.0	5 to 1	50
1.2	6 to 1	43
1.4	7 to 1	38
1.6	8 to 1	35
1.8	9 to 1	30
2.0	10 to 1	27
2.2	11 to 1	25
2.4	12 to 1	23
2.6	13 to 1	22
2.8	14 to 1	20
3.0	15 to 1	19

Explanation:

- **T_{high} (seconds):** This represents the inspiratory time, increasing in increments of 0.2 seconds.
- **I to E Ratio:** The ratio of the inspiratory time to the expiratory time, calculated as T_{high}: T_{low}.
- **rate (breaths per minute):** The corresponding respiratory rate is calculated based on the total cycle time T_{high} + T_{low}.

This table shows how the respiratory rate decreases and the I to E ratio increases as T_{high} is increased in increments of 0.2 seconds, with T_{low} fixed at 0.2 seconds.

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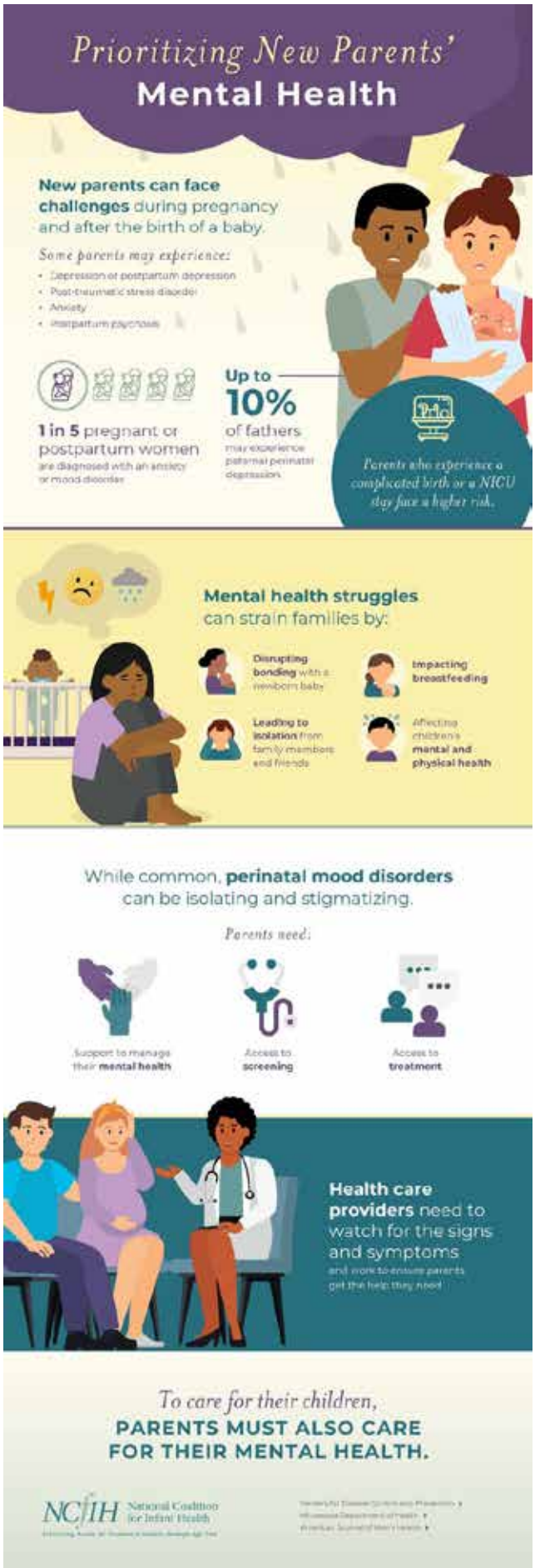
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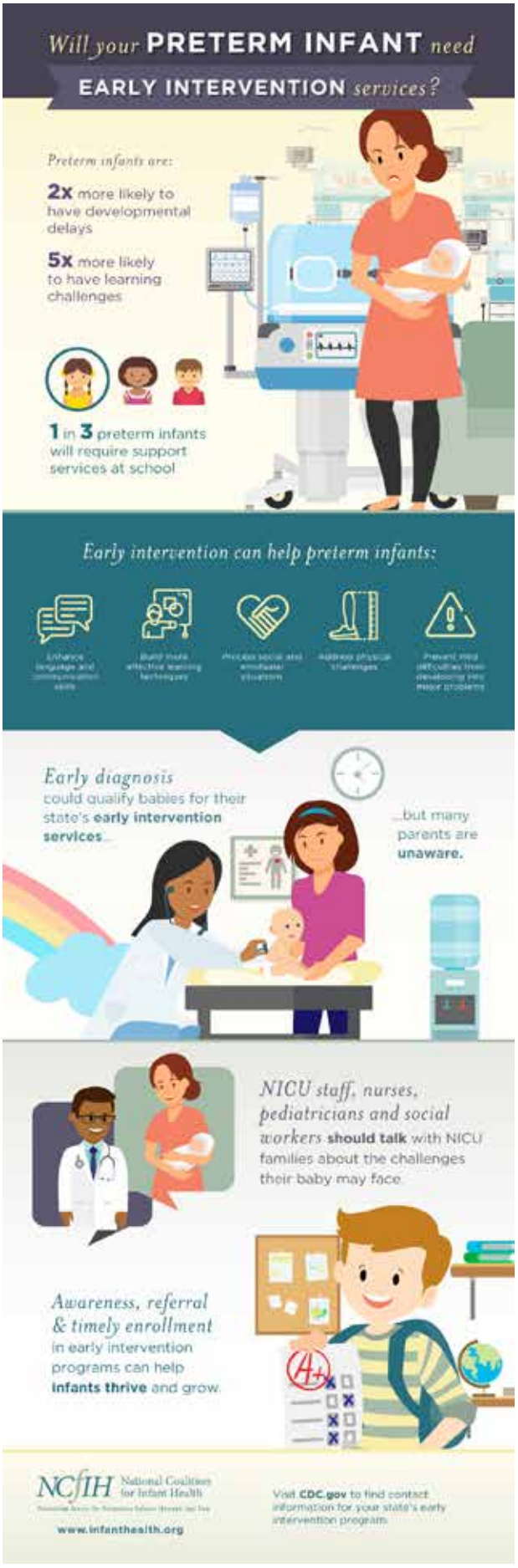
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Prioritizing New Parents' Mental Health
New parents can face challenges during pregnancy and after the birth of a baby.
Some parents may experience:
• Depression or postpartum depression
• Post-traumatic stress disorder
• Anxiety
• Postpartum psychosis
1 in 5 pregnant or postpartum women are diagnosed with an anxiety or mood disorder
Up to 10% of fathers may experience paternal perinatal depression
Parents who experience a complicated birth or a NICU stay face a higher risk.
Mental health struggles can strain families by:
Disrupting bonding with a newborn baby
Impacting breastfeeding
Leading to isolation from family members and friends
Affecting children's mental and physical health
While common, perinatal mood disorders can be isolating and stigmatizing.
Parents need:
Support to manage their mental health
Access to screening
Access to treatment
Health care providers need to watch for the signs and symptoms and work to ensure parents get the help they need
To care for their children,
PARENTS MUST ALSO CARE FOR THEIR MENTAL HEALTH.
NCFIH National Coalition for Infant Health


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
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The Indirect Impact of **RSV**

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

OVERVIEW



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

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

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

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

RSV PARENT SURVEY

340 parents who had at least 1 child sick with RSV



67% of parents said their child was hospitalized for RSV

RSV HEALTH CARE PROVIDER SURVEY

175 health care providers across various pediatric and neonatal subspecialties



67% worked in an outpatient facility

33% worked in a hospital

RESULTS

FINANCIAL BURDEN

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

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

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

EMOTIONAL BURDEN

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

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

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

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

SOCIAL BURDEN

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

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

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

RESULTS

PARENT EDUCATION & AWARENESS

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

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

TREATMENT CHALLENGES

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

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

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

MISCONCEPTIONS

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

CONCLUSION

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

The virus may lead to:

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

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

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

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

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

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Peer Reviewed

Ethics and Wellness: The Art of Disagreement in Neonatology: Navigating Change with Grace

Mitchell Goldstein, MD, MBA, CML

"Neonatology, a field dedicated to the care of newborns, is characterized by its rapid pace of evolution. New research findings, advanced technologies, and updated guidelines continuously reshape our understanding and practices. What was considered best practice a decade ago may be outdated as the field progresses."

Neonatology, a field dedicated to the care of newborns, is characterized by its rapid pace of evolution. New research findings, advanced technologies, and updated guidelines continuously reshape our understanding and practices. What was considered best practice a decade ago may be outdated as the field progresses. This constant flux can lead to disagreements among professionals, which, though potentially disruptive, play a critical role in advancing care standards and improving patient outcomes.

"Navigating these disagreements with finesse ensures they contribute rather than hinder progress. Constructive disagreement is not just about airing differing opinions; it involves engaging in a thoughtful and respectful dialogue that fosters professional growth and enhances patient care."

Navigating these disagreements with finesse ensures they contribute rather than hinder progress. Constructive disagreement is not just about airing differing opinions; it involves engaging in a thoughtful and respectful dialogue that fosters professional growth and enhances patient care. (1) Here are several fundamental principles for managing disagreements effectively in neonatology.

1. Prioritize Respectful Dialogue

The foundation of productive disagreement is respectful communication. Interrupting others disrupts the flow of conversation and can escalate tensions. It is crucial to allow each participant to complete their thoughts before responding. This practice ensures that every viewpoint is fully understood and considered. Active listening is a cornerstone of respectful dialogue; it demonstrates that you value the other person's perspective and are open to their ideas. (2)

"It is crucial to allow each participant to complete their thoughts before responding. This practice ensures that every viewpoint is fully understood and considered. Active listening is a cornerstone of respectful dialogue; it demonstrates that you value the other person's perspective and are open to their ideas."

2. Let Everyone Speak

Equally important is ensuring that every participant has the opportunity to voice their opinions. Dominating the conversation or dismissing others' viewpoints can stifle valuable insights and create a skewed discussion. Encourage a balanced exchange where all voices are heard. This inclusive approach not only fosters a more democratic dialogue but also enriches the decision-making process by incorporating diverse perspectives.

"Encourage a balanced exchange where all voices are heard. This inclusive approach not only fosters a more democratic dialogue but also enriches the decision-making process by incorporating diverse perspectives."

3. Silence is Golden

In the heat of a debate, silence can be a powerful tool. It provides a moment for reflection and allows participants to process the information being discussed. Rather than rushing to fill every pause with words, embrace moments of silence as an opportunity to gather your thoughts and consider the points raised by others. Silence can also help de-escalate tensions and allow everyone to cool down before responding.

"Silence can also help de-escalate tensions and allow everyone to cool down before responding."

4. Maintain Professionalism in All Interactions

During heated debates, maintaining a calm and measured tone is vital. Raising your voice or displaying frustration can create a hostile environment and detract from the validity of your arguments. Professionalism means addressing issues without personal attacks and focusing on the topic rather than the individual. Keeping the discussion civil, you help ensure that disagreements are resolved constructively.

"Professionalism means addressing issues without personal attacks and focusing on the topic rather than the individual. Keeping the discussion civil, you help ensure that disagreements are resolved constructively."

5. Choose the Appropriate Setting for Discussions

The context in which disagreements occur can significantly impact their resolution. Sensitive or contentious issues are often better addressed in a private rather than a public forum. A private discussion allows for more candid exchanges without the added pressure of an audience, which can lead to more effective problem-solving and reduce the risk of escalating the conflict.

" A private discussion allows for more candid exchanges without the added pressure of an audience, which can lead to more effective problem-solving and reduce the risk of escalating the conflict."

6. Focus on the Issue, Not the Person

Effective disagreement involves focusing on the issue rather than allowing personal animosities to cloud the discussion. Avoid competitive "pissing contests" where the goal is to outshine or undermine the other person. Instead, concentrate on clearly articulating the opposing viewpoint and contrasting it with evidence-based data. This approach ensures that the debate remains centered on the merits of the arguments rather than personal conflicts. (3)

" Instead, concentrate on clearly articulating the opposing viewpoint and contrasting it with evidence-based data. This approach ensures that the debate remains centered on the merits of the arguments rather than personal conflicts."

7. Use the Praise Sandwich Approach

One effective method for presenting a differing opinion is the "praise sandwich" approach. This technique involves beginning with a positive remark or acknowledgment of the other person's perspective, presenting your disagreement, and concluding with another positive note. This approach helps soften the impact of dissent and maintains a positive and constructive tone throughout the discussion. It demonstrates respect for the other person's contributions while making your point.

"This technique involves beginning with a positive remark or acknowledgment of the other person's perspective, presenting your disagreement, and concluding with another positive note."

8. Know When to Step Back

Sometimes, despite our best efforts, discussions can become too heated to be productive. In such cases, stepping back and taking a break is wise. A pause lets participants cool down and reflect on the discussion with a clearer perspective. Revisiting the conversation later can lead to more thoughtful and constructive dialogue, fostering a better resolution.

"Sometimes, despite our best efforts, discussions can become too heated to be productive. In such cases, stepping back and taking a break is wise."

9. Cultivate an Open Mind

Approaching disagreements with an open mind is essential for constructive dialogue. Suspend disbelief and be willing to consider new ideas, even if they challenge your current beliefs. This willingness to explore different viewpoints can lead to innovative solutions and improvements in practice. Agreeing to disagree is a natural part of professional discourse and can enhance collaboration and problem-solving.

"Suspend disbelief and be willing to consider new ideas, even if they challenge your current beliefs. This willingness to explore different viewpoints can lead to innovative solutions and improvements in practice."

10. Remember the Shared Goal

Regardless of the intensity of the disagreement, it is essential to

remember that all participants share a common goal: improving patient care. Maintaining a sense of camaraderie and mutual respect helps to keep the bigger picture in focus. (4) Disagreements should be viewed as opportunities to refine and enhance practices rather than as personal battles.

"Maintaining a sense of camaraderie and mutual respect helps to keep the bigger picture in focus. (4) Disagreements should be viewed as opportunities to refine and enhance practices rather than as personal battles."

By adhering to these principles, disagreements can be transformed from potential conflicts into valuable opportunities for professional development and innovation. Constructive disagreement enriches the practice environment and contributes to improved physician retention and a more dynamic approach to patient care. (5) Fostering a respectful dialogue ensures that every voice is heard and that the field of neonatology continues to advance in its pursuit of excellence.

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Peer Reviewed

Giant Maxillary Mass in the Neonatal Stage: Case Report

Juan Sebastian Pimienta Parra, MD, Nesly Lorena Velandia, MD, Maria Elena Venegas, MD

"The oral epithelium can develop multiple tumors in the intrauterine and neonatal periods, most benign. In this period, small masses disappear with the child's development, leaving no vestiges or recurrences. However, depending on their extension and location, some may require surgical intervention."

Summary:

The oral epithelium can develop multiple tumors in the intrauterine and neonatal periods, most benign. In this period, small masses disappear with the child's development, leaving no vestiges or recurrences. However, depending on their extension and location, some may require surgical intervention.

In this case, we present a 38-week term newborn with a birth weight of 2.9 kilograms, adequate for her gestational age, with adequate prenatal control, negative HIV, VDRL, and rectal-vaginal culture, no maternal comorbidities, and no relevant findings in her prenatal ultrasounds.

The child was born vaginally, and upon physical examination, a giant pedunculated mass of 3x2x4 centimeters, the color of the oral mucosa, protruding from the upper gingival region outwards, obstructing the oral cavity and making it impossible to latch on to the mother's breast and feeding, without interfering with the patient's breathing.

Due to the infrequency of the case, its multidisciplinary approach (neonatology, maxillofacial surgery, and vascular surgery) recommended surgical treatment with complete resection of the lesion.

Congenital Epulis Congenital was suspected at first stay. Although the histopathologic diagnosis is giant hemangioma, the histologic description is compatible with congenital granular cell tumors.

Less than 200 cases are reported worldwide, making it very difficult to diagnose and may cause a discrepancy in the histopathological conclusion.

Introduction:

Congenital epulis is a lesion of the oral mucosa with a very low incidence (0.0006% per live birth), characterized mainly as a benign granulomatous pedunculated tumor, typically of the same color as the mucosa, almost exclusively predominant in girls, 8-10:1 (1). Its origin is unknown, it can be diagnosed prenatally by ultrasound, but it is commonly diagnosed at birth, where a mass is evident in the oral cavity, which can cause difficulty in breathing and feeding, depending on its size.

Its most common location is in the upper jaw, mainly the canine area. Dr. Neumann first described this in 1871, receiving the name of Neumann's tumor until the WHO categorized it as congenital granular cell epulis (1-3).

"Congenital epulis is a lesion of the oral mucosa with a very low incidence (0.0006% per live birth), characterized mainly as a benign granulomatous pedunculated tumor, typically of the same color as the mucosa, almost exclusively predominant in girls, 8-10:1 (1)."

Small lesions may regress spontaneously, but larger lesions require surgical resection. They do not usually involve bone tissue and do not leave permanent sequelae in the mucosa. However, multidisciplinary clinical follow-up is necessary (2).

"Small lesions may regress spontaneously, but larger lesions require surgical resection. They do not usually involve bone tissue and do not leave permanent sequelae in the mucosa. However, multidisciplinary clinical follow-up is necessary (2)."

Clinical case:

This is a female 38-week term newborn by Ballard scale, weighing 2.9 kilograms (between 10-50 percentile), with a height of 48 centimeters (between 10-50 percentile) and head circumference of 35 centimeters (between 50-90 percentile). The child was

born to a young 28-year-old mother, with no significant personal or family history, who attended eight prenatal check-ups, with negative infectious serologies for HIV, VDRL and negative rectal-vaginal culture screening.

The birth was by vaginal delivery without complications, with clear amniotic fluid, cephalic presentation, and late cord clamping was performed.

The neonate was transferred to the adaptation room, and there was evidence of a large rounded pedunculated tumor in the left maxilla at the level of the right canina, covered with smooth pink mucosa of firm-elastic consistency, measuring approximately 3x2x4 centimeters, which appeared vascularized as shown in image 1. There were no other findings on physical examination; she was admitted to the neonatal intensive care unit.



Image 1: A 38-week newborn with a pedunculated tumor in the left maxilla.

An evaluation was requested by the maxillofacial surgery team, who requested angiotomography to determine the management of the same, finding it highly vascularized.

The surgical procedure was performed in conjunction with vascular surgery to prevent complications—intervention without intraoperative intercurrences. The specimen was sent to the pathology service, who reported that the mass was formed by cells with granular cytoplasm and rich vascular stroma, covered by a thin mucous layer with ulcerative-necrotic tissue in its apical portion, a description compatible with congenital granulomatous tumor or congenital epulis.

The patient presented complete recovery of her suction-deglutition capacity and was discharged home with interdisciplinary outpatient follow-up appointments.

"The specimen was sent to the pathology service, who reported that the mass was formed by cells with granular cytoplasm and rich vascular stroma, covered by a thin mucous layer with ulcerative-necrotic tissue in its apical portion, a description compatible with congenital granulomatous tumor or congenital epulis."

Discussion:

Congenital Epulis is a rare finding, with a prevalence of 1-9 / 1 000 000 live births; it has been described anatomopathologically as a congenital gingival tumor of granular cells of the newborn, predominantly female, of unknown origin and with a wide spectrum of evolution over time (4).

It has been described as a single, pedunculated, mobile lesion. However, up to 10% have presented as multiple lesions, mainly involving the alveolar ridges of the maxilla (5-6).

Ideally, prenatal diagnosis should be made with control ultrasounds, especially those of anatomical detail; however, in some cases, it is not possible due to the intrauterine position of the fetus, so diagnostic confirmation is made in the physical examination of the newborn. Its main characteristic is that it is a benign tumor since no significant metastasis or recurrence has been described since its description in 1871 (5).

We present the case of a female minor with a lesion compatible with congenital epulis who received successful medical-surgical treatment and was subsequently discharged without apparent complications.

"Ideally, prenatal diagnosis should be made with control ultrasounds, especially those of anatomical detail; however, in some cases, it is not possible due to the intrauterine position of the fetus, so diagnostic confirmation is made in the physical examination of the newborn."

Since it is mainly associated with the female sex, in 1982, Dr. Lack et al. performed histogenesis studies to determine a hormonal mechanism in its development, but no progesterone or estrogen receptors have been demonstrated to date. Subsequently, immunohistochemical studies, mainly performed in Italy in 1999 by Dr. Leocata and collaborators, did not discover a cellular origin

for this disease (7-8).

"Its main characteristic is that it is a benign tumor since no significant metastasis or recurrence has been described since its description in 1871 (5)."

Histologically, the literature describes it as glandular conformations, highly vascularized, with cells of ample cytoplasm with small nuclei, covered with squamous epithelial cells and some ulcerated and necrotic spots (8), precisely as in this patient's case.

The differential diagnosis with the highest incidence and most common in childhood is hemangioma, which is a benign tumor that can be found in the oral mucosa, infrequently present from birth (only 30% of cases and are spontaneous involution), most appear in the first six months postnatal. They do not tend to infiltrate adjacent tissue but can deform the bone structure. Histologically, it is described as an endothelial lobular proliferation, with histiocytic infiltrate, surrounded by large (ectatic) and aberrant extralobular veins (9-10).

No short or long-term complications are expected for these patients. As previously mentioned, they do not generate the risk of metastasis or recurrence, and the patient can evolve satisfactorily and recover their ability to feed with adequate mouth-baby seal and ensure breastfeeding.

"The differential diagnosis with the highest incidence and most common in childhood is hemangioma, which is a benign tumor that can be found in the oral mucosa, infrequently present from birth (only 30% of cases and are spontaneous involution), most appear in the first six months postnatal."

Conclusion:

Tumors in the oral cavity pose a diagnostic challenge in newborns since several etiologies may have similar macroscopic appearance but represent different histologic etiologies.

Fortunately, most of them are benign but require timely evaluation and intervention to avoid complications due to a mass effect. It becomes mandatory to generate optimal childcare environments for parents since they are striking entities to the caregiver and can generate high anxiety in them.

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Randall Bell, Ph.D.

Celebrating the Distinct Contributions of Neonatal Therapists Within Interprofessional Neonatal Care

Christy Gliniak, PhD, OTR/L, CNT, CPXP, NTMTC

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.

National Perinatal Association
Educate. Advocate. Integrate.

High-quality neonatal intensive care requires diverse specializations and interprofessional teamwork to include the unique contributions of neonatal therapists. Neonatal therapists include occupational therapists (OT), physical therapists (PT), and speech-language pathologists (SLP), who specialize in delivering age-specific evaluations and therapeutic interventions for premature and medically complex infants in the neonatal intensive care unit (NICU) (1). A neonatal therapist begins with the end in mind to mitigate adverse sequelae, optimize neurodevelopment, and strengthen infant mental health by scaffolding the infant-parent dyad (1-3). Although therapists are traditionally known for their rehabilitative roots, neonatal therapists utilize a preventative, habilitative approach, emphasizing neuroprotection and neuropromotion (1).

What is Neonatal Therapy?

Neonatal therapy is an advanced practice area for OTs, PTs, and SLPs as described by the Neonatal Therapy Core Scope of Practice© (1). All three professional groups share core fundamental knowledge yet recognize that each discipline adds unique and valuable contributions to the field. In part, neonatal therapy is "the art and science of integrating typical development of the infant and family into the environment of the NICU." (1). As interdisciplinary care team members, neonatal OTs, PTs, and SLPs help drive the delivery of Family-Centered, developmental care and are often instrumental in the discharge planning process. In level III and IV NICU settings, neonatal therapists are integral to neonatal follow-up clinics, providing neurodevelopmental testing and triage for early intervention services (1,2).

"High-quality neonatal intensive care requires diverse specializations and interprofessional teamwork to include the unique contributions of neonatal therapists. Neonatal therapists include occupational therapists (OT), physical therapists (PT), and speech-language pathologists (SLP), who specialize in delivering age-specific evaluations and therapeutic interventions for premature and medically complex infants in the neonatal intensive care unit (NICU) (1)."

Why is neonatal therapy considered an advanced practice area?

Professional training programs for OT, PT, or SLP entail graduate-level or doctoral degrees. Despite this rigorous education, advanced training in the neonatal therapy subspecialty is required. An entry-level neonatal therapist requires NICU-specific continuing education and mentorship to ensure safe, well-timed, risk-adjusted neonatal care (2, 4-8). Neonatal therapists must be familiar with the complexities of the NICU environment, recognize neonatal risk factors, precautions, and medical comorbidities, navigate NICU equipment, safely handle preterm and critically ill infants, apply trauma-informed principles when working with families, and have a solid understanding of typical preterm and newborn neurobehavior and developmental progression (1-3). This extensive education and training instills confidence in neonatal therapists' expertise and their ability to provide evidence-based services in this highly vulnerable patient population.

"An entry-level neonatal therapist requires NICU-specific continuing education and mentorship to ensure safe, well-timed, risk-adjusted neonatal care (2, 4-8). Neonatal therapists must be familiar with the complexities of the NICU environment, recognize neonatal risk factors, precautions, and medical comorbidities, navigate NICU equipment, safely handle preterm and critically ill infants, apply trauma-informed principles when working with families, and have a solid understanding of typical preterm and newborn neurobehavior and developmental progression (1-3)."

What are the requirements to become a certified neonatal therapist (CNT)?

The CNT designation is internationally recognized and obtained through

the Neonatal Therapy Certification Board (NTCB). The CNT certification requirements include: (a) credentialling as an OT, PT, or SLP for three or more years, (b) 3500 hours of experience in the NICU, (c) Forty hours of NICU-specific education in less than three years, (d) forty hours of NICU mentorship, and (e) successful completion of the Neonatal Therapy National Certification Exam (1,2).

"Neonatal OT, PT, and SLP have a shared foundational knowledge, including six practice domains: (1) environment, (2) family/psychosocial support, (3) sensory system, (4) neurobehavioral system, (5) neuromotor and musculoskeletal systems, and (6) oral feeding and swallowing, which are not fundamentally exclusive to any one discipline (1,2)."

What are the neonatal therapy practice domains?

Neonatal OT, PT, and SLP have a shared foundational knowledge, including six practice domains: (1) environment, (2) family/psychosocial support, (3) sensory system, (4) neurobehavioral system, (5) neuromotor and musculoskeletal systems, and (6) oral feeding and swallowing, which are not fundamentally exclusive to any one discipline (1,2). Neonatal therapists use an integrative collaborative-care model when administering continual assessment and intervention cycles grounded in evidence-based decision-making (9). Ideally, therapeutic interventions begin at the earliest point of the lifespan when therapists collaborate with other disciplines and use their unique lenses to help advance infant competencies, promote parental confidence, and expedite the journey home.

"The neonatal therapy team helps to advance individualized care plans to include environmental modifications, positive touch, therapeutic handling for posture and regulation, protection of the aerodigestive system, infant-driven feeding strategies, and parent education related to discharge needs (1, 3, 11)"

What interventions do neonatal therapists provide?

From the first day of life, neonatal therapists promote healthy postures and movement patterns, reduce pain and stress, and nurture age-appropriate sensory experiences (1,3). In tandem with the bedside nurse, neonatal therapists partner with families to engage them in their baby's activities of daily living, such as diapering, eating, dressing, bathing, etc. (10). Neonatal therapists can be instrumental in coaching parents with direct hand-over-hand support and anticipatory guidance to help develop proficiency and confidence in their co-occupation as parents (11,12). The neonatal therapy team helps to advance individualized care plans to include environmental modifications, positive touch, therapeutic handling for posture and regulation, protection of the aerodigestive system, infant-driven feeding strategies, and parent education related to discharge needs (1, 3, 11). In many settings, neonatal therapists are considered feeding specialists with advanced training in pre-feeding strategies, breastfeeding support, and clinical feeding assessments (10, 13). Highly skilled neonatal therapy professionals will often have extensive training in any of the following areas: (a) evaluating an infant's neurologic integrity using skilled observations and standardized testing, (b) therapeutic management of orthopedic conditions, (c) instrumental swallowing evaluations such as videofluoroscopic swallow studies (VFSS) or fiberoptic endoscopic evaluation of swallowing (FEES), and (d) lactation support as a Certified Lactation Counselor (CLC) or International Board Certified Lactation Consultant (IBCLC).

What is the best approach to successful neonatal therapy staffing?

With the rising complexity and volume of premature and medically fragile infants, there is a growing need for highly trained, multidisciplinary NICU teams (2). Finding and staffing NICUs with all three disciplines who also have NICU-specific expertise can be highly challenging, particularly in units with high fluctuations in their census and for smaller, more rural NICUs (2). Larger level III and IV NICUs have additional staffing challenges of higher acuity, heavy caseloads, and shortage of qualified therapists. The staffing models of neonatal therapy teams often vary in size and the way they delineate roles between neonatal therapists based on therapist availability, cross-discipline knowledge, therapy service requirements, budget constraints, and the individual therapist's competence and confidence within the neonatal subspecialty (2, 14). The American Academy of Pediatrics (AAP) NICU Verification Program includes neonatal therapy services for Level II, III, and IV NICUs, with certified neonatal therapists (CNTs) preferred (15).

"Every September, the National Association of Neonatal Therapists (NANT) hosts International Neonatal Therapy Week (INTW) to highlight this advanced practice area and unite neonatal OT, PT, and SLP clinicians around the globe. NANT is a professional organization that delivers NICU-specific continuing education, resources, standards, mentorship, and supportive connections to advance this specialty."

Help celebrate neonatal therapists from around the world!

Every September, the National Association of Neonatal Therapists (NANT) hosts International Neonatal Therapy Week (INTW) to highlight this advanced practice area and unite neonatal OT, PT, and SLP clinicians around the globe. NANT is a professional organization that delivers NICU-specific continuing education, resources, standards, mentorship, and supportive connections to advance this specialty. During the week of September 15th-21st, 2024, NANT will celebrate the impact of this vibrant neonatal

therapy community with its members, who span over thirty countries and five continents.

Want To Learn More?

- Celebrate International Neonatal Therapy Week between September 15th and 21st, 2024 and join our vibrant neonatal community.
- Attend NANT 15, the annual neonatal therapy conference, in Indianapolis, IN, from March 27th to 29th, 2025. Attendees typically represent all fifty states and eight or more countries.
- Join NANT's annual Virtual Summit in December — A FREE educational event— info coming soon!
- Stay informed by subscribing to NANT NEWS and visiting www.neonataltherapists.com
- Therapists interested in becoming a CNT can apply online at https://www.ntncb.com/.

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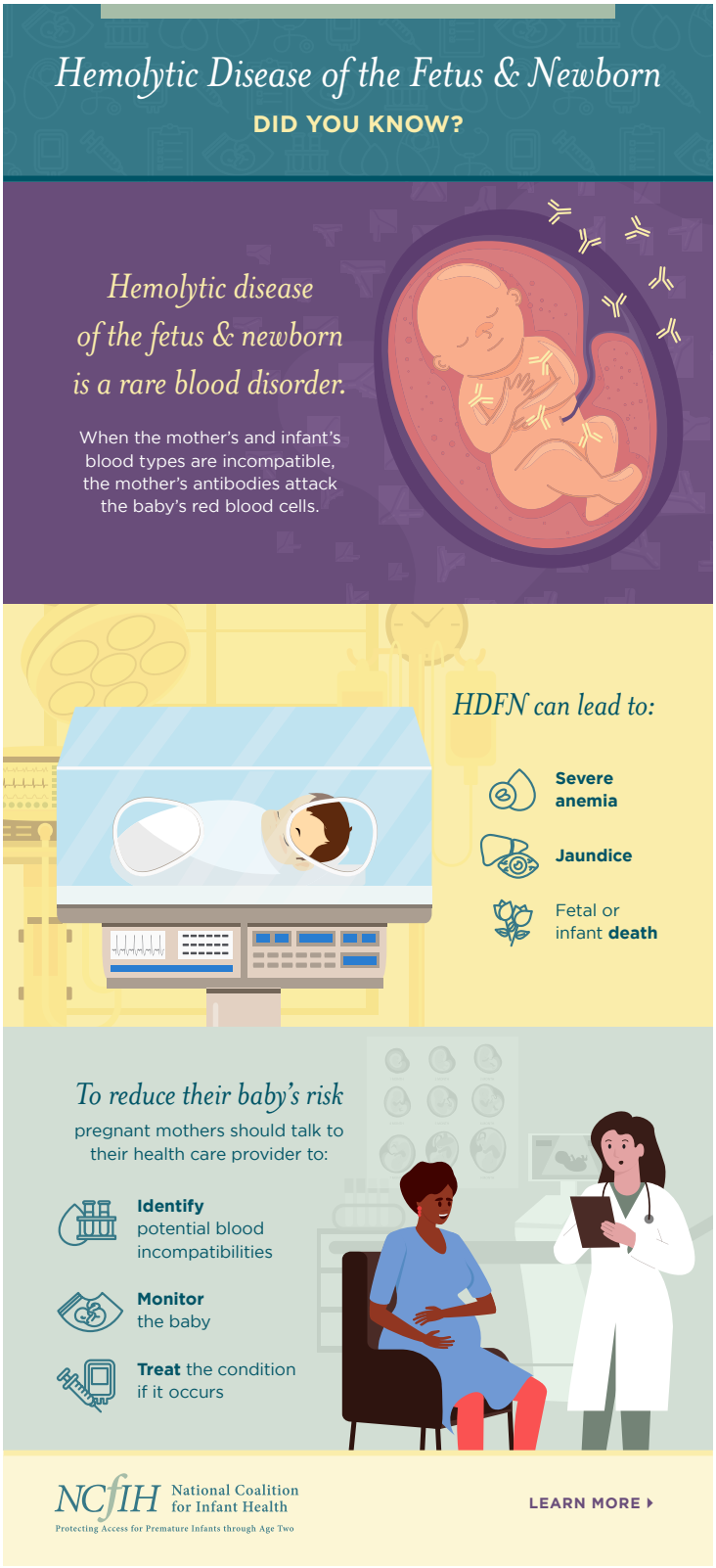
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Section on Neonatal Perinatal Medicine Updates: 2025 SONPM Pioneer Award Nominations

Munish Gupta, MD, FAAP

Dear Colleagues,

We are excited to announce the call for 2025 SONPM Pioneer Award nominations. Now in its second year as an official AAP honor, this prestigious award recognizes individuals who have made pioneering contributions to the health and well-being of newborns, positively impacting newborn care worldwide.

"We are excited to announce the call for 2025 SONPM Pioneer Award nominations. Now in its second year as an official AAP honor, this prestigious award recognizes individuals who have made pioneering contributions to the health and well-being of newborns, positively impacting newborn care worldwide."

Nominations will be reviewed by members of the WECaN (Well-Established Career Neonatologists) group and the SONPM Executive Committee. The award description is as follows:

AAP Section on Neonatal-Perinatal Medicine (SONPM) Pioneer Award

The SONPM Pioneer Award seeks to honor an individual who has championed the health and well-being of newborns and whose contributions have had a lasting impact on the care of newborns through significant, innovative, and pioneering work. The recipient should be the first—or among the first—to develop, utilize, or disseminate a new method, area of knowledge, or activity within newborn care.

Eligibility:

- Nominees must be living individuals from the U.S. or Canada whose achievements have contributed meaningfully to the advancement of newborn care.
- The nominee may or may not be a clinician but should be well-established in their career.
- Nominees must not have previously received the Virginia Apgar Award, the Avroy Fanaroff Neonatal Education Award, or the Landmark Award.
- The award cannot be given posthumously.
- While nominees do not need to be SONPM members, nominations must be submitted by SONPM members.

"Nominations are due by October 31, 2024. The recipient will be honored at the 2025 SONPM Workshop on Neonatal-Perinatal Practice Strategies, which will take place from February 21 to 23, 2025, in Scottsdale, Arizona."

Nomination Process:

Nominations are due by **October 31, 2024**. The recipient will be honored at the **2025 SONPM Workshop on Neonatal-Perinatal Practice Strategies**, which will take place from **February 21 to 23, 2025, in Scottsdale, Arizona**.

More details on the award and the nomination process can be found in the attached document.

Additionally, we will be opening calls for our other annual SONPM awards—**the Virginia Apgar Award in Neonatal-Perinatal Medicine, the Avroy Fanaroff Neonatal Education Award,** and **the Landmark Award**—in November. These awards will be presented at the **AAP NCE next fall**.

"Additionally, we will be opening calls for our other annual SONPM awards—the Virginia Apgar Award in Neonatal-Perinatal Medicine, the Avroy Fanaroff Neonatal Education Award, and the Landmark Award—in November. These awards will be presented at the AAP NCE next fall."

All of us have benefited from the mentorship and guidance of pioneers in neonatology. We hope you will take this opportunity to submit a nomination and help honor these trailblazers.

Please do not hesitate to contact me or **Jim Couto** with any questions.

Best regards,

Munish

Disclosures: No conflicts noted

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2025 NEONATAL PIONEER AWARD
Call for Nominations
Deadline: October 31st, 2024

Nominations are now being accepted for the AAP Section on Neonatal-Perinatal Medicine (SONPM) Pioneer Award. This award seeks to honor an individual who has championed the health and well-being of newborns and has thereby contributed to newborn care worldwide. The recipient is a pioneer, meaning that they were the first or among the first to develop, use, or spread a new method, area of knowledge or activity. Any living individual from the U.S. or Canada whose achievements have had a lasting influence on the care of newborns through a significant innovative and important contribution is eligible. The individual may or may not be a clinician but should be well-established. The nominee must not have previously received the Virginia Apgar, Avroy Fanaroff Education, or Landmark Award. The award cannot be awarded posthumously. The nominee does not necessary need to be a member of SONPM; however, the nomination letters must be submitted by SONPM members.

The recipient will be chosen by the SONPM Well-Established Career Neonatologists (WECaN) group and the SONPM Executive Committee, and approved by the AAP Board of Directors. The recipient will be notified after final approval, and will be invited to the Workshop on Neonatal-Perinatal Practice Strategies where the award will be presented. The Workshop will be held February 21st to 23rd, 2025, in Scottsdale, AZ.

If you wish to nominate an individual, or yourself, please submit:

- a nomination letter supporting why this individual should receive the award;
- the candidate's curriculum vitae; and
- two supporting letters from two members of the Section on Neonatal-Perinatal Medicine.

ALL INFORMATION MUST BE COMPLETE BEFORE SUBMITTING YOUR NOMINATION.
Please send all materials **no later than October 31st, 2024** to:

Jim Couto, MA
Director, Hospital& Surgical Subspecialties
American Academy of Pediatrics
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The Pioneer Award is supported by Mead Johnson Nutrition

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Letters to the Editor

Letter to the Editor: "Early Nursery Discharge during COVID-19 and Readmissions for Hyperbilirubinemia"

Dear Editor,

The article "Early Nursery Discharge during COVID-19 and Readmissions for Hyperbilirubinemia" by Srinivasan et al. (2024) discusses a significant change in hospital policy adopted during the COVID-19 pandemic wherein newborns were discharged early to minimize exposure as well as combat challenges in visitor restrictions for patients' families. (1) Srinivasan et al. led a prospective observational study in a New York hospital that adopted early discharge protocols during the pandemic. The authors were particularly interested in the readmission rates for hyperbilirubinemia for newborns discharged early, specifically those discharged at or before 36 and 48 hours of life. The study consisted of data collected from January 2020 through June 2021. The study population included 1,714 newborns born at greater than 36 weeks gestation by normal spontaneous vaginal delivery (NSVD) and admitted to the general nursery. Of the 34% of newborns discharged ≤36 hours, there was a sign while further research to improve the generalizability of the study is needed, there may be a possibility that early discharge for infants may be safer than previously assumed. This is exciting for many reasons, including the possibility of a reduced length of stay and the associated financial benefits. Research suggests that the average charges associated with vaginal delivery and subsequent newborn care in the hospital after delivery in the United States are around $17,624, while the average charges associated with cesarean delivery and subsequent newborn care in the hospital are $13,805.(2) As charges closely correlate to the length of stay, it is safe to conclude that there may be some potential financial benefit for hospitals and parents in safely reducing the length of stay for newborn infants. (3) Furthermore, reduced length of stay is associated with decreased hospital-acquired conditions in the adult patient population and may prove true for newborns. (4)

"As charges closely correlate to the length of stay, it is safe to conclude that there may be some potential financial benefit for hospitals and parents in safely reducing the length of stay for newborn infants. (3) Furthermore, reduced length of stay is associated with decreased hospital-acquired conditions in the adult patient population and may prove true for newborns. (4)"

A possible challenge to modifying clinical protocols surrounding newborn discharge is the lack of data surrounding early discharge and readmission rates. A 2021 meta-analysis of 17 randomized controlled trials found that early discharge from the newborn nursery may lead to higher rates of readmission for a variety of neonatal morbidities, including but not limited to hyperbilirubinemia. (5) However, this meta-analysis found that studies regarding early discharge have remarkably varied definitions of early discharge, ranging from six hours to five days. Due to the lack of standardization across studies, it is hard to draw decisive conclusions. While the article provided new insight into early discharge and readmission, some limitations should be considered when interpreting the results of this prospective study. The study's observational nature cannot establish a causal relationship between early discharge and reduced readmissions. The research was conducted in a single hospital in New York, limiting the generality of the results to others.

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Hospitals or regions have different patient populations and healthcare practices/policies. In addition, they chose a Baby-Friendly hospital where universal bilirubin screening, strong breastfeeding support, and comprehensive follow-up care are standard practice.

"These policies are essential for minimizing the risks of early discharge, but they may not be uniformly available across all hospitals. It would be interesting to investigate whether the safety of early discharge holds in hospitals that may lack the same level of resources or support systems."

These policies are essential for minimizing the risks of early discharge, but they may not be uniformly available across all hospitals. It would be interesting to investigate whether the safety of early discharge holds in hospitals that may lack the same level of resources or support systems. For example, hospitals in rural areas or low-resource settings may not have the same capacity to provide intensive lactation support or ensure early follow-up appointments. It would be essential to examine whether early

discharge remains safe in these environments or if additional interventions would be necessary.

In addition, there was also no mention of the genetic differences or demographics of the babies. While the study did indicate that the gender of the babies was one of the characteristics that may impact the results, there was no mention of race. Race is considered a risk factor for hyperbilirubinemia as well as Asian babies tend to have a higher risk of hyperbilirubinemia due to their decreased UGT activity. This calls into question if the study purposely selected infants who were at lower risk of hyperbilirubinemia. As mentioned in the study, the sample size for infants with LOS <24 hours was only six patients and was therefore excluded from the paper's results. This introduces the potential of future studies that can study the relation of the LOS <24 hours with hyperbilirubinemia. It would be interesting to know with more significant sample sizes if LOS <24 hours did not increase hospital readmissions. This would help reduce the emotional and economic burden placed on families.

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The study was also conducted during the COVID-19 pandemic, during which hospital policies and protocols differed. It would have been beneficial to include how the policies differed compared to today. For example, there may have been increased vigilance from both healthcare providers and parents due to heightened health concerns, which could have contributed to the study's outcomes. The lower readmission rates observed for early discharge patients may reflect these unique conditions. As such, it would be interesting to replicate this study in a post-pandemic setting to see if the same results are obtained when external pressures like COVID-19 no longer influence hospital practices and parental behaviors. In particular, it is unclear whether the lower readmission rates associated with early discharge are sustainable under more typical healthcare circumstances.

Further research with larger sample sizes should be conducted better to understand the correlation between LOS and readmissions for hyperbilirubinemia. Multi-center, multi-region data collection would help validate and enhance the generalizability of the findings. Including more recent data after the COVID-19 pandemic would also improve the validity of the paper's findings with the most recent hospital guidelines and policies. Our question to the author would be, have any of the conclusions found in the study changed any of the policies or protocols for discharge currently?

In conclusion, this study presents valuable evidence that early discharge does not necessarily lead to increased readmission rates for hyperbilirubinemia, but further research is needed.

To confirm these findings across diverse settings and populations. The COVID-19 pandemic offered a unique context that may have influenced outcomes in ways that are not replicable in a typical healthcare environment. Additional studies in non-pandemic conditions, across multiple hospital systems, and in vulnerable populations will be necessary to ensure that early discharge policies are safe and effective for all newborns. We commend the authors for their significant contributions to this ongoing discussion and look forward to seeing future research that builds on their findings.

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References:

1. Srinivasan P, Rosenfeld WN, Li D, Bagiella E, Ferguson L. Early Nursery Discharge during COVID-19 and Readmissions for Hyperbilirubinemia. Neonatology Today. 2024 May;19(5):3-9

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Sincerely,

Inesa Navasardyan, OSMIII, Kyle Tran, OSMIII, Ryan Koel, OSMIII

Dear Inesa Navasardyan <inesa.navasardyan@westernu.edu> OSMIII, Kyle Tran, OSMIII, and Ryan Koel, OSMIII

Thank you for a detailed response to the manuscript by Srinivasan et al. on early nursery discharge during the COVID-19 pandemic and readmissions for hyperbilirubinemia. This critique brings forward several considerations that warrant deeper exploration, notably as healthcare systems transition from emergency pandemic protocols. These points contribute to the ongoing discussion of how neonatal care practices should evolve post-pandemic.

"This critique brings forward several considerations that warrant deeper exploration, notably as healthcare systems transition from emergency pandemic protocols. These points contribute to the ongoing discussion of how neonatal care practices should evolve post-pandemic."

First, the study's central limitation is its observational nature. While the findings from Srinivasan et al. are undoubtedly intriguing—suggesting that early discharge may not lead to higher readmission rates for hyperbilirubinemia—this study, by design, cannot establish a causal relationship between early discharge and these outcomes. The reliance on a single institution's experience during a unique and specific period raises questions about the generalizability of these findings. The Baby-Friendly hospital featured in the study offers universal bilirubin screening, strong breastfeeding support, and comprehensive follow-up care, conditions not present in all hospitals, particularly those in rural or low-resource settings. The authors' decision to conduct the study in such a well-resourced institution undoubtedly skews the results in favor of safer early discharge, and as suggested, the same outcomes might not be observed in hospitals without these resources. This is a critical oversight, as implementing early discharge policies without accounting for the variability in hospital resources could lead to unintended consequences for neonatal health.

"The Baby-Friendly hospital featured in the study offers universal bilirubin screening, strong breastfeeding support, and comprehensive follow-up care, conditions not present in all hospitals, particularly those in rural or low-resource settings."

There is an issue of racial and genetic predispositions to hyperbilirubinemia, particularly among Asian infants who have a higher risk due to decreased UGT activity. The exclusion of race from the study's demographic analysis is a significant limitation. Hyperbilirubinemia disproportionately affects certain populations, and ignoring these variations in risk factors limits the study's applicability to more diverse patient populations. This oversight raises a critical question: Were the infants in this study a lower-risk cohort by design, perhaps unintentionally skewing the data toward safer early discharges? If so, this would weaken the study's argument for generalizing early discharge protocols. Future studies must take race and other genetic factors into account to ensure that discharge policies are safe and equitable for all newborns, particularly those at higher risk of hyperbilirubinemia and other neonatal complications.

In addition to demographic considerations, another issue highlighted is the sample size, particularly the exclusion of infants with a length of stay (LOS) of less than 24 hours. While the study suggests that early discharge within 36 hours does not necessarily increase the risk of readmission, excluding infants with an LOS of under 24 hours leaves a significant gap in understanding the safety of ultra-early discharge. The potential for reducing hospital stays to such an extreme must be approached with caution, and without a larger sample size of infants in this category, it is not easy to ascertain whether this practice could be safely implemented on a larger scale. While the study was designed to be prospective and observational, it would have been valuable for the authors to at least consider the impact of ultra-early discharge and initiate discussions around this critical area. As mentioned, a more robust investigation with a larger sample size of infants discharged before 24 hours would be essential to inform better discharge practices that reduce both the emotional and economic burden on families while ensuring patient safety.

"While the study was designed to be prospective and observational, it would have been valuable for the authors to at least consider the impact of ultra-early discharge and initiate discussions around this critical area. As mentioned, a more robust investigation with a larger sample size of infants discharged before 24 hours would be essential to inform better discharge practices that reduce both the emotional and economic burden on families while ensuring patient safety."

Moreover, the unique context of the COVID-19 pandemic undoubtedly influenced the study's results. Hospitals during this time were under extraordinary pressure to minimize exposure to the virus, leading to modified protocols and heightened vigilance among healthcare providers and families alike. These exceptional circumstances likely contributed to the outcomes observed, and it is questionable whether the same vigilance would be sustainable in a post-pandemic healthcare environment. For instance, parents may have been more cautious about follow-up care, and healthcare providers may have been more diligent in screening for complications due to heightened health concerns during the pandemic. It is critical to ask whether these conditions can be replicated under normal circumstances and whether early discharge remains safe once hospitals return to more typical surveillance and parental engagement levels. The suggestion to replicate this study in a post-pandemic setting is well-taken and necessary to ensure that the observed benefits of early discharge can be maintained in a more traditional healthcare setting.

Finally, there is the point regarding the financial implications of early discharge. While the study and subsequent commentary suggest that early discharge could lead to significant cost savings for hospitals and families, this argument must be approached cautiously. Cost savings should never outweigh the patient's safety, and while reducing the length of stay may decrease hospital charges, this practice must be balanced with adequate follow-up care and access to resources that ensure newborns discharged early are not at increased risk for readmission or other complications. The authors suggest that early discharge is financially

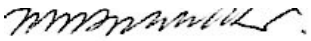
beneficial, but this argument fails to account for the potential costs associated with readmissions, additional follow-up visits, and long-term complications that could arise from insufficient post-discharge support. These financial implications must be examined in future studies to ensure that the drive for cost-effectiveness does not come at the expense of patient safety.

"Cost savings should never outweigh the patient's safety, and while reducing the length of stay may decrease hospital charges, this practice must be balanced with adequate follow-up care and access to resources that ensure newborns discharged early are not at increased risk for readmission or other complications."

In conclusion, while the study by Srinivasan et al. offers valuable preliminary data on early discharge during the COVID-19 pandemic, it is clear that further research is needed to validate these findings. We echo the call for larger, multi-center studies that include diverse populations, address racial and genetic predispositions, and consider the realities of post-pandemic healthcare environments. Whether early discharge can be safely implemented across various hospital systems remains open, and future research must provide a more comprehensive understanding of how to optimize newborn care in the face of evolving healthcare challenges.

This is a critical evaluation of this important study. These comments contribute meaningfully to the ongoing discourse on early discharge practices and help pave the way for future research that prioritizes both safety and equity in neonatal care.

Sincerely,



Mitchell Goldstein, MD, MBA, CML

Editor in Chief

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Erratum (Neonatology Today August, 2024)

There were no reported erratum for August, 2024

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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Neonatology Today welcomes your editorial commentary on previously published manuscripts, news items, and other academic material relevant to the fields of Neonatology and Perinatology.

Please address your response in the form of a letter. For further formatting questions and submissions, please contact Mitchell Goldstein, MD at LomaLindaPublishingCompany@gmail.com.

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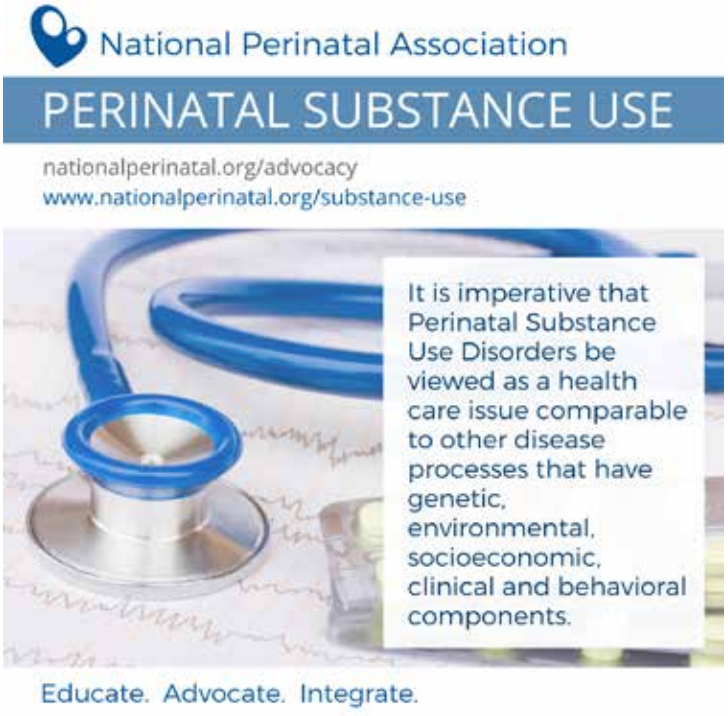


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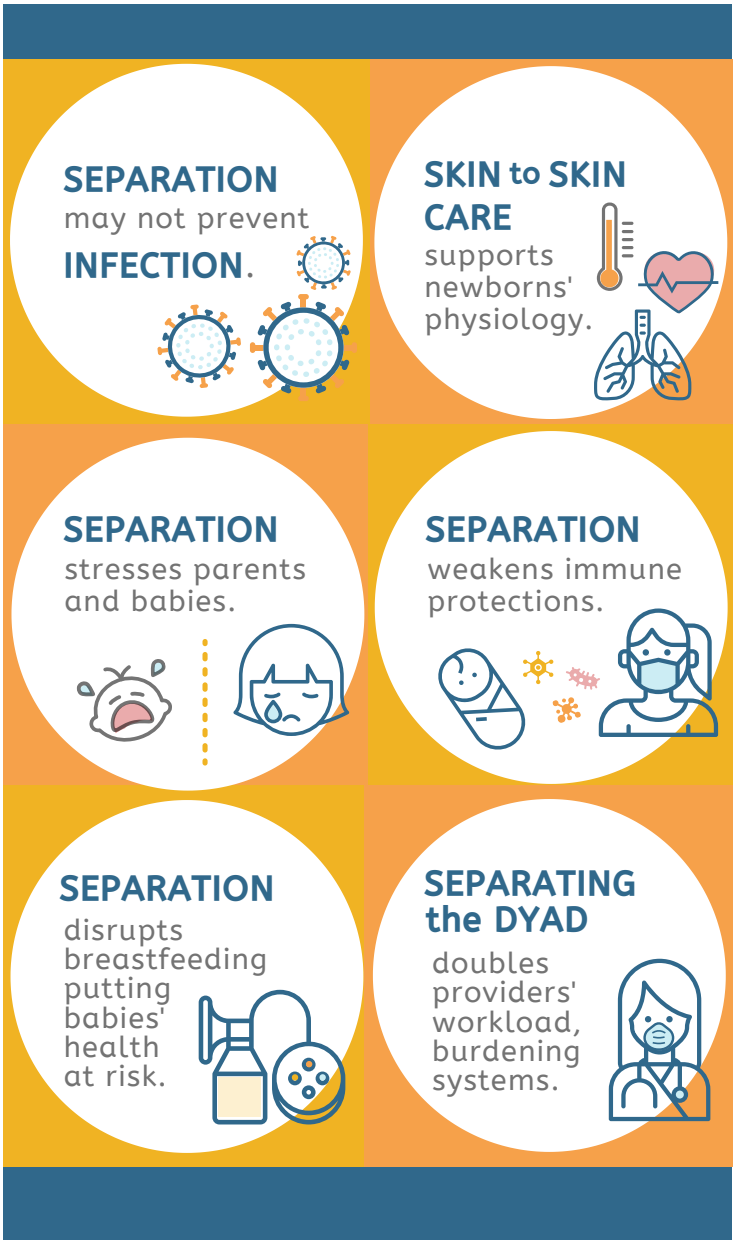
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Should Infants Be Separated from Mothers with COVID-19?

FIRST DO NO HARM



BASED ON THE ARTICLE:

Should Infants Be Separated from Mothers with COVID-19? First, Do No Harm

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Gravens by Design: Highlights of the 2025 Gravens Conference on the Environment of Care for High-Risk Newborns and Their Families

Robert D. White, MD, Joy V. Browne, PhD, PCNS, IMH-E, Vincent Smith, MD

"The 38th Gravens Conference will convene in Clearwater Beach, FL, on March 5-8. As always, there will be many opportunities to network with colleagues who are exploring better ways to provide care to our babies and their families, commercial vendors offering products to assist in this goal, and a variety of presentations, workshops, and abstracts that will summarize the state of the art and science in our rapidly evolving specialty."

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"The first day of the Gravens Conference is devoted to presentations focused on the state of the science on the environment of care in the NICU. This year's theme is 'Providing Safe Spaces for Babies, Families, and Staff' and will be opened with a presentation from a parent on 'What Makes a Safe Space?'"

The first day of the Gravens Conference is devoted to presentations focused on the state of the science on the environment of care in the NICU. This year's theme is "Providing Safe Spaces for Babies, Families, and Staff" and will be opened with a presentation from a parent on "What Makes a Safe Space?" Subsequent presentations will include a discussion of pain assessment and management, palliative and end-of-life care, advocacy, circadian rhythms, and using AI in the NICU. A highlight of the day will be the presentation of the Gravens Award to Dr. John Hartline, who will offer a historical perspective of Dr. Gravens' impact on the dramatic changes in our discipline since the early days of NICU care.

Participants can choose the Infant and Family-Centered Care (IFCDC) Track or the NICU Design Track on day two. The IFCDC track will address three primary evidence-based Standards, Competencies, and Best Practices for caring for babies in intensive care. As always, we intend to support integrating evidence-based recommendations into caregiving practices. Using a *systems* thinking perspective, Dr. Jennifer diBari will present her professional and personal experience with how the standards could alleviate family stress and how these recommendations fit into the advocacy framework for lifelong family growth.

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Last year, we addressed alleviating pain and stress in newborns. At the upcoming 2025 conference, Dr. Richard Shaw will review the evidence for alleviating pain and stress in family members. Dr. Amy Salisbury will then present a comprehensive review of the evidence for supporting sleep and arousal for babies in intensive care. The next speaker will address scientific rationale and support strategies for optimizing positioning and touch, which are integral in the everyday care of babies in intensive care.

A following panel discussion with experienced clinicians will highlight their experience with how they approached systems change for each of the standards presented in the track. Rose Bigsby will discuss her experience implementing sleep and arousal protection for the developing newborn. Dr. Michael Hynan will provide his recommendations for implementing successful stress reduction practices with family members. Similarly, implementing appropriate touch and positioning strategies for babies in intensive care will be discussed.

We always learn from each other, so there will be an open discussion with the audience of successful and challenging approaches to advance change in these practice areas.

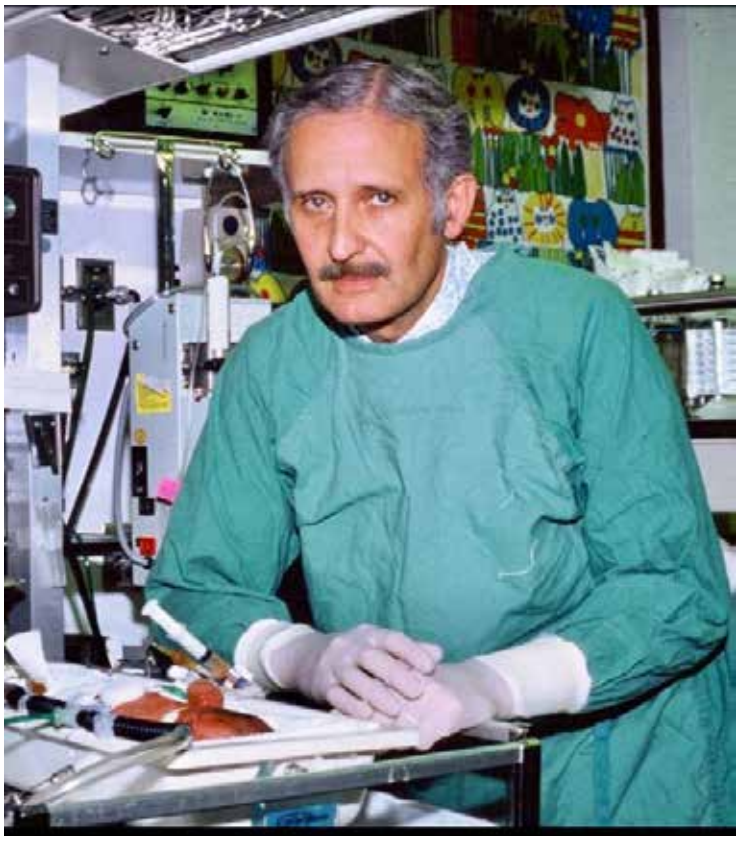
The IFCDC consensus panel has been working to update the current standards. Their efforts will add new research in support of the standards and will streamline access to their use. We will present the updates to the audience members and request their

review and recommendations as the updated standards are finalized.

"Another approach associated with the IFCDC's efforts to provide sound practice recommendations is a virtual preconference on the basic science of sensory development. It will be the first of a three-phased series designed to culminate in recommendations for best practices."

Another approach associated with the IFCDC's efforts to provide sound practice recommendations is a virtual preconference on the basic science of sensory development. It will be the first of a three-phased series designed to culminate in recommendations for best practices. The goal is to optimize evidence-based practices that are appropriate for and enhance the sensory environment for high-risk babies and their families. The half-day preconference will be held the day before the Gravens meeting and is currently under construction.

In the design track, our new unit presentation will be conducted by Dr. Gregg Martin, who will describe the features of the new NICU at Phoenix Children's Hospital. The circadian biology theme from day one will be continued with a presentation by Dr. James Greenberg on the impact of NICU lighting on retinal development. Dr. Jay Yoon will discuss "Designing for Happiness in the ICU." Dr. Kris DeCoen and Geert Lingier, neonatologist and head nurse, respectively, will describe the planning that went into moving from an open multi-bed NICU to a single-family room design, and the morning will conclude with our "crowdsourcing" session where attendees can pose their design questions and challenges to the entire audience of architects and experienced clinicians.



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The afternoon of day two is open to allow for informal meetings and sunshine therapy.

Day three provides many choices of workshops and abstract presentations relevant to the Gravens theme; the topics for these will be available on the Conference website.

The Saturday morning theme is "What is Your Why? Finding meaning and doing meaningful work". The morning will begin with Mollie Faust-Wylie, a NICU parent, who describes how the NICU experience altered the course of her life. She will be followed by Dr. Erick Rideout, who will discuss how NICU leadership can create a pleasurable and meaningful environment for those working in the NICU. Then, Dr. Susan Hwang and Dr. Laurie Sherlock, a NICU parent and neonatologist, will discuss the meaning of NICU admission and the transition to home for a family with an infant in the NICU. The morning and the conference will conclude with a panel composed of NICU parents.

"Throughout the Gravens Conference, there will be many opportunities to network with colleagues who have encountered challenges similar to those you might be facing. There will also be virtual options, both real-time and recorded, for those who cannot attend in person. Many of these presentations would be suitable for a local NICU team to watch together and then discuss the implementation of the ideas they liked."

Throughout the Gravens Conference, there will be many opportunities to network with colleagues who have encountered challenges similar to those you might be facing. There will also be virtual options, both real-time and recorded, for those who cannot attend in person. Many of these presentations would be suitable

for a local NICU team to watch together and then discuss the implementation of the ideas they liked.

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

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HAVE QUESTIONS? PLEASE EMAIL

Kelly McGlothen-Bell
(mcglothen@uthscsa.edu)
Christie Lawrence
(Christie_Lawrence@rush.edu)

*Please use the Google Chrome browser; eligibility requirements do apply

Review Committee for Pediatrics (RC-Peds) Nominee Qualifications

To qualify to be nominated to the RC-Peds for this position, the candidate:

- must be a board-certified pediatrician or pediatric subspecialist with a background in education and expertise in graduate medical education.
- should have at least three years of experience as a program director of an ACGME-accredited pediatrics residency program or pediatric subspecialty fellowship or three years of experience as a designated institutional official. The nominee's program must be in good standing with a status of Continued Accreditation.
- must have a current or past association with graduate medical education.
- should participate in major specialty societies.
- must be skilled in the use of computers (communication with staff is primarily through email, and members will use electronic systems for receipt of agenda materials, program reviews, reimbursement of expenses, and peer evaluations).
- must demonstrate fairness, the ability to work collaboratively, and express views clearly and concisely.
- must be able to attend an observation meeting, April 10-11, 2025, prior to the start of the term.
- must devote sufficient time to prepare for and participate in three RC meetings per year (January, April, and September), two-three days per meeting, as well as contribute to RC-Peds subcommittee work as assigned.
- ideally, will not hold the same subspecialty certifications as the members of the RC-Peds at the time of appointment. The RC-Peds strives to maintain a balance of specialties; it is preferable that individuals from the following specialties are not nominated:
    - General Pediatrics
    - Internal-Medicine Pediatrics
    - Pediatric Hospital Medicine
    - Pediatric Emergency Medicine
    - Neonatal-Perinatal Medicine
    - Pediatric Critical Care Medicine
    - Pediatric Endocrinology
- must not be at the same institution as any member of the RC-Peds at the time of appointment.
    - *Same-Institution Disqualification: Although the RC-Peds may have multiple members from the same state, they may not be from the same institution. Accordingly, individuals must not be nominated from the following institutions:*
        - UC Davis (Davis, CA)
        - Stanford University (Stanford, CA)
        - University of Colorado (Aurora, CO)
        - Advocate Children's Hospital (Park Ridge, IL)
        - Mayo Clinic (Rochester, MN)
        - Columbia University College of Physicians & Surgeons (Yonkers, NY)
        - Goryeb Children's Hospital-Atlantic Health System (Morristown, NJ)
        - University of North Carolina School of Medicine (Chapel Hill, NC)
        - Cincinnati Children’s Hospital Medical Center (Cincinnati, OH)
        - University of Texas Health San Antonio (San Antonio, TX)
        - University of Washington/Seattle Children's (Seattle, WA)

The RC-Peds expects the AAP to consider diversity and inclusion when submitting its nominations.

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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.

Thick yellow, green, or grey mucus

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

Fever that is more than 101° Fahrenheit

101°

which is especially dangerous for babies younger that 3 months

National Perinatal Association

www.nationalperinatal.org/rsv

Why Pregnant and Nursing Women Need Clear Guidance on

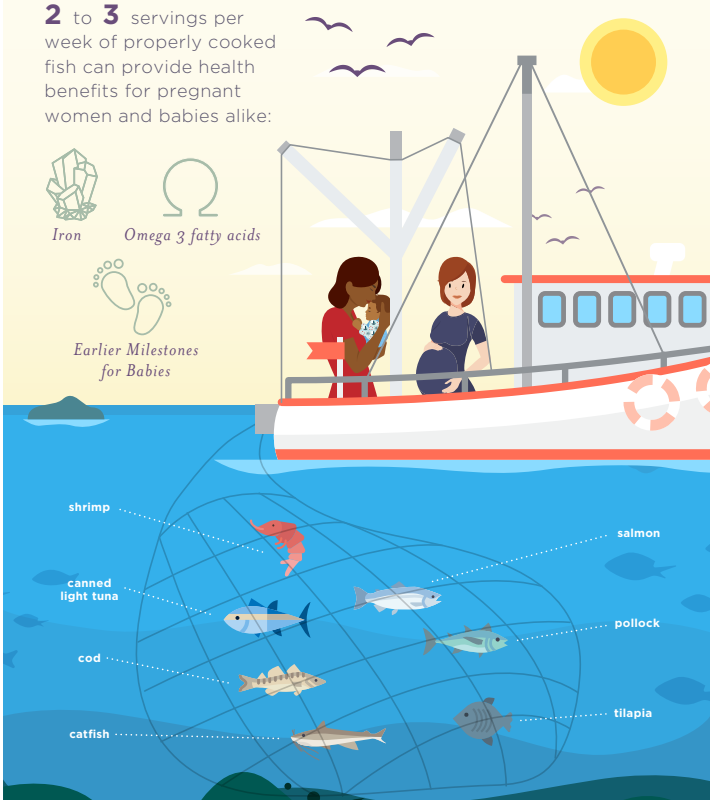
THE NET BENEFITS OF EATING FISH

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.



GET THE FACTS
ON FISH CONSUMPTION FOR PREGNANT WOMEN, INFANTS, AND NURSING MOMS.

NCfIH National Coalition for Infant Health

LEARN MORE

Resistance and Compliance: It is not always the Lungs

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.

Change is often said to be inevitable; everything changes, and nothing stays the same. This holds in medicine as in life. However, if a change in the "real world" happens at light speed, it often happens at a snail's pace in medicine.

"Change is often said to be inevitable; everything changes, and nothing stays the same. This holds in medicine as in life. However, if a change in the 'real world' happens at light speed, it often happens at a snail's pace in medicine."

We deal in human lives. This is understandable as the consequences of change or the long-term consequences of implementing change can be dire. Research ethics boards now place much greater scrutiny on studies involving human subjects. Double-blind, randomized, controlled, independently audited studies now provide higher quality evidence (when properly designed!) to guide us in deciding whether or not change should be implemented. Coupled with the high cost of litigation when things do not go as planned, tragedies like thalidomide are (hopefully!) a thing of the past.

The aforementioned notwithstanding, results may not be desirable. Cost and shareholder value may result in unscrupulous cherry-picking, obfuscating, or downright hiding undesirable findings (for instance, Vioxx). Thankfully, this happens rarely. The cost of unscrupulous methodology uncovered after a product or device is introduced is much higher than admitting them and quitting when ahead.

Regulatory approval does not guarantee success when something new reaches the sales and marketing point. The consumers' desire for new gadgets does not always extend to medicine. Reasons are varied, i.e., it does the same job as a tried-and-true therapy that may cost less, whereas sometimes it defies logic, such as when high-quality evidence strongly suggests a superior product with improved outcomes and lower risk is rejected.

Why do those who identify as people of science reject change that is clearly positive? While it is easy to blame medical staff, resistance to change occurs right down the line from "bean counters" to physicians to those at the bedside. Can we lead the horses to water *and* make them drink?

Personal preference

The reluctance to implement something new is understandable when perceived benefits and potential cost savings are marginal. However, progress is hindered when resistance stems from personal opinion, practice, or downright intransigence. Whether from upper management, medical staff, or bedside caregivers, shutting the door on therapies that offer proven benefits to patients is counterproductive at best and flies in the face of "first do no harm" at worst.

"The reluctance to implement something new is understandable when perceived benefits and potential cost savings are marginal. However, progress is hindered when resistance stems from personal opinion, practice, or downright intransigence. Whether from upper management, medical staff, or bedside caregivers, shutting the door on therapies that offer proven benefits to patients is counterproductive at best and flies in the face of "first do no harm" at worst."

A friend and former colleague penned an editorial in 2009 titled "The Art of Inconsistency: Evidence-Based Practice My Way" (1). It raised some hackles then, and were it published today, it

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would likely do the same. Though 15 years have passed since its publication, it is as relevant today as it was then. When some clinicians adopt something new (and the evidence to support it is strong), and some do not, the seeds of doubt regarding its efficacy are sown. Care division along the lines of yay vs nay groups are not conducive to practice change; the nays often win out, and the status quo continues.

We can all think of a new piece of equipment, introduced with great fanfare and excitement, that collects dust in a storage room like a prom dress in a closet. How often is this because person A uses it, followed by person B, who takes it away in favour of the status quo? It should be no surprise when person A eventually throws their hands up and simply gives up. Not only does this represent a waste of capital equipment resources, but it also erodes person A's confidence and morale. Eventually, this leads to burnout and the loss of experienced staff members (1). Nobody, including the patient, wins.

"If it ain't broke, don't fix it."

When a change in practice is proposed, that change is more likely to be embraced if it involves an area where a unit is underperforming and a desire to improve. Efforts to change practice are more likely to be successful if the benefits derived therefrom are easily quantifiable. The greater the numbers needed to treat to show improvement, the harder the sell.

"When a change in practice is proposed, that change is more likely to be embraced if it involves an area where a unit is underperforming and a desire to improve. Efforts to change practice are more likely to be successful if the benefits derived therefrom are easily quantifiable. The greater the numbers needed to treat to show improvement, the harder the sell."

For instance, staff working in a unit with stellar respiratory outcomes may balk at changes in practice, especially if they come from other centres that do not do as well. Improving chronic lung disease outcomes in a unit with a 30% rate is relatively easy; when that rate is 10%, not so much.

Conversely, introducing new equipment to a high-functioning respiratory therapy department may not be as difficult. This may be partly because high-performing respiratory therapists may be more eager to try new things. Indeed, eagerness to trial new equipment may contribute to good outcomes, providing that equipment offers something that is not just new but improved. The unit where I practice has a long history of being the first to use various ventilation modes as they are offered. (We also have a long history of being the first to use new equipment and modalities.)

I want to be a cowboy.

The term "cowboy" in medicine is often used in a derogatory manner. This is never acceptable. Calculated risks have always been a part of medicine, but those willing to colour outside the lines may be considered reckless, even dangerous. Medicine needs clinicians who recognise when the status quo is failing a patient and are willing to stray outside of guidelines to provide the treatment the patient requires. In addition, "cowboys" may drive changes in practice and be more willing to try new equipment and modalities. Remember, cowboys only get paid for the cows delivered, not those who die. (Full disclosure: I am often referred to as a cowboy, but it is generally with admiration, not denigration.)

Cynics, naysayers, and the intransigent

Every unit has them: staff who are adept at bad-mouthing just about anything, including proposed changes. It is best not to involve these people in introducing anything. Instead, seek out influencers, early adaptors, and innovators among staff. They are much more likely to generate excitement and convince other staff to give things a chance. Eventually, those who resist change will come along, kicking and screaming, though they may be, especially if the benefits of the change are incontrovertible.

The medium is the message.

The nature of sales and marketing makes a degree of cynicism natural, even prudent when a company representative introduces the latest great thing that goes "ding". Studies funded by manufacturers are met with skepticism; thus, the glowing review a sales rep presents to staff is naturally met the same way. Sales is a challenging but necessary job, and reps are essential in training staff to use new devices. Regarding staff acceptance, though, testimonials from clinicians familiar with equipment through their practice are invaluable. Fellow clinicians experienced with the use of equipment can relate their experience, good and bad, with a device. In doing so, a rapport between them and new users is hard to emulate with a sales rep who may be years removed from the bedside.

"Introducing changes in practice or new equipment must be reinforced with repetitive messaging and interaction with end users. It takes time for staff to embrace change and address concerns they may have during implementation. If staff members feel their concerns are heard and addressed, they are more likely to cooperate with those introducing new things."

Lather, rinse, repeat.

Introducing changes in practice or new equipment must be reinforced with repetitive messaging and interaction with end users. It takes time for staff to embrace change and address

concerns they may have during implementation. If staff members feel their concerns are heard and addressed, they are more likely to cooperate with those introducing new things.

An in-service is not enough to make a clinician an expert in the use of a device, particularly as medical devices become more and more complex. Recruiting a team of early adopters and innovators to provide ongoing support to those at the bedside is invaluable and essential for the safe introduction of change. I cannot count the number of times I have found something in the layered menu of a device, only to spend more time trying to remember where I found it. This leads to frustration easily avoided if someone is readily available to refresh one's memory.

Hotlines manned 24/7 by knowledgeable company representatives are invaluable and go a long way towards easing fears that may surround something new. They should be de rigueur.

Just remember that ram.

Successfully changing practice or introducing new equipment is an uphill journey. Do not give up on something that benefits patients and/or staff. Eventually, the proof of its superiority will be established, and that hill will crest. Like that ram, that will only happen if one keeps trying.

Bonne chance!

References:

1. Golec L. The art of inconsistency: evidence-based practice my way. J Perinatol. 2009 Sep;29(9):600-2. doi: 10.1038/jp.2009.98. PMID: 19710655.

2. Footnote: I would like to thank Kim Firestone, RRT, for suggesting the topic for this column and for her assistance in implementing change in our NICU.

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.

NT

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

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August 9, 1996 - April 3, 2010

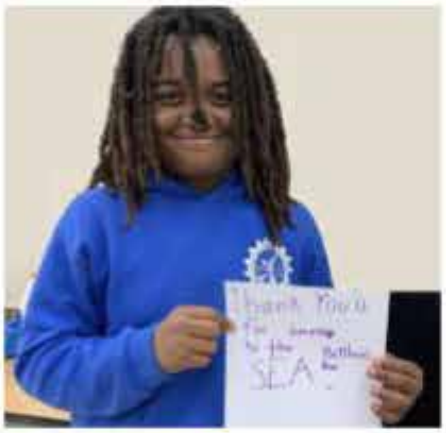


Each year, the Emily Shane Foundation SEA(Successful Educational Achievement) Program provides academic and mentoring support to over 100 disadvantaged middle school students who risk failure and have no other recourse. We have served over 700 children across Los Angeles since our inception in the spring 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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The average cost for the program to provide a mentor/ tutor for one child is listed below.



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1 week	$30
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1 year	$1,080
Middle School	$3,240

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

The Village Son



A Life's Journey

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

Houchang D. Modanlou

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National Perinatal Association
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2024

Respiratory Syncytial Virus:

How you can advocate for babies this RSV season

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



Identify the babies at greatest risk



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

Teach families how to protect



their babies from respiratory infections

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



Use your best clinical judgement



when prescribing RSV prophylaxis

Tell insurers what families need



and provide the supporting evidence

National Perinatal Association

www.nationalperinatal.org/rsv

Destiny Stokes, MPH, Joins First Candle as Programs Expand

Alison Jacobson

Saving babies. Supporting families.

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

"We at First Candle are pleased to announce that Destiny Stokes, MPH, has joined the organization as Program Director."

We at First Candle are pleased to announce that **Destiny Stokes, MPH,** has joined the organization as Program Director. She was previously Research Manager at Healthy Mothers Healthy Babies Coalition of Georgia, which has been First Candle's partner in executing a three-year grant from the U.S. Department of Health and Human Services Office of Minority Health, focusing on infant mortality in the Atlanta Perinatal Region.



She will be responsible for program strategic planning, management, and community and stakeholder engagement. This includes expanding the Let's Talk Community Chat program, a community-based initiative that educates and supports families on infant safe sleep practices and breastfeeding. (1)

She holds a Master of Public Health degree in Health Promotion and Behavior and a B.S. in Biology from Georgia State University.

Destiny's deep knowledge of maternal and infant health and health equity makes her the perfect candidate for this position. Her having worked closely with First Candle for several years is a bonus that will allow her to guide the other Let's Talk programs successfully.

The Let's Talk program allows families to discuss and learn about infant-safe sleep and breastfeeding at monthly gatherings in convenient local settings. Sessions are led by First Candle-trained peers, who are joined by doulas, lactation consultants, and other local healthcare resources.

The program grew out of listening sessions we held in 2020 and 2021 with parents and family members in several U.S. locations. During these sessions, we learned a lot about their infant sleep practices, day-to-day realities, and how they cope with healthcare and safe sleep advice.

Then, in May 2022, we launched Let's Talk Community Chats in Harlem, partnering with Hope Center Harlem and with support from the Ryan Wolfe Kossar Foundation.

Since then, Let's Talk has expanded to three additional communities in Atlanta and one in Philadelphia. We have reached more than 200 parents directly and exponentially more through indirect outreach, as families share what they've learned with other family members and friends. Their community feedback is boosting our skills in reaching future families—a true community-based feedback loop.

"Let's Talk complements First Candle's Straight Talk for Infant Safe Sleep program, which began in 2018. The program helps healthcare professionals learn effective ways to counsel families in safe sleep practices through awareness of cultural and socioeconomic realities. To date, trainings have been conducted in 15 states."

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Our work in Let's Talk Community Chats and Straight Talk for Safe Sleep brings us full circle with families and healthcare professionals—by working with both audiences, we can share each other's perspectives.

To learn more about these programs and our bereavement support services, please visit us at www.firstcandle.org

References:

1. https://firstcandle.org/lets-talk-community-chats/#
2. https://firstcandle.org/community-work/straight-talk-infant-safe-sleep-program/

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

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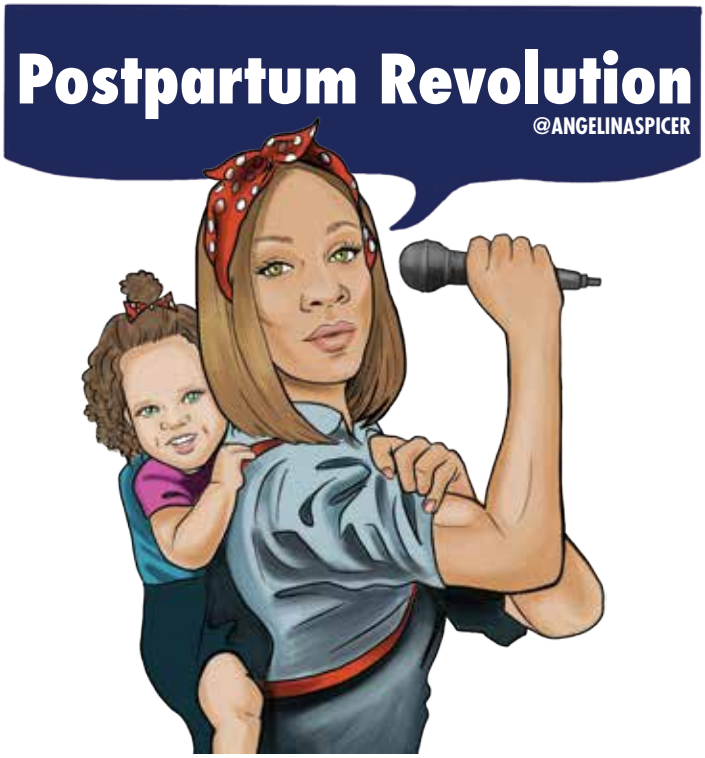
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Email: Alison@firstcandle.org

About First Candle

First Candle, based in New Canaan, CT, is a 501c (3) committed to eliminating Sudden Unexpected Infant Death while providing bereavement support for families who have suffered a loss. Sudden Unexpected Infant Death (SUID), which includes SIDS and Accidental Suffocation and Strangulation in Bed (ASSB), remains the leading cause of death for babies one month to one year of age, resulting in 3,500 infant deaths nationwide per year.

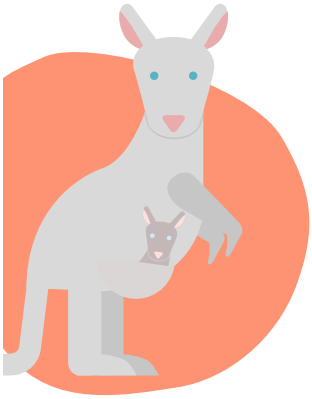






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SKIN-TO-SKIN CARE DURING COVID-19



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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Raising Global Awareness of RSV

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

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

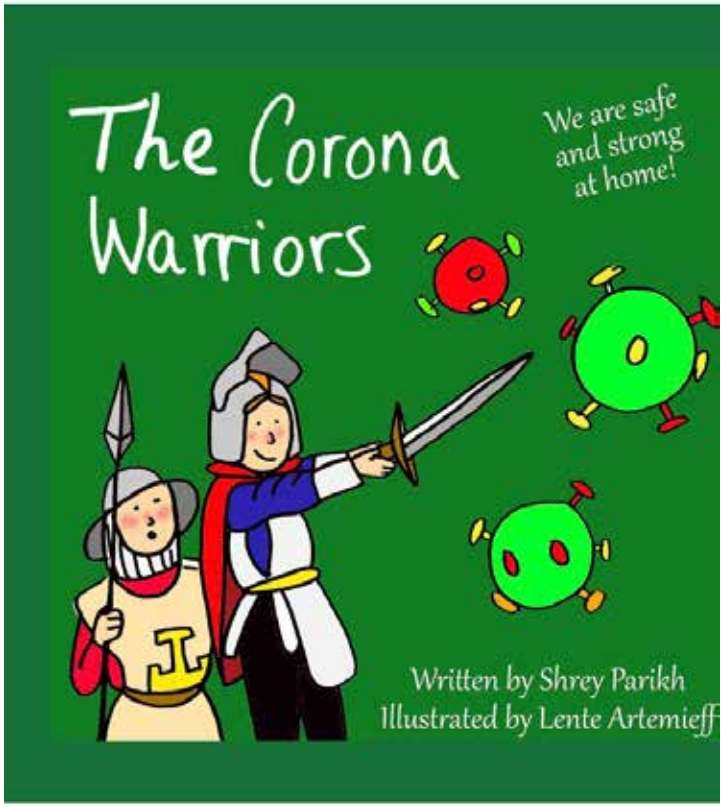
They have produced a personal video entitled "*Why we should all know about RSV*" about Simone van Wyck, a mother who lost her son due to RSV. The video is available at www.rsvgold.com/awareness and can also be watched using the QR code on this page. Please share the video with your colleagues, family,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

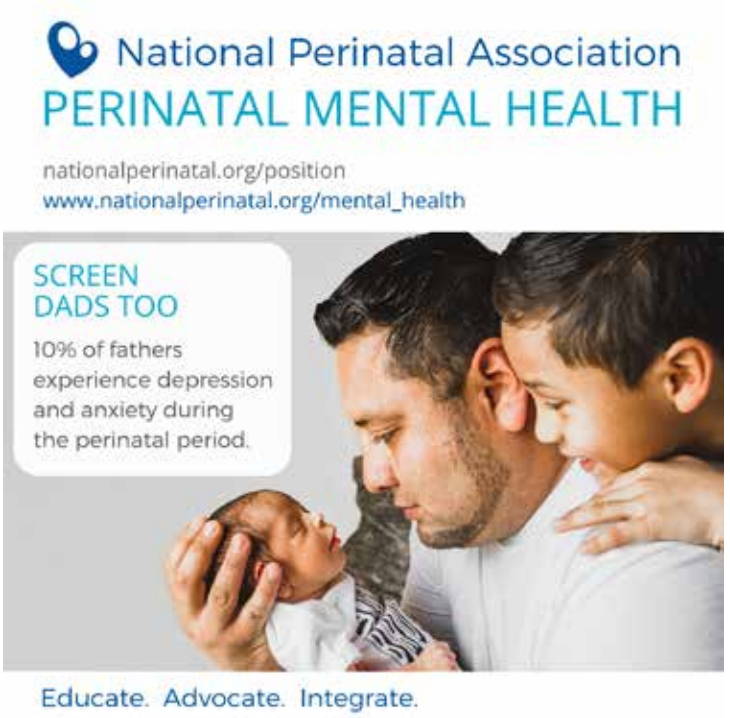


RSV GOLD

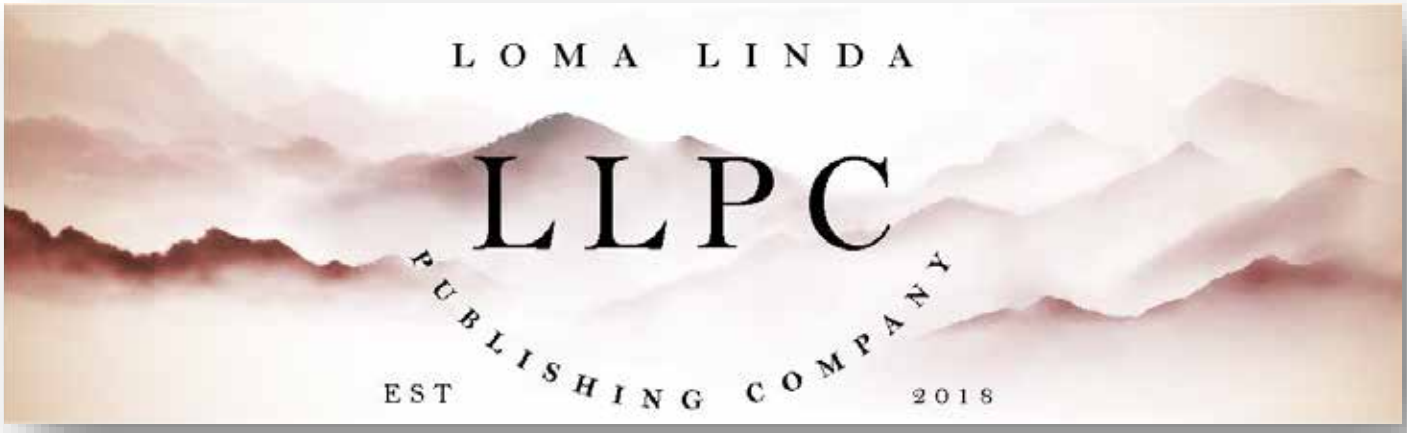
A Global Mortality Database for Children with RSV Infection

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





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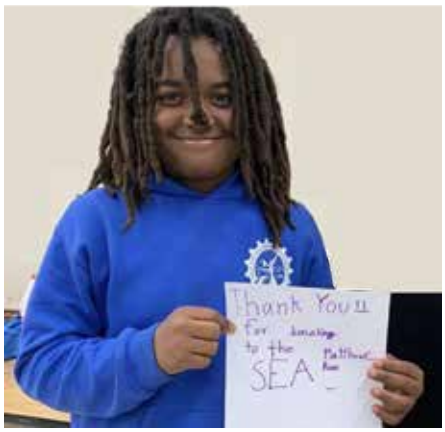


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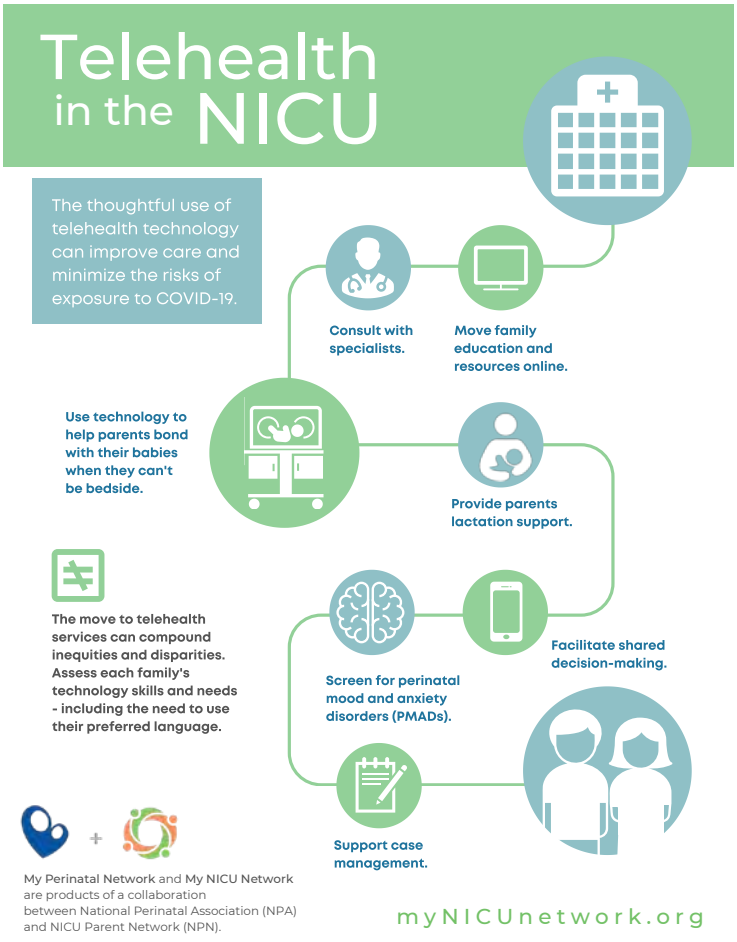


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Middle School	$3,240

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National Coalition for Infant Health: Statement on Nutritional Practices in the NICU for Extremely Low Birth Weight Infants

Susan Hepworth, Mitchell Goldstein, MD, MBA, CML

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

The National Coalition for Infant Health emphasizes the critical importance of individualized nutritional care in the Neonatal Intensive Care Unit (NICU), particularly for extremely low birth weight (ELBW) infants weighing less than 1250 grams.

Research strongly supports the use of an exclusive human milk diet as the safest and most effective nutritional approach for these vulnerable infants in the NICU, including human milk-based formulas and fortifiers. These fragile infants require additional nutritional fortification to achieve critical growth milestones. An exclusive human milk diet is the safest way to achieve growth outcomes while reducing the risk of a life-threatening condition, necrotizing enterocolitis (NEC). (1,2)



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For extremely premature and low birth weight infants, achieving the necessary caloric and nutrient intake to support growth is a challenge, even with breast milk. These infants require additional fortification to meet their elevated nutritional needs, which is where human milk-based fortifiers and formulas come into play. When added to an infant's diet, these fortifiers provide extra protein, calories, and micronutrients for brain development, bone growth, and overall health.

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The use of an EHMD is significant because it reduces the risk of necrotizing enterocolitis (NEC), a life-threatening condition that predominantly affects premature infants. NEC causes inflammation and, in severe cases, tissue death in the intestines, often leading to critical illness or even death. Studies have found that infants fed an exclusive human milk diet have a lower incidence of NEC, reducing mortality and long-term complications.

The nutritional benefits of an EHMD extend beyond reducing NEC risk, including cost avoidance. Research indicates that infants on an exclusive human milk diet experience improved gastrointestinal health, better feeding tolerance, reduced need for surgery related to gut complications, and more favorable neurodevelopmental outcomes later in life. These benefits highlight human milk's protective, anti-inflammatory, and growth-promoting properties, making it the gold standard for feeding the most vulnerable infants in the NICU. (1,2)

We call on neonatal healthcare providers to provide information on all available nutritional options to families and to engage with them in shared decision-making regarding the nutrition their babies receive in the NICU.

The coalition is committed to promoting evidence-based practices and prioritizing the health and safety of the most fragile infants in the NICU.

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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.

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

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Your Pregnancy and Substance Use

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



Get Prenatal Care

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



Reduce Your Use

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

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

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



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

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

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



Take Good Care of Yourself

You deserve a healthy pregnancy & childbirth.

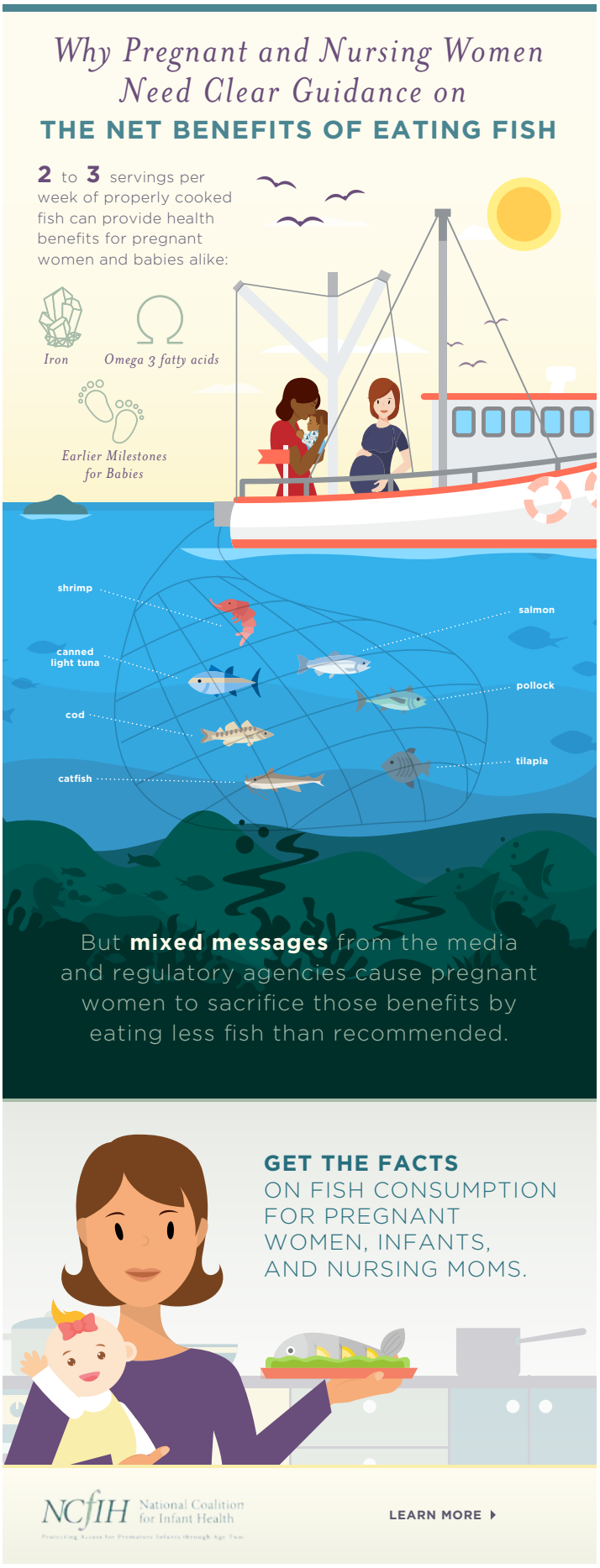
- Eat healthy and take your prenatal vitamins
- Find the right balance of rest and exercise
- Surround yourself with people who care

Your Health Matters

Academy of Perinatal Harm Reduction

National Perinatal Association

www.perinatalharmreduction.org | www.nationalperinatal.org



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

KEEPING MOTHERS + INFANTS TOGETHER

Means balancing the risks of...

- HORIZONTAL INFECTION
- SEPARATION AND TRAUMA





EVIDENCE

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

PARTNERSHIP

What is the best for this unique dyad?

SHARED DECISION-MAKING

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





TRAUMA-INFORMED

Both parents and providers are confronting significant...

- FEAR
- GRIEF
- UNCERTAINTY

LONGITUDINAL DATA

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

- MENTAL HEALTH
- POSTPARTUM CARE DELIVERY



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

Partnering for patient-centered care when it matters most.

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Infant and Family-Centered Developmental Care Standards Implementation: An Emphasis on Early Relational Health for Babies and Parents in Intensive Care

Joy V. Browne, Ph.D., PCNS, IMH-E

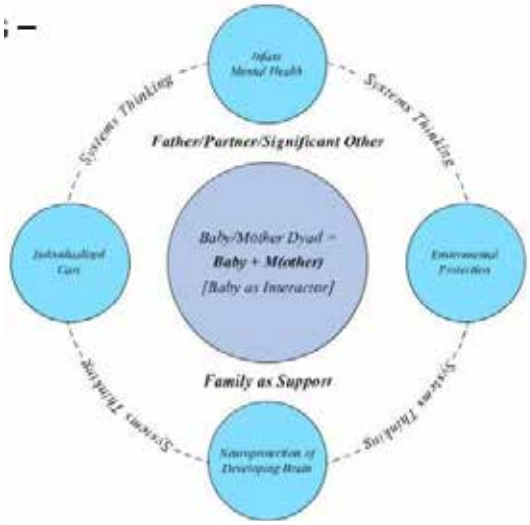


"There is no such thing as a baby…..there is only the baby and someone."

The Theory of the Parent-Infant Relationship (footnote),1960 Donald Winnicott

The statement by Winnicott recognizes the importance of nurturing babies and mothers as a dyadic unit, each contributing to the survival and optimal outcome of the other.

At the center of the IFCDC standards concept model is promoting close, intimate, and regulatory relationships between the mother and her baby, supported by significant family members.



The initial physiologic, emotional, and sensory exchange between the two begins in utero, providing continuity for their ongoing relationship and a foundation for attachment. (1) Ideally, babies and mothers are not separated at birth, so they can immediately and consistently engage in physiological and emotional exchanges that begin a close bidirectional early relationship.

Early relationship health

Early relationship health is now recognized as essential to a child's cognitive, emotional, social, and physical development and is described as "the positive, nurturing relationships that build on interpersonal connections and emotional security of young children." The emphasis on *safe, stable nurturing relationships (*SSNRs) is considered a biological and physiological necessities for babies and young children (2-4).

"Early relationship health is now recognized as essential to a child's cognitive, emotional, social, and physical development and is described as "the positive, nurturing relationships that build on interpersonal connections and emotional security of young children." The emphasis on safe, stable nurturing relationships (SSNRs) is considered a biological and physiological necessities for babies and young children (2-4)."

SSNRs provide regulation of the baby's physiology, motor tone, posture and movement, arousal and sleep, and beginning social interaction. These regulatory processes are foundational to later development and are mainly influenced in the early perinatal period. Early relationships play a central role in organizing babies' brains and shaping stress-related physiology during the sensitive period of heightened neuroplasticity. Brain organization is especially molded by caregiver input, so disruption of the parent-infant relationship can lead to longstanding behavioral and neural consequences.(5)

Babies come biologically prepared for early relationships and social communication. Supportive and protective SSNRs provide the foundation for social interaction, emotion, emotion regulation, and learning and have implications for lifelong socioemotional development and resilience to adverse events. (6-8) Parental buffering regulates the baby's emotional behaviors and stress physiology as emotion regulation circuitry continues to develop. (9-11) SSNRs ultimately affect how the child can respond to toxic stress and build resilience in the face of lifelong experiences. https://www.gse.harvard.edu/ideas/usable-knowledge/23/09/why-relationships-really-matter-our-earliest-years.

Research into parents' sensitive periods has revealed not only neuroendocrine but many brain size and organization changes that contribute to their role in being ready for a nurturing relationship with their baby. (9, 12-14) Both fathers and mothers experience physiological changes during pregnancy, after delivery, and while they engage in parenting behaviors. (15-18) These neuroendocrine, brain, and behavioral changes make mothers more receptive to their baby's behavior and better able to provide nurturing care. (14, 19, 20) (for a good resource on sensitive periods, see https://ascend.aspeninstitute.org/wpcontent/uploads/2017/10/Two20Open20Windows_Infant20and20Parent20Neurologic20Change_Watamura_Kim_Ascend20at20the20Aspen20Institute.pdf)

Relationship development through biobehavioral synchrony

Parents and babies establish relationships primarily through biobehavioral exchanges that start in utero and lay a foundation for ongoing relationship building after birth. Synchronous bidirectional physiological neurohormonal and behavioral exchanges occur through close and intimate proximity between mother and baby. Early physical and social interactions with the parent affect the baby's brain structure, physiology, and development. (9-11)

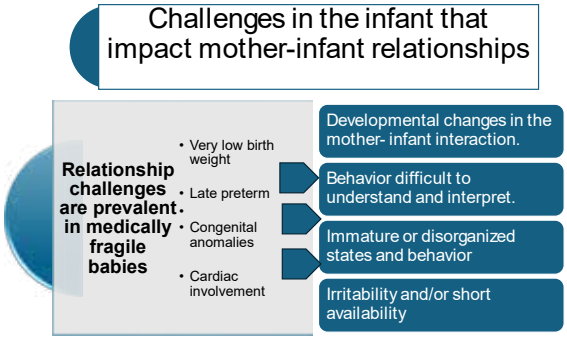
Similarly, parents' brains are shaped by the physical and emotional exchanges with their babies. The mother's (and likely both parents') changes in brain organization, physiology, and behavior are in response to their baby's physiology and behavior. As these bidirectional exchanges continue, they become more synchronous and regulated, creating a safe, sensitive, and nurturing space for both mother and baby. Early separation negates the dyad's ability to engage in those synchronous exchanges. (21) Encouraging a practice of non-separation, that is, assuring physical, social, and emotional closeness, is essential for bidirectional regulation and relationship development.

Importance of establishing early relationships for high-risk babies

As important as it is for typically developing babies to engage in early SSNRs, it is just as, and likely more important, for high-risk hospitalized babies. Delivery and early hospitalization of the early born and/or medically fragile baby often results in a separation that interrupts physical and behavioral interaction with their mother. Separation of the dyad, even for short periods, can affect the early relationship and lead to lasting effects as the baby develops.(22-25)

Stressful events that medically fragile and early-born babies experience in intensive care are well recognized. Skin-breaking and invasive procedures and events have been documented to have long-term effects on pain responses, behavior disorganization, and brain development. Separation from the physical and emotional regulatory buffer that the mother provides can compound the dysregulation the baby experiences during stressful events.

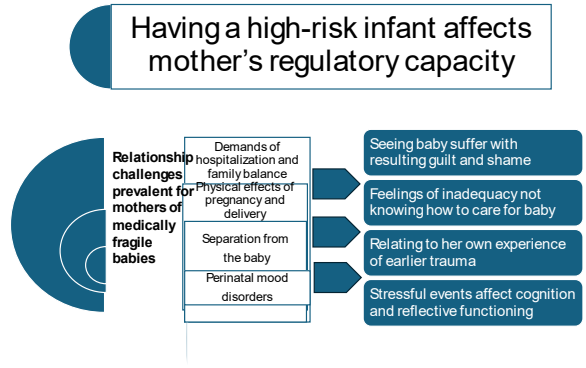
Parents also often experience significant stress from pregnancy, delivery, and their baby's hospitalization. The impact of the parents' stressful events contributes to the difficulty of establishing early SSNRs. (22, 26, 27) The regulatory physiologic and socioemotional strategies typically provided to the baby by the mother are challenged by many aspects of having a low birth weight or otherwise medically fragile baby. The baby's behavior may be challenging to understand and interpret, and their states may not be easily recognizable or stable enough for interaction. It is particularly challenging for mothers to understand the behavioral communication of their irritable or lethargic baby. Often, these challenges make it difficult to know how best for them to interact effectively with their baby. An accumulation of these effects can disturb the early relationship experience. (5, 7, 8, 28, 29)



Importance of establishing early relationships for parents of high-risk babies

Although most emerging research on brain and behavioral effects on parenting is done with full-term infants, there is reason to believe that neurohormonal and anatomical changes have been present during pregnancy, even if the pregnancy did not result in a term birth. (18) The resulting added stress of early delivery of a baby or of a baby who is hospitalized may have an impact on parents' ability to provide their baby with SSNRs. "Reward-stress dysregulation of parenting" has been proposed as a conceptual model for mothers whose baby has challenges at birth (frequently applied to babies who have been substance-exposed). It states that although infants and caregiving are inherently rewarding because of neurohormonal and brain changes during pregnancy and postpartum, stressful events and separation can affect physical, social, and affective relationships. Given the demands of hospitalization and infant caregiving during the physiologic and behavioral sensitive period, parents can feel vulnerable and have difficulty providing the kind of SSNRs they would otherwise provide their baby.(30, 31)

Cognitive processing and parent mental health effects resulting from stressful events can also interfere with establishing SSNRs, setting the stage for the mismatch between the mother and baby. Separation, seeing the baby suffer, and feeling inadequate to care for their baby are a few other factors. It is not uncommon for a mother's mental health to be affected and previous mental health issues to resurface, challenging her ability to engage with her baby. Additionally, mothers and fathers typically have to juggle ongoing family and sibling issues, work and financial challenges, transportation to and from the hospital, and self-care.



Caring for the parent as well as the baby in intensive care

The importance of Early Relationship Health for babies and young children has been well established and should also be a focus of care for newborns in intensive care as they are at high risk for relationship disturbances. Parents are physiologically and emotionally primed for relationships with their babies, so efforts to support them contribute to their baby's early physical and relational health.

The mother/infant dyad is at the heart of the IFCDC standards, and they aim to enhance practice and improve the baby's developmental outcomes. The babies receive comprehensive assessment and clinical intervention as they become more medically stable. Parents are viewed as collaborators in planning care for their baby and may not specifically be seen as needing intervention for their own physical and psychological needs.

Focusing on interventions for the baby without a focus on supporting the parent leaves out a significant window of opportunity for successful health and developmental outcomes. Strategies to provide the baby **and their parents** with *safe, sensitive, nurturing relationships* are essential.

"Focusing on interventions for the baby without a focus on supporting the parent leaves out a significant window of opportunity for successful health and developmental outcomes. Strategies to provide the baby and their parents with safe, sensitive, nurturing relationships are essential. "

Supporting early parent-infant relationships during babies' and parents' sensitive periods provides opportunities to shape their future outcomes. Because it is a time of remarkable neuroplasticity, supporting parents in their interactions with their baby will lay the groundwork for early relationship health and optimal physical and mental health outcomes.

Caring for the parent, typically and most importantly the mother, involves developing and using clinical skills that support them *physically, cognitively,* and *emotionally*. Not only do physical environments in intensive care need to target a warm, private, nurturing, and healing space, but parents also need their own physical needs met for pain alleviation, mobility support, nutrition, appropriate sleep arrangements, privacy for self-care, and lactation. Exploration of challenges with the baby's sibling(s) and parental work issues, as well as transportation and provision of appropriate resources to address those challenges, will help parents to be with their baby as much as possible. These supports will allow for appropriate nurturing relationships with their baby.

Under stressful circumstances, parents often experience cognitive challenges and need supportive and easily understood information in the language of their choice. Educational offerings must be repeated to their satisfaction, and parents should be supported in applying information to care for their baby. Adaptation of information to cultural and spiritual ways of understanding is essential. Formal and informal educational approaches should include understanding the behavioral communication of their high-risk baby and how to interact with and support the baby's regulation. In addition, parents typically will need to know how to care for their medically fragile baby and have assurances that they will have professional, peer, and family resources to address those times when they or their baby need additional support.

Emotional support is also an essential component of care for the parent so they can feel encouraged and respected as their baby's parent, yet allowed to express vulnerability and feel understood. As early as 1978, Dr. Stanley Graven advocated for the support of mothers when he stated, "Perinatal health embodies not only physiologic well-being (absence of pathology) but also the social and psychological well-being that is so important to the mother. fetus, newborn, and family. Perinatal health as a state perceived and experienced by mother, fetus, newborn, and family must be differentiated from services delivered by perinatal health care providers." (32)

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Attending to and normalizing the effects of pregnancy, delivery, and postpartum on parent's emotions while still recognizing when more mental health supports are needed is part of emotional support. Cultural and spiritual beliefs and practices that the family prefers should be honored.

To address all of these support elements for the parent, a practice of non-separation, that is, assuring physical, social, and emotional closeness between the baby and parent as early and often as possible, is imperative. Support for non-separation includes all of the components of care for the baby and the parent. (9, 33, 34)

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Conclusion.

One of the primary goals of mothers and babies is to establish and experience safe, secure nurturing relationships (SSNRs). Early relational health promotes physical, emotional, and social benefits

for the baby and mother. Neuroendocrine, brain, and behavior changes during the baby's and mother's sensitive periods of development are best regulated by biobehavioral synchrony within the dyad. The perinatal period provides an optimal window for affecting babies' and parents' life-long health and developmental outcomes by supporting early physical and emotional relationships. However, multiple stressful events typically occur for babies and parents as a result of intensive care, which has an impact on health and behavioral outcomes. Stressful events impact the mother's ability to provide a buffer and regulation in the face of those stressors. Unbuffered stressful events, including separation of the dyad, interrupt the biobehavioral organization necessary for optimal synchronous relationship development. Providing physical, cognitive, and emotional support for mothers, including an emphasis on non-separation from their babies, should be an evidence-based imperative for all dyads in intensive care.

"Providing physical, cognitive, and emotional support for mothers, including an emphasis on non-separation from their babies, should be an evidence-based imperative for all dyads in intensive care."

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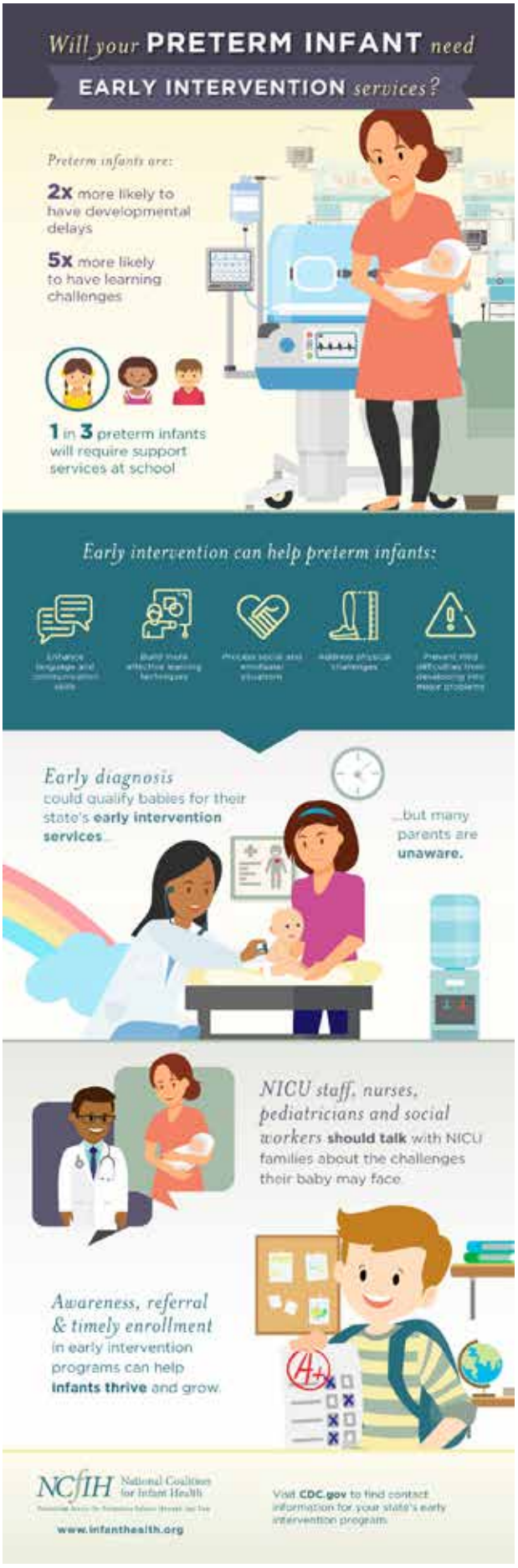
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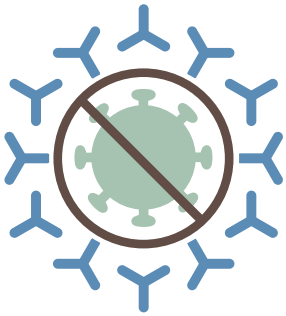
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Protecting your baby and family from

Respiratory Viruses:



What parents need to know this RSV and flu season

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

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

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

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

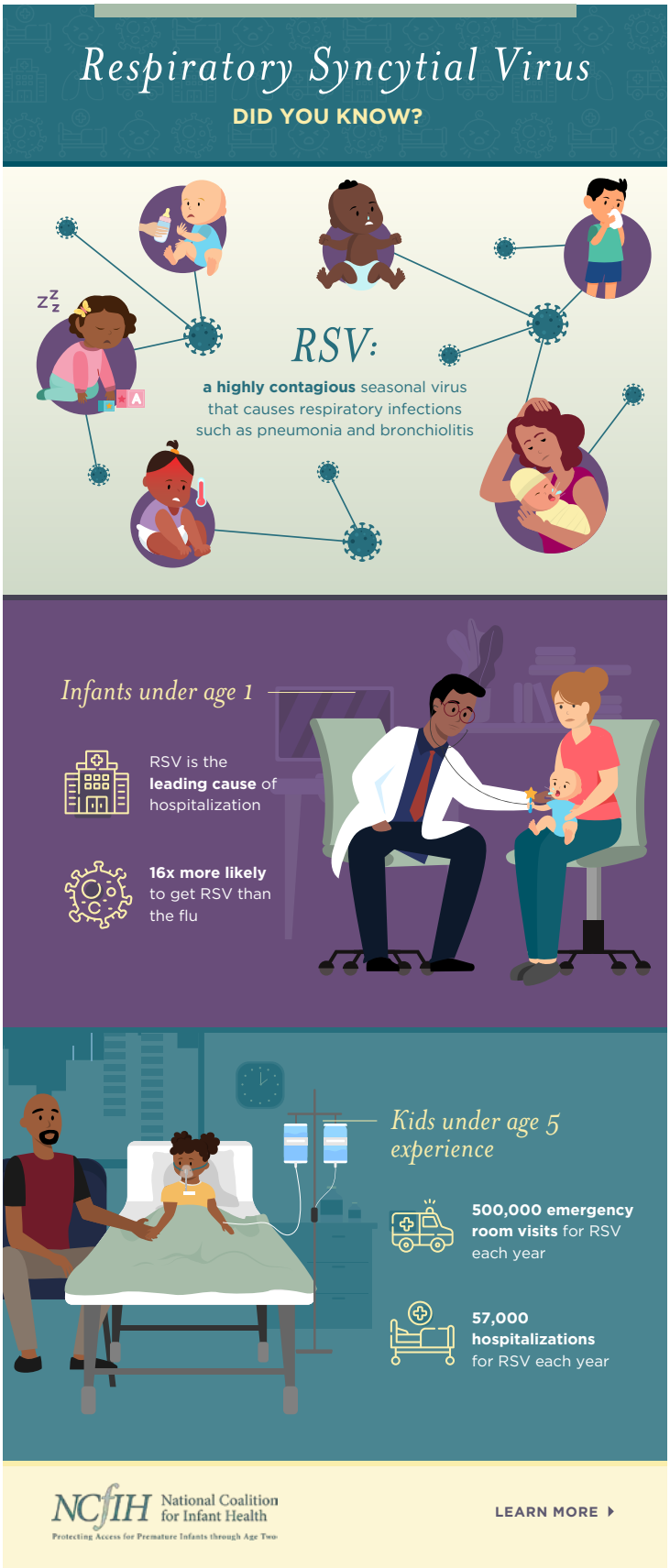
Immunizations save lives. Stay up-to-date with your family's flu vaccinations and COVID-19 boosters. This helps our community stay safe by stopping the spread of deadly viruses.

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

WE CAN HELP PROTECT EACH OTHER.

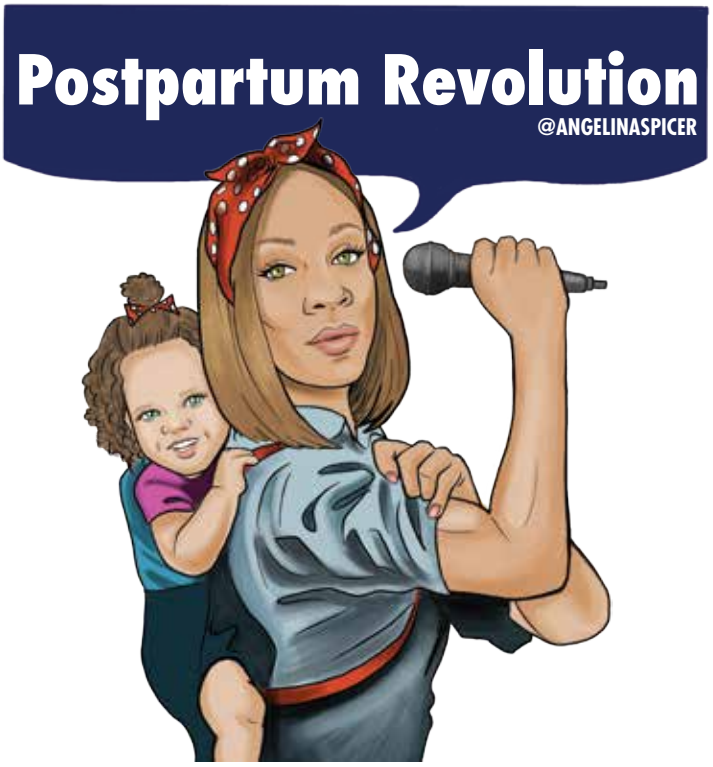
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The Gap Baby: An RSV Story





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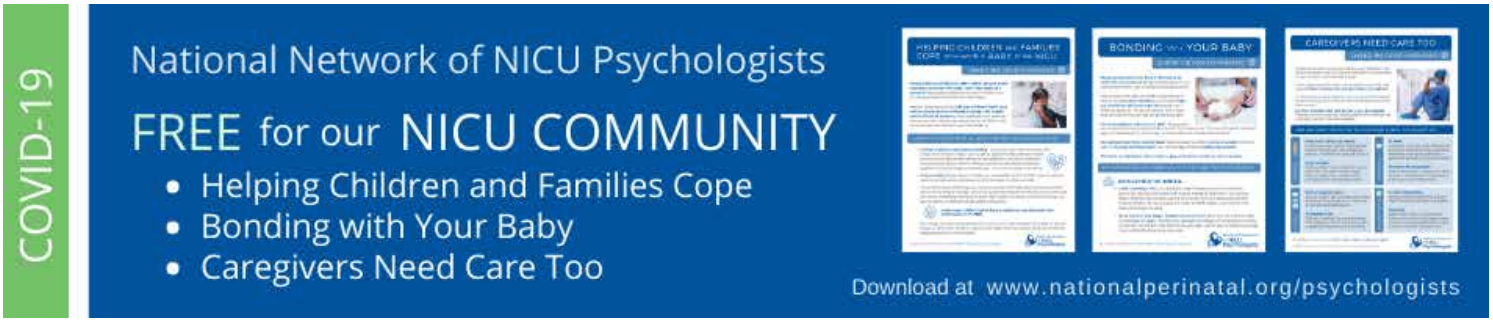
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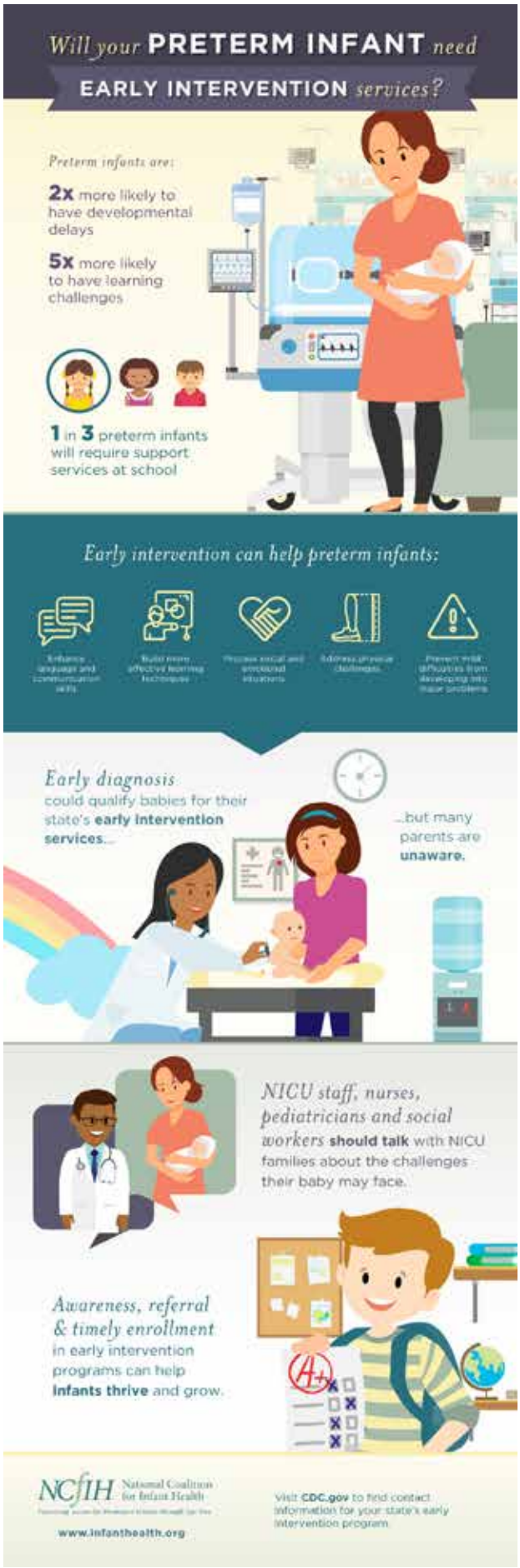
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As we indicated last month, we look forward to a number of new features as well.

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

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

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

fu-sheng.chou@neonatologytoday.net

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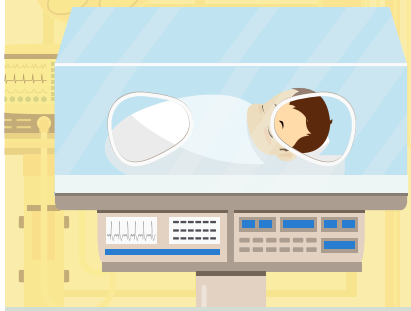
Hemolytic Disease of the Fetus & Newborn

DID YOU KNOW?

Hemolytic disease of the fetus & newborn is a rare blood disorder.

When the mother's and infant's blood types are incompatible, the mother's antibodies attack the baby's red blood cells.





HDFN can lead to:

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

To reduce their baby's risk

pregnant mothers should talk to their health care provider to:

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



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Protecting Access for Premature Infants through Age Two

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Which Infants are More Vulnerable to Respiratory Syncytial Virus?

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

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

*Source: Respirator Syncytial Virus and African Americans

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

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

AfPA Alliance for Patient Access

COVID-19

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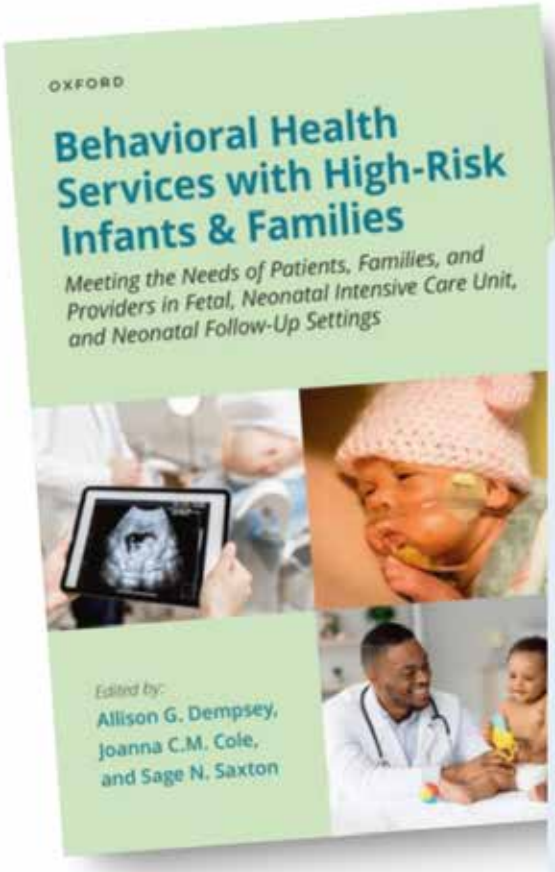
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Navigating toward Neonatology: Neonatal Bacterial Meningitis

Benjamin Hopkins, DO, Minesh Khashu, MD

"Welcome back to another installment. My name is Benjamin Hopkins, and I am currently a post-grad year one pediatric resident at the University of California, San Francisco–Fresno. When 'I grow up,' I want to be a Neonatologist. Look at previous months' journals for my earlier articles and follow along with this column as I navigate my way to becoming a neonatologist."

Welcome back to another installment. My name is Benjamin Hopkins, and I am currently a post-grad year one pediatric resident at the University of California, San Francisco–Fresno. When 'I grow up,' I want to be a Neonatologist. Look at previous months' journals for my earlier articles and follow along with this column as I navigate my way to becoming a neonatologist.

I recently began my residency intern year. I have rotated within pediatric neurology and general inpatient wards and spent some time in the outpatient clinic. I have been privileged to work closely with other residents and attendings who genuinely care for their patients and practice individualized care for each one.

"Meningitis is a severe life-threatening infection of the meninges and subarachnoid space associated with high mortality and morbidity in the neonatal population. Even though the brain has barriers designed to protect it from infection, the neonatal period (<28 days old) has increased susceptibility to meningitis. Neonatal meningitis can be categorized as either early (≤72 hours old) or late onset (>72 hours old) but always requires immediate treatment to prevent severe, long-lasting consequences."

This month, I will be discussing neonatal bacterial meningitis. Meningitis is a severe life-threatening infection of the meninges and subarachnoid space associated with high mortality and morbidity in the neonatal population (1–4). Even though the brain has barriers designed to protect it from infection, the neonatal period (<28 days old) has increased susceptibility to meningitis (3, 4). Neonatal meningitis can be categorized as either early (≤72 hours old) or late onset (>72 hours old) but always requires immediate treatment to prevent severe, long-lasting consequences (1–3).

"Group B Streptococcus (GBS, Streptococcus agalactiae) is the leading cause of neonatal meningitis worldwide. GBS is reported to cause roughly 90,000 infant deaths and 57,000 stillbirths worldwide. Other less common causes are Escherichia coli (E. coli), Listeria monocytogenes, coagulase-negative Staphylococci, Staphylococcus aureus, and Klebsiella spp."

Neonatal meningitis incidence ranges from 0.3–6.1 per 1000 births, largely dependent on geographic location (2–5). Actual infection values may be higher than reported due to lumbar puncture not being performed, being performed after the start of antibiotics, or having limited resources (2, 3). Although it has been studied for decades, the mechanism of brain injury is not entirely understood (3). Group B *Streptococcus* (GBS, *Streptococcus agalactiae*) is the leading cause of neonatal meningitis worldwide (2–5). GBS is reported to cause roughly 90,000 infant deaths and 57,000 stillbirths worldwide (3). Other less common causes are *Escherichia coli* (*E. coli*), *Listeria monocytogenes*, coagulase-negative *Staphylococci*, *Staphylococcus aureus*, and *Klebsiella* spp (1–3). GBS is part of the normal vaginal and intestinal microbiome; however, when the opportunity arises, GBS can become a highly invasive pathogen leading to neonatal meningitis (3).

"Neonatal meningitis has a near 100% fatality rate if left untreated. Even with treatment, fatality rates can increase up to 50% in developing countries and are between 10–15% in developed countries. Long-term complications are seen in 10–50% of survivors."

Neonatal meningitis has a near 100% fatality rate if left untreated (3). Even with treatment, fatality rates can increase up to 50% in developing countries and are between 10–15% in developed

countries (1, 5). Long-term complications are seen in 10–50% of survivors (1, 5). Impairments range in severity between mild, moderate, and severe, with cognitive, neurodevelopmental, motor, hearing, and visual impairments common in neonatal meningitis (1, 3).

There are a multitude of risk factors that increase the chances of a neonate being infected with meningitis. These include prematurity, maternal rectovaginal GBS colonization, history of GBS colonization in a previous pregnancy, chorioamnionitis, premature rupture of membranes, prolonged rupture of membranes, invasive fetal monitoring, very low birth weight, low birth length, prolonged hospitalization, presence of external devices, and immaturity in humoral and cellular immunity (2–4). Additionally, in twins, if one is infected, the other has a 40% chance of becoming infected (3).

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Meningitis often has a nonspecific presentation in neonates and can overlap with other ailments (1–3). Patients can have clinical symptoms that include lethargy, fussiness, irritability, sleepiness, jitteriness, anorexia, vomiting, hypotonia, apnea, respiratory distress, jaundice, diarrhea, generalized weakness, bradycardia, poor perfusion, hypo/hyperglycemia, temperature instability, seizure, bulging anterior fontanelle, hydrocephalus, and high pitched crying (1–5). Nuchal rigidity is uncommon in neonates but can be present in 20–45% of cases (2, 3). On clinical exam, nuchal rigidity can be assessed with the Kernig sign (painful knee extension after flexing the thigh with the hip and knee at 90-degree angles) and Brudzinski sign (reactive hip and knee flexion when the neck is flexed). However, these tests have limited specificity and sensitivity (1, 4).

When meningitis is expected, a diagnosis should be confirmed with a culture of the cerebral spinal fluid (CSF) (1-4). CSF is collected via Lumbar Puncture (LP), preferably before antibiotics are administered (2, 4). Sometimes, it is necessary to do a repeat LP if no clinical improvements are seen in the first 48–72 hours (4). There are concerns about when and if performing an LP is necessary, and it is often deferred when there are concerns it will exacerbate deterioration or cause additional distress (2, 3). CSF is plated on sheep's blood and chocolate agar and incubated with culture growth usually within 24–72 hours (1). CSF indexes can vary; however, it is most often stated that leukocyte count ≥20/mm^3 suggests bacterial meningitis (2). It is important to note that there is also the chance of normal CSF results even with a positive diagnosis of meningitis (2). CSF culture is still considered the gold standard, although new tests such as PCR and genetic sequencing are being developed to help provide rapid and accurate diagnosis (1, 4).

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It is critical to start antibiotics immediately, even before diagnosis and underlying causes are identified (2–4). Empiric antibiotics should begin with a broad spectrum that can be adapted to the pathogen's sensitivities (2–5). Initial antibiotics need adequate CSF penetration, with a combination of high-dose ampicillin and gentamicin being a standard therapy, and then the transition or addition of cephalosporins and vancomycin as necessary to provide adequate coverage (2–4). For uncomplicated meningitis, the treatment duration is a 14-day course for GBS, *Listeria*, and *Strep pneumoniae* and a 21-day course for *Pseudomonas* and *E. coli* (1–4). A longer course is typically required for complicated meningitis, with a minimum of 21 days being the start (3, 4). Supportive care with respiratory therapies, fluid and electrolyte balance, nutritional support, and seizure control should all

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be provided for proper care (3). Several adjunctive therapies have been studied to increase overall outcomes, including intraventricular antibiotics, intraventricular immunoglobulins, dexamethasone, oral glycerol, and granulocyte-macrophage colony-stimulating factor; however, none are routinely used in clinical care (2). Finally, and most importantly, consultation with infectious disease should be done to inform on antibiotic treatment type and duration (4).

Bacterial meningitis occurs worldwide and in all age groups; however, neonates are more susceptible (1). Many neonates have a positive outcome, while others do not and can have a myriad of long-term impairments (1–3). Universal antenatal screening for GBS was implemented in 1996, and significant decreases in early-onset GBS infections following intrapartum antibiotics were observed (2, 3). The guidelines were updated once in 2002 and again in 2010, and maternal GBS culture-based screening between 36–37 weeks of gestation is currently recommended (3). Intrapartum GBS prophylaxis is indicated when there has been a prolonged rupture of membranes (>18 hours), preterm gestation, intrapartum fever, previous pregnancy with GBS-positive screening, GBS-positive intrapartum nucleic acid amplification test, and when the GBS status is unknown (3). A couple of promising trivalent GBS vaccines are currently in different phases of trials that can protect both the fetus and the newborn and hopefully help prevent mortality and morbidity from GBS bacterial meningitis (2–3).

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This month, I had the privilege to talk with Dr Minesh Khashu, a consultant neonatologist and professor of Perinatal Health at Bournemouth University in Poole, England. We discussed the characteristics of an excellent neonatologist, priorities as a resident, variations in neonatal practices by location, and some of his current interests and research. *

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

The qualities required of a Neonatologist are similar to those of most other specialties. First and foremost are compassion and good communication skills because you're dealing with people at a very difficult time in their lives. You're not just dealing with the patient or the baby but the whole family. You need to have excellent communication skills because you are trying to communicate with people or families who might be in a significant amount of distress. Likewise, you communicate with your team or deal with stuff in a very charged environment. From my perspective, communication and compassion skills are at the top of the list.

In terms of procedural and diagnostic skills, those are a given as a doctor. However, the critical thing to understand is that you can teach a resident how to intubate; you can teach them in a week how to put long lines in. You can't teach them compassion and communication in a week. That's why the more important skills are those that take time to develop and which, in many ways, can't be taught by others. One has to develop them over years and years with practice and diligence. I can teach procedural skills in a reasonably short period. I can't make someone compassionate or be a good human being in a week, a month, or even a year.

"However, the critical thing to understand is that you can teach a resident how to intubate; you can teach them in a week how to put long lines in. You can't teach them compassion and communication in a week. That's why the more important skills are those that take time to develop and which, in many ways, can't be taught by others. One has to develop them over years and years with practice and diligence. I can teach procedural skills in a reasonably short period. I can't make someone compassionate or be a good human being in a week, a month, or even a year."

2. What would you encourage a future neonatologist to prioritize and be involved in?

To be an excellent neonatal clinician, you must understand neonatal physiology well. You will only become a great clinician if you understand neonatal physiology well. You can become an average clinician, and you might be right 90% of the time, but you won't be right 10% of the time. That's where the difference lies between being an average clinician and an excellent clinician. Focus, read, learn, and understand as much of neonatal physiology as possible. I always encourage people to spend as much time on the 'shop floor' as possible. It would help if you read the book or have been taught about something. That is a given. As they say, "Eyes don't see what the mind does not know," but between the mind knowing about something and you picking it up

"To be an excellent neonatal clinician, you must understand neonatal physiology well. You will only become a great clinician if you understand neonatal physiology well."

as an astute clinician are hours of being on the shop floor and a very good foundation of neonatal physiology.

I separate diagnoses and presentations into four categories or layers as part of teaching. The first is common presentations of common things, followed by uncommon presentations of common things, followed by common presentations of uncommon things, and lastly, uncommon presentations of uncommon things. Out of those four layers, the top two are the bread and butter of day-to-day neonatal practice, and that's what we expect from trainees in the first instance. You see what is common if you're around the unit or the ward. That's where your foundation as a neonatologist will be. In time, you will also develop insights related to the other two layers.

In parallel to learning about neonatology, I would like future neonatologists to be very good at teamwork skills, communication, and other aspects of leadership. Everyone should be trained in Quality Improvement, Safety, and Human Factors. We want trainees and newly qualified neonatologists to ask these questions of themselves and their teams: How can we improve outcomes? How can we make the NICU a safer place? How can we understand our team better? How do we anticipate and manage difficult situations better?

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In addition to understanding the physiology and clinical presentations in neonatology, these courses and training should be done in parallel to make someone a well-rounded neonatologist.

3. What caused you to pursue a career in neonatology?

I trained in India, then moved to the UK, and then trained again here. We didn't have separate neonatal training in the UK in those days. You were a pediatrician; if you did more neonatology, you became a neonatologist. If you did more general pediatrics, you became a general pediatrician. I went for a fellowship at BC Children's in Vancouver, initially for a year, and then stayed over three years there. I was also a Chief fellow there. My excellent experience and training in Vancouver was what hooked me into neonatology for good. It was a big quaternary unit, one of the biggest units in North America at that time. I got an excellent experience in all aspects of neonatology, including surgical care, ECMO, and air transport. This helped consolidate my previous learning and further strengthened my foundation in neonatal physiology and disease.

4. How does the practice of neonatology vary depending on location?

Practice does vary, but in my opinion, the variation is decreasing. Practice sometimes has to vary because patients may be unwell with different conditions, or there may be different expectations. If you look at the Western developed hemisphere, preterm neonatology is the more significant aspect of work, whereas, in the less developed world, more term babies with infection and other conditions like HIE are perhaps the predominant problem. What is interesting in neonatology is that it varies center from center within countries as well, so no two UK centers are necessarily alike, and similarly, in the US. There's significant variation not just between centers and countries but within individual consultants in the same center. This is largely related to many grey areas within neonatology, with no clear black-and-white answers from research. In many ways, compared to other areas of medicine, Neonatology is a 'baby' science (no pun intended) that has been going on for only six decades or so.

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Variation in itself is not a bad thing. Excellence is also a variation; if you're perfect, you are an outlier, but that's a good type of variation. You want to avoid variation if you're an outlier on the lower end, where your outcomes are worse. Moreover, some variation is good for progress, but it must be channeled correctly. Every system will have variation; that's how complex systems are. You want good variation: excellence to drive the whole system to excellence, i.e., the difference between the best and worst becoming less and less by the poorly performing units raising their game to match the best performing units.

It is useful to discuss the grey areas in neonatology further. Because there are grey areas, people try to do what they feel they're more used to because they don't have clear-cut evidence to do anything differently. For example, there are some units where the PDA ligation rate is "X," and there are some units where the PDL ligation is "one-tenth of X," and it's the same babies; the babies are not different. Why is that? It is because historically, one center has easy access to a pediatric surgeon, the other center doesn't; and historically, one center did it one way, the other center did it the other way; and that's how they kept going for years and years. The problem is that we have had many PDA trials and still don't have the answers. Because there's a lack of evidence, there are grey areas; different units and individuals will continue to practice in a way they deem best.

This begs the question: Why aren't we getting the answers to our research questions? I think we are either asking the wrong questions or asking the right questions but in the wrong way. There are also limitations to funding for neonatal research. The industry also generally shies away from neonatal products and from including neonatal subjects in research for obvious reasons. There is also perhaps too much emphasis on the RCT as the only methodology to provide answers to research questions and a total disregard for

exploring other options like the use of big data and AI techniques. In the last 30 or 40 years of neonatology, only two or three things have changed practice in terms of randomized control trials, and only one thing has changed practice universally. Apart from the randomized control trials about therapeutic hypothermia, no other randomized control trials in neonatology have changed neonatal practice universally; by universally, I mean that it has changed practice in every neonatal unit across the globe. We need to get better at exploring why and finding solutions to this. Prior to that, the only other trials that changed the universal practice were surfactant studies. The success rate of our research studies is very poor.

We need to better understand why this is the case. There is something wrong with our research paradigm, and that's why the paradigm needs to be questioned. We need to ask ourselves why we are not getting the correct answers. As I said previously, Are we asking the wrong questions, or are we asking the right ones but asking them the wrong way? Every baby, every minute worldwide, provides data, and most of that data goes down the bin. If we collected that data and used it to generate insights, we would do better studies, and some studies we wouldn't need to do at all. Focusing on randomized controlled trials as the only way of providing answers is not necessarily the right paradigm. Shouldn't data be collected and scrutinized as part of standard care? Why does it need a study? Data is being collected in many ways but we're doing little with it. Why is it so difficult today not to have a composite data set at the national level? Why don't we have national and global data sets for most neonatal conditions, be they extreme prematurity, diaphragmatic hernia, retinopathy, or chronic lung disease? Some of this work is slowly starting, but it's too little and perhaps too late.

"There is something wrong with our research paradigm, and that's why the paradigm needs to be questioned. We need to ask ourselves why we are not getting the correct answers. As I said previously, Are we asking the wrong questions, or are we asking the right ones but asking them the wrong way?"

We would still need to conduct randomized controlled trials, but we would use data and machine learning to help ask more critical and better questions, and we would have better success with our RCTs.

Moreover, when it comes to changing newborn care, the research priorities must focus on what is important for the patient and the family. For example, in NEC, one of my areas of interest, there is very little research focused on survivors of NEC and their long-term outcomes. Most of the research on NEC is on prevention and pathophysiology, and some on treatment. The research questions must be proportionate to their importance to the patient and the family, not just how important they seem to the clinician or researcher.

Since funding for neonatal research is limited, we need to make sure we use scarce resources to ask the most important questions. Research priority-setting partnerships are a good way forward in this context, but they also have their pitfalls. We need to do more of this well, both at a country/regional level and also at a global level. We need to be able to answer the question: What are the 20 critical priorities in neonatal care that we are trying to answer? That is where the funding should go. Some of these priorities will be similar across the globe, but some may vary between countries, e.g., Sweden, India, Nigeria, or Brazil.

5. What has inspired you to focus on your current education topics?

Data collection and appropriate utilization are essential aspects. Because we're a baby science, a newer specialty, we could better utilize research and data. Of course, we also understand that neonatology has a small number of patients, and the funding and money allocation are tiny for us.

In terms of the other stuff I talk about, all of us as professionals, as doctors, have to be holistic human beings, and **we can't progress as doctors in isolation without progressing as human beings**. Please read that highlighted bit again! Progressing as human beings is essential as you become better members of teams, organizations, communities, and societies, and everything moves forward with you. It's not just about becoming the best neonatologist. Even if you were the best neonatologist in the world, that wouldn't guarantee the best outcomes for your unit. You can't do it all alone. Your growth as a human being is essential for becoming a better doctor, a better team player, and a better member of an organization and a community.

"...we can't progress as doctors in isolation without progressing as human beings...Progressing as human beings is essential as you become better members of teams, organizations, communities, and societies, and everything moves forward with you. It's not just about becoming the best neonatologist. Even if you were the best neonatologist in the world, that wouldn't guarantee the best outcomes for your unit. You can't do it all alone."

Talking about the first level, i.e., professionally, as a neonatologist and a doctor, my main interests in neonatology are NEC, nutrition, and fathers' experiences. I was the founder of SIGNEC, the first global special interest group for NEC (3E). I chair an international collaboration of researchers called the FINESSE Group, which focuses on fathers' experiences. We have developed specific tools for supporting fathers, who are often sidelined within maternity and neonatal pathways (1E, 2E). One of my other areas of interest is innovation in health care. I also mentor healthcare startups in Silicon Valley, India, and elsewhere. I work with cutting-edge innovation, essential in a field like ours that needs to grow as effectively as possible.

The next level is the team and neonatal unit level. From that perspective, I focus a lot on the well-being of my team members, including issues like mental health and resilience (6E, 7E). I also have a special interest in and expertise in quality improvement, and it is essential to ensure that the team has good QI and safety skills (8E).

The next level as a human being is at the societal level, and this is where I discuss issues like information overload and the campaign

"However, the most important level for all of us is the personal level. Are we growing as individuals? Are we becoming better human beings?"

#FifteenTrees4mylife (5E).

However, the most important level for all of us is the personal level. Are we growing as individuals? Are we becoming better human beings? This is discussed in many of my spirituality-focused blogs and posts.

6. What are you currently working on?

Recently, we did a special issue on NEC for the journal *Frontiers* (4E).

We've also just finished a special issue: What's new in neonatology (9E). It's a compilation, a special issue of *Frontiers in Pediatrics*/ Neonatology on new stuff within different domains of Neonatology practice.

Other ongoing work is on various aspects of QI and safety in neonatal care.

Education:

Father's Work

1E. https://podcasts.apple.com/us/podcast/022-dr-minesh-khashu-nec-research-fathers-in-the-nicu/id1566031191?i=1000536633905

2E. https://thedadpad.co.uk/neonatal/

NEC

3E. https://signec.org/

4E.https://www.frontiersin.org/journals/pediatrics/articles/10.3389/fped.2023.1326204/full

QI

5E. https://www.linkedin.com/posts/mineshkhashu_minutes-lifetime-critical-activity-7152714725691170817-645G?utm_source=share&utm_medium=member_desktop

6E. https://www.linkedin.com/posts/mineshkhashu_fastest-problem-thinking-activity-7216081465271271424--13b?utm_source=share&utm_medium=member_desktop

7E. https://www.linkedin.com/posts/mineshkhashu_information-overload-impact-activity-7218641696383774722-e8d9?utm_source=share&utm_medium=member_desktop

Innovation

8E.https://www.frontiersin.org/journals/pediatrics/articles/10.3389/fped.2023.1147512/full

9E. https://www.frontiersin.org/research-topics/60207/what-is-new-on-the-horizon-in-neonatology-recent-advances-in-monitoring-diagnostics-and-therapeutics-in-neonatal-care/articles

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*Answers are paraphrased from video/voice calls.

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Founder of SIGNEC UK – Special Interest Group NEC
Co-Founder Global Newborn Society
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Poole, England, United Kingdom

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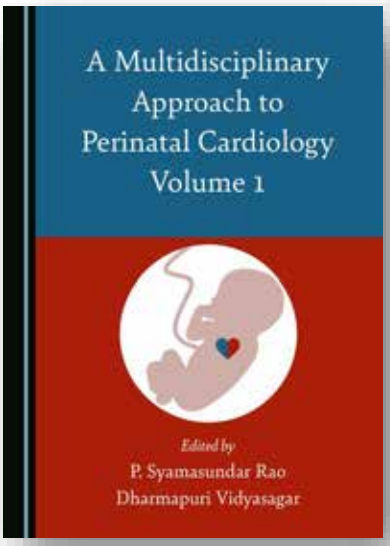
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A Multidisciplinary Approach to Perinatal Cardiology *Volume 1*

Edited by P. Syamasundar Rao and Dharmapuri Vidyasagar



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Book Description

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

About the Editors

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

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

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

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National Perinatal Association + NICU Parent Network

Online L&D Staff Education Program

Caring for Pregnant Patients & Their Families:

Providing Psychosocial Support During Pregnancy, Labor and Delivery

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Continuing education credits provided by

pac-lac

About the Program

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

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

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

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

Program Objectives

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

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

PROGRAM CONTENT



COMMUNICATION SKILLS CEUs offered: 1

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

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



PERINATAL MOOD AND ANXIETY DISORDERS CEUs offered: 1

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

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



PROVIDING ANTEPARTUM SUPPORT CEUs offered: 1

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

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



PROVIDING INTRAPARTUM SUPPORT CEUs offered: 1

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

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



PROVIDING POSTPARTUM SUPPORT CEUs offered: 1

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

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



SUPPORTING STAFF AS THEY SUPPORT FAMILIES CEUs offered: 1

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

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

Cost

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

Contact help@myperinatalnetwork.org to learn more.

Faculty

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

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

CANCELLATIONS AND REFUNDS

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

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

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

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

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

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Means balancing the risks of...

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





EVIDENCE

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

PARTNERSHIP

What is the best for this unique dyad?

SHARED DECISION-MAKING

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





TRAUMA-INFORMED

Both parents and providers are confronting significant...

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

LONGITUDINAL DATA

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

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



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House and Senate Agree: New Mothers Need More Support

Josie Cooper

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

AfPA | Alliance for Patient Access

IfPA | Institute for Patient Access

"Despite partisan divides, agreement around funding is emerging in one important area: maternal health. Funding bills from both the House of Representatives and the Senate pay special attention to the needs of new mothers and their infants."

Despite partisan divides, agreement around funding is emerging in one important area: maternal health. Funding bills from both the House of Representatives and the Senate pay special attention to the needs of new mothers and their infants.

Both bills allot the same amount – roughly $608.5 million – in block grants to fund state efforts to address maternal mortality, an increase of $5 million over current levels. (1)

An Investment in Better Data

Both chamber's appropriation committees also requested a report on "barriers to effective and consistent data collection and opportunities to improve coordination among State MMRCs," referring to Maternal Mortality Review Committees. (2)

"Data collection varies among states, so an influx of federal funding could support the development and implementation of uniform data collection standards, (3) which could lead to a better understanding of the nation's collective challenges."

Every state has a committee designed to study the causes and contributing factors of pregnancy-related and neonatal deaths, but that's about where the commonalities end. Data collection varies among states, so an influx of federal funding could support the development and implementation of uniform data collection standards, (3) which could lead to a better understanding of the nation's collective challenges.

"In 2022, at least 800 women died in pregnancy, (4) childbirth, or soon after the birth of a baby, but those statistics likely undercount women in rural areas and marginalized populations. Black women and those without reliable access to prenatal care face higher rates of maternal death."

In 2022, at least 800 women died in pregnancy, (4) childbirth, or soon after the birth of a baby, but those statistics likely undercount women in rural areas and marginalized populations. Black women and those without reliable access to prenatal care face higher rates of maternal death. (5) Experts say at least 80% of such deaths are preventable. (6)

Reconciliation is Ongoing:

But differences remain between the bills, including the House's hesitation to fund the Healthy Start program aimed at reducing maternal deaths in high-risk pregnancies. (7-9)

Other programs being considered but not yet agreed upon include:

- Vaccination campaigns to combat human papilloma virus and resulting cancers,

- Efforts to better reach and provide support to children born with special needs,
- Expansion of prenatal screening for syphilis to reduce congenital infections,
- Reduction in disparities in health care access for vulnerable and at-risk populations,
- Support for maternal mental health challenges, which impact one in five new moms,
- Technical assistance for states to improve the health of pregnant women and infants, and
- Improvements in state-run data systems to improve data collection on maternal deaths.

"The White House has backed efforts to improve maternal health, (10) particularly those with overlapping mental health focus, so Congress should be able to count on support from the current administration once they come to agreement within chambers."

The White House has backed efforts to improve maternal health, (10) particularly those with overlapping mental health focus, so Congress should be able to count on support from the current administration once they come to agreement within chambers.

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

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Immunizing Yourself Against **COVID-19**

COVID-19 vaccines have been shown to:

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

Understanding the Options

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

mRNA VACCINES

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

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

PROTEIN SUBUNIT VACCINES

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

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

VECTOR VACCINES

Used for decades against chickenpox, malaria and tuberculosis.

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

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

Safe and Sound

COVID vaccines have been:

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

Get Your Jab

Vaccines are available at your:

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



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

1. https://www.mayoclinic.org/diseases-conditions/coronavirus/symptoms-causes/syc-20479963
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8782520/
3. https://www.nejm.org/doi/full/10.1056/nejmc2107717
4. https://royalsocietypublishing.org/doi/full/10.1098/rsif.2020.0683
5. https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html
6. https://doh.wa.gov/emergencies/covid-19/vaccine-information/safety-and-effectiveness
7. https://doh.wa.gov/emergencies/covid-19/vaccine-information/safety-and-effectiveness
8. https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-19-vaccines
9. https://www.ema.europa.eu/en/human-regulatory/overview/public-health-threats/coronavirus-disease-covid-19/treatments-vaccines/vaccines-covid-19/covid-19-vaccines-authorised
10. http://www.bccdc.ca/Health-Info-Site/Documents/COVID-19_vaccine/WHO-EUA-qualified-covid-vaccines.pdf

GAfPA Global Alliance for Patient Access

NCPA NATIONAL COMMUNITY PHARMACISTS ASSOCIATION

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Supporting NICU Staff so they can support families



Providing online education that is...

- Story-Driven
- Trauma-Informed
- Evidence-Based

National Perinatal Association

NPN NICU PARENT NETWORK

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Still a **Preemie?**

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

But that's not every preemie's story.

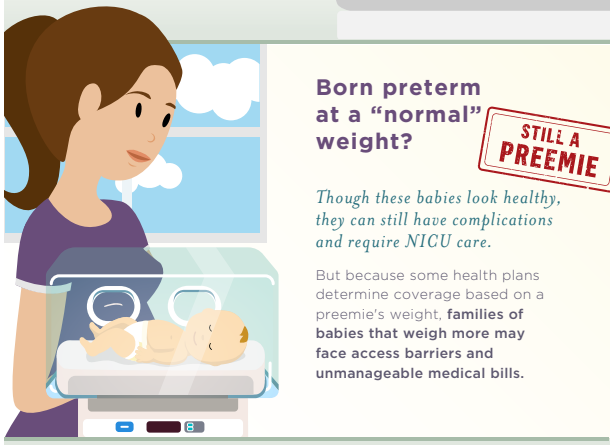
Born between 34 and 36 weeks' gestation?

STILL A PREEMIE

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

Jaundice | Feeding issues | Respiratory problems

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



Born preterm at a "normal" weight?

STILL A PREEMIE

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

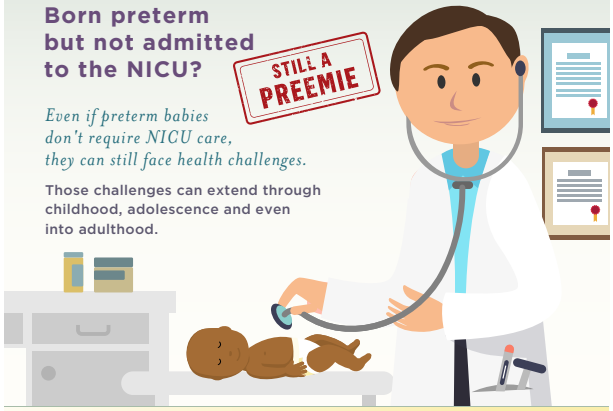
But because some health plans determine coverage based on a preemie's weight, **families of babies that weigh more may face access barriers and unmanageable medical bills.**

Born preterm but not admitted to the NICU?

STILL A PREEMIE

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

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



Some Preemies

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

All Preemies

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

NCfIH National Coalition for Infant Health

Protecting Access for Premature Infants through Age Two

www.infanthealth.org

The Gap Baby: An RSV Story



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



The National Coalition for Infant Health advocates for:

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

www.infanthealth.org

iCAN in Action: Ask the Experts, AAP, and FDA Events

Sabina Schmidt Goldstein-Becerra



Get involved today and Join the iCAN Parent Council!

"To foster diversity, all children from anywhere may freely join iCAN. iCAN also supports young adults and the voice of parents, many of whom have young people who cannot share their voices. We continue to be a collaboration between the American Academy of Pediatrics (AAP) Section on Advances in Therapeutics and Technology (SOATT), Georgia Institute of Technology (the GT Pediatric Innovation Network), local AAP Chapters, children's hospitals, local academia, and other non-profits. We aim to get our youth where they need to be to have their voices heard."

iCAN, the International Children's Advisory Network, is the premier global pediatric platform empowering the patient voice in healthcare, driven by youth for youth. As a worldwide consortium of 36 KIDS' (Kids Impacting Disease through Science) advisory groups spanning four continents, including one virtual chapter, iCAN's dedicated youth member groups work in unison around the world to provide a voice for children and families in medicine, research, science, and innovation, to foster greater global understanding about the importance of the pediatric patient and caregiver voice in healthcare, clinical trials, and research. On average, our youth are ages 8-18 years old, most of whom are living with chronic, rare, and complicated diagnoses, though a few of our youth have no medical diagnoses or medical conditions.

"Our amazing youth make a difference in pediatric healthcare through interactions with industry, by presenting original research at conferences, by innovating new solutions, by empowering the pediatric patient voice in healthcare worldwide, and by telling their stories at conferences and to organizations like the FDA, iACT, NIH, NORD, CDC, and AAP."

iCAN values and understands that all patients, even the youngest, often have ideas that can help improve their healthcare experiences. To foster diversity, all children from anywhere may freely join iCAN. iCAN also supports young adults and the voice of parents, many of whom have young people who cannot share their voices. We continue to be a collaboration between the American Academy of Pediatrics (AAP) Section on Advances in Therapeutics and Technology (SOATT), Georgia Institute of Technology (the GT Pediatric Innovation Network), local AAP Chapters, children's hospitals, local academia, and other non-profits. We aim to get our youth where they need to be to have their voices heard. Our amazing youth make a difference in pediatric healthcare through interactions with industry, by presenting original research at conferences, by innovating new solutions, by empowering the pediatric patient voice in healthcare worldwide, and by telling their stories at conferences and to organizations like the FDA, iACT, NIH, NORD, CDC, and AAP. Whether you are a patient, family

Readers can also follow

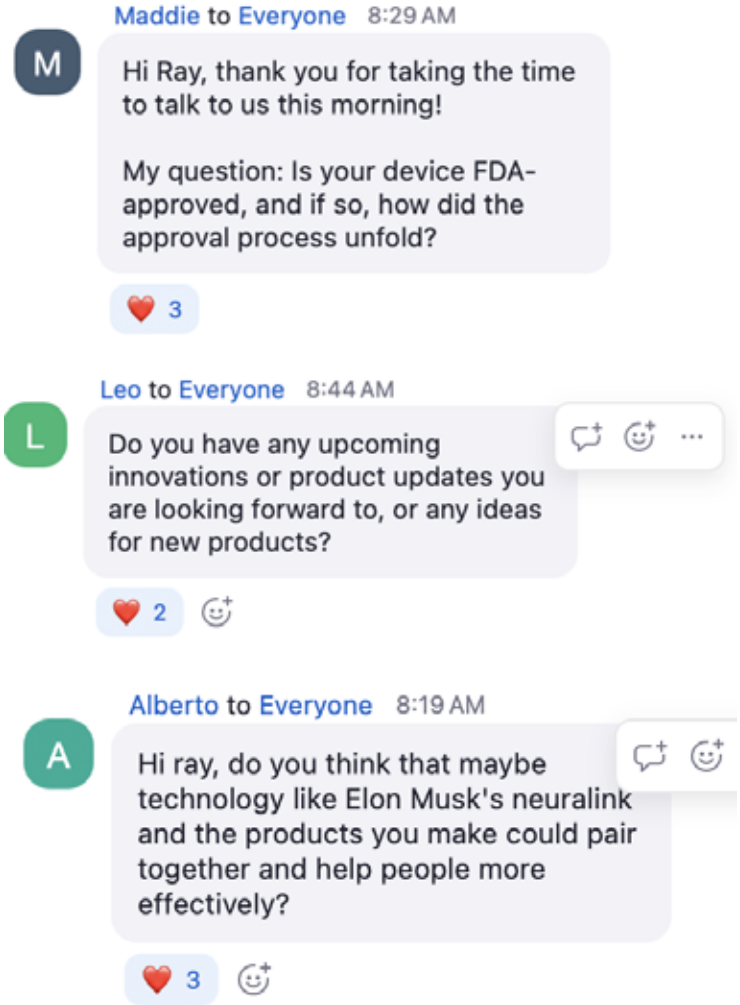
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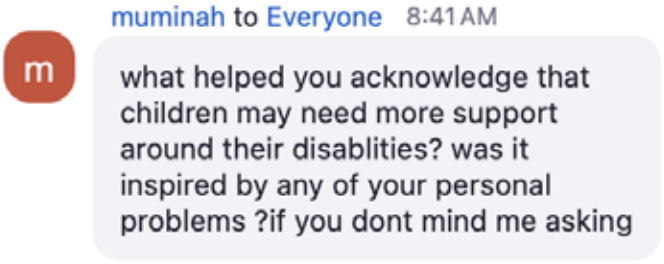
via our Twitter Feed

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member, healthcare professional, or supporter of the cause, we welcome you to visit our website at icanresearch.org to learn more about our mission, various programs, and initiatives. Join us to ensure that every child's voice is heard and that their unique experiences are taken into account to improve healthcare outcomes for all pediatric patients. September's Ask the Experts: Featuring Ray Browning







At our latest "Ask the Experts" event, we were so excited to have Ray Browning, CEO and Founder of Biomotum, join us. His wisdom, compassion, and groundbreaking work profoundly impacted the entire iCAN community.

"Ray's passion for innovation stems from a mission close to his heart—empowering children with cerebral palsy to experience life in ways they never imagined possible. He shared one of the most emotional moments of his career: watching a child, using his robotic assistive device, climb a flight of stairs for the very first time."

Ray's passion for innovation stems from a mission close to his heart—empowering children with cerebral palsy to experience life in ways they never imagined possible. He shared one of the most emotional moments of his career: watching a child, using his robotic assistive device, climb a flight of stairs for the very first time. For that child, what once seemed impossible became reality. These life-changing moments inspire Ray's work and remind us all of the powerful impact innovation can have on a child's life.

"Ray's dedication to putting the user first is at the core of everything he does. He emphasized how crucial it is to understand the real needs and experiences of the children his devices are designed to help."

Ray's dedication to putting the user first is at the core of everything he does. He emphasized how crucial it is to understand the real needs and experiences of the children his devices are designed to help. This is why he collaborates closely with iCAN, gathering direct feedback from the kids. Ray is scheduled to visit KIDS Lurie in November to gather even more feedback on his assistive device, ensuring it is effective and life-changing for the kids who use it.

During the event, Ray shared a powerful message about the importance of curiosity—how asking "why" helps us discover the

right answers and unlock new possibilities. His personal journey, filled with challenges and triumphs, shows us how adversity can be transformed into strength and innovation.

"The feedback from our kids has been overwhelmingly positive, with many expressing how much they appreciated Ray's insights and heartfelt dedication to making a difference. His contributions made this event unforgettable, and we are beyond proud to have him as part of the iCAN family."

The feedback from our kids has been overwhelmingly positive, with many expressing how much they appreciated Ray's insights and heartfelt dedication to making a difference. His contributions made this event unforgettable, and we are beyond proud to have him as part of the iCAN family.

Thank you, Ray, for your passion, heart, and tireless commitment to changing lives. Your work continues to inspire us all.

"We are excited to announce that Dr. Mary Jo Klein will join us for our next Ask the Experts session on October 19th at 8 AM PST, 11 AM EST, and 5 PM CET! Dr. Mary Jo Klein has a PhD in philosophy from Marquette University. She teaches Bioethics and Logic at Wittenberg University in Ohio."

Mark your calendars- iCAN invites you to another installment of *Ask the Experts* on October 19th!

Ask the Experts Series: Featuring Mary Jo Klein, Professor of Bioethics

We are excited to announce that Dr. Mary Jo Klein will join us for our next *Ask the Experts* session on October 19th at 8 AM PST, 11 AM EST, and 5 PM CET! Dr. Mary Jo Klein has a PhD in philosophy from Marquette University. She teaches Bioethics and Logic at Wittenberg University in Ohio. She has taught SAT prep classes and started a tutoring business while homeschooling her six kids. Dr. Klein loves to paint, hike, and spend time with family and friends. She has been a member of iCAN for the last nine years.



Join us for this exciting event as Mary Jo offers an insight into his career, his vision for the future, and how our iCAN kids are making a tangible impact on the innovation process!

Secure your spot by registering here today!

Save the dates for the next *Ask the Experts*:

November 18th with Harvey Castro, AI in Healthcare Expert

iCAN Leadership Shines at AAP Conference in Orlando, Florida!



NEONATOLOGY TODAY is interested in publishing manuscripts from Neonatologists, Fellows, NNPs and those involved in caring for neonates on case studies, research results, hospital news, meeting announcements, and other pertinent topics.

Please submit your manuscript to: LomaLindaPublishingCompany@gmail.com



We are excited to share that iCAN's dynamic trio—Leanne West, Sabina Goldstein, and Abby Clark—attended the American Academy of Pediatrics (AAP) Conference in Orlando, Florida, this October! We also had a surprise visit from Charlie Thompson, the founder of iCAN! These inspiring leaders represented iCAN and spread the word about our youth members' groundbreaking work in elevating pediatric care, innovation, and research on a global scale.

"We are excited to share that iCAN's dynamic trio—Leanne West, Sabina Goldstein, and Abby Clark—attended the American Academy of Pediatrics (AAP) Conference in Orlando, Florida, this October! We also had a surprise visit from Charlie Thompson, the founder of iCAN!"

At the AAP Conference, Leanne, Sabina, and Abby connected with leading healthcare professionals, researchers, and policymakers to share how iCAN empowers the next generation of changemakers in pediatric healthcare. From fostering patient-centric research to creating kid-friendly clinical trials, they showcased the significant impact of our global youth advisory network.

The AAP Conference provided an incredible opportunity to amplify iCAN's message. Thanks to Leanne, Sabina, and Abby's efforts, we made lasting connections with healthcare leaders and furthered our mission for better pediatric care.

Follow us on social media to see highlights from the event and the amazing strides we are making to impact children's healthcare globally!

iCAN Spotlight

Spotlight on iCAN Members: Michael, Anvita, and Michael's Mom at the FDA Workshop



We are proud to highlight a special moment for iCAN as Michael, Anvita, and Michael's mom recently represented our community at the FDA's "ADEPT 9: Public Workshop on Enhancing Diversity in Therapeutics Development for Pediatric Patients" on September 6th, 2024. Hosted by the University of Maryland Center of Excellence in Regulatory Science and Innovation (MCERSI) in collaboration with the FDA, this event focused on amplifying the voices of patients and their families to ensure a more inclusive approach to pediatric therapeutic development.

"We are proud to highlight a special moment for iCAN as Michael, Anvita, and Michael's mom recently represented our community at the FDA's "ADEPT 9: Public Workshop on Enhancing Diversity in Therapeutics Development for Pediatric Patients" on September 6th, 2024."

Michael, Anvita, and Michael's mom played a key role in the workshop, where they shared their personal experiences and insights during a keynote speech and panel discussions. Their perspectives, grounded in their lived experiences as young patients and advocates, added authenticity and impact to the conversation. As always, their contributions exemplified the heart of iCAN's mission—ensuring that young voices are heard and valued in shaping the future of healthcare.

The workshop brought together patients, caregivers, academicians, industry leaders, and FDA representatives, all united in enhancing diversity in therapeutics development for pediatric patients. The participation of Michael, Anvita, and Michael's mom was a powerful reminder of the importance of collaboration in creating meaningful change.

We are incredibly proud of their efforts and are excited to see iCAN continue to make a lasting impact in critical conversations around pediatric care and research. Their stories reflect their courage and determination and strengthen the broader iCAN community's mission of driving patient-centered innovation.

Thank you, Michael, Anvita, and Michael's mom, for representing iCAN with passion and purpose! We look forward to seeing even more milestones as we continue to work together to improve pediatric healthcare for every kid everywhere.



iCAN's 2025 Annual Research and Advocacy Summit

Presented by Jumo Health

July 14-18, 2025

To sponsor our Summit, visit bit.ly/iCANsponsorships

We are so excited to announce that our next Summit will take place in Canada from July 14th to 18th, 2025, hosted by KIDS Canada Francais. Please save the date! Additional details will be shared later this year. Here is the video announcing the location, which was played at our annual Summit.

"We are so excited to announce that our next Summit will take place in Canada from July 14th to 18th, 2025, hosted by KIDS Canada Francais. Please save the date! Additional details will be shared later this year."

Our annual Summit is a transformative platform for nurturing innovation, compassion, and collaboration in pediatric healthcare among all stakeholders. We invite you to join us in this life-changing event and contribute in two meaningful ways:

1. Sponsor the 2025 Summit: Your sponsorship is pivotal in organizing the Summit, ensuring an impactful experience for all attendees.
2. Sponsor a Child to Attend: Your sponsorship directly impacts a child's life, allowing them to attend the Summit in Canada. Your support covers travel, accommodation, and participation, offering a world of learning and empowerment.

"Together, we are shaping a brighter future for pediatric healthcare. Regardless of size, your contribution makes a significant difference in prioritizing the patient's voice and fostering positive change. Your generosity and dedication are deeply valued. Let us unite in Canada to create a summit experience that will empower the pediatric community for years to come!"

Together, we are shaping a brighter future for pediatric healthcare. Regardless of size, your contribution makes a significant difference in prioritizing the patient's voice and fostering positive change. Your generosity and dedication are deeply valued. Let us unite in Canada to create a summit experience that will empower the pediatric community for years to come! Let us work together to make next year's Summit even bigger by bringing more kids to share their voices! To contribute to the funding for next year's Summit, please click here to donate.



Disclosures: *There are no reported disclosures*

NT

Corresponding Author



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NEW NANN/INC DIGITAL PRODUCT OUT NOW!

BRIDGING THE GAP:
EMPOWERING NEONATAL NURSES IN DRUG DEVELOPMENT FOR NEONATES

Free course *created for neonatal nurses to increase their knowledge on the need for additional neonatal drug therapies.*

YOU WILL LEARN...

- *Innovative, regulated medicine development for neonates*
- *Pharmaceutical industry pipeline decision making, including factors that influence Go/No-Go decisions*
- *Information to advocate for neonatal needs*

SCAN THE QR CODE TO LEARN MORE!

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

National Perinatal Association



9TH INTERNATIONAL NEONATOLOGY ASSOCIATION CONFERENCE

INAC2024

What's new in neonatology?

5-8 DECEMBER 2024 | BERLIN, GERMANY

www.worldneonatology.com/2024

Join iCAN's Virtual Focus Group!



We warmly welcome all individuals within the age ranges of 8-10 and 12-18, including those with:

- Learning disabilities (example: dyslexia)
- Speech or language disabilities (examples: stuttering, understanding others, hearing)
- Physical disabilities (examples: epilepsy, cystic fibrosis)
- Autism Spectrum Disorder (ASD) or Attention-Deficit/Hyperactivity Disorder (ADHD)

Every voice counts!

It's a one-minute survey to see if you qualify for a one-hour focus group to be scheduled at a later date.

Survey Link: bit.ly/icanxkismet

Fill out the recruitment survey now and let your voice be heard! Together, we can make a real difference in pediatric healthcare!

iCAN
International Children's Advisory Network

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The Academy of Neonatal Care serves to educate Respiratory Therapists, Nurses, and Doctors in current and best practices in Neonatal ICU care. We prepare RT's new to NICU to fully function as a bedside NICU RT. Our goal is to enrich NICU care at all levels. Beginner to Advanced Practice, there is something for you at:

www.AcademyofNeonatalCare.org.

Keeping Your Baby Safe
from respiratory infections

RSV
COVID-19
colds
flu

How to protect your little ones from germs and viruses

This year is an especially dangerous cold and flu season - especially for vulnerable infants and children. Fortunately, there are proven protective measures that we can take to stay healthy.

Here's what you can do...

Wash Your Hands

- This is the single, most important thing you can do to stop the spread of viruses.
- Use soap.
- Wash for more than 20 seconds.
- Use alcohol-based sanitizers.



Limit Contact with Others



- Stay home when you can.
- Stay 6 feet apart when out.
- Wear a face mask when out.
- Change your clothes when you get home.
- Tell others what you're doing to stay safe.

Provide Protective Immunity

- Hold your baby skin-to-skin.
- Give them your breast milk.
- Stay current with your family's immunizations.



Take Care of Yourself

- Stay connected with your family and friends.
- Drink more water and eat healthy foods.
- Seek mental health support.
- Sleep when you can.



Get Immunized

Vaccinations save lives. Protecting your baby from COVID-19, flu and pertussis lowers their risks for complications from respiratory infections.



WARNING

Never Put a Mask on Your Baby

- Because babies have smaller airways, a mask makes it hard for them to breathe.
- Masks pose a risk of strangulation and suffocation.
- A baby can't remove their mask if they're suffocating.



If you feel sick or are positive for COVID-19

- Wash with soap and water and put on fresh clothes before holding or feeding your baby.
- Wear a mask to help stop the virus from spreading.
- Watch out for symptoms like fever, confusion, or trouble breathing.
- Ask for help caring for your baby and yourself while you recover.



We can help protect each other.
www.nationalperinatal.org/rsv

National Perinatal Association

International Children's Advisory Network, Inc. (iCAN)
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www.icanresearch.org
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iCAN, the International Children's Advisory Network, is a 501(c)(3) nonprofit organization comprising 90% youth with medically rare or complex diagnoses from around the world, with 10% not having any diagnoses but wanting to contribute to change in pediatrics. For over a decade, iCAN has consistently advocated for the representation of children and families in the realms of pediatric medicine, research, and innovation. iCAN is the platform for empowering young individuals to contribute their insights and experiences, directly influencing the landscape of pediatric medical research and innovation. Through various initiatives and events, iCAN strives to enhance the involvement of children and families in healthcare decision-making processes with clinicians, researchers, the FDA, and industry to foster patient-centric advancements in pediatric healthcare.

On behalf of iCAN, we extend an invitation for you to contribute an in-kind donation to our upcoming online auction event scheduled for October 24-October 31, 2024, where buyers across the continental US will support us in raising funds for our kids. Your generous contribution not only provides life-changing opportunities but also empowers these children to actively shape the future of pediatric healthcare.

Your valuable contribution to this auction directly supports our fundraising efforts, enabling us to sponsor children from around the world who do not have the financial means to attend our annual Research and Advocacy Summit. This upcoming year, the iCAN Summit will be hosted by our Canada chapter and is scheduled for July of 2025. The proceeds specifically cover global travel and accommodation expenses to bring together pediatric participants from around the world. Throughout the interactive and educational week-long event, children will engage with industry, work in a university medical lab and on projects, share research findings from the past year, and perform a service project with the local children's hospital.

Exclusive recognition for your contributions will be provided during this event, such as acknowledgment on our social media platforms, recognition on our website under "Auction Donors," and mentions in our promotional materials for the auction. Your dedication to our cause will be prominently highlighted within our network of supporters.

To confirm your generous donation, including coverage of shipping costs to our organization, we have enclosed an in-kind donation form specifying the item you intend to contribute. You can also sponsor the Summit as well. Please take a moment to complete this form and return it to us via email at goldsteinmd@icanresearch.org by September 30, 2024. Your prompt response will ensure the accurate acknowledgment of your donation or sponsorship for tax purposes.

Your consideration and support are highly valued. By contributing to our cause, you play a crucial role in making a tangible difference in the lives of children everywhere. Together, we can amplify these young voices and contribute to groundbreaking advancements in pediatric medicine and healthcare, recognizing the patient as the most important stakeholder.

We look forward to your partnership!

Sincerely,

Charles A. Thompson, MD FAAP

Founder/Chairman, International Children's Advisory Network

Sponsorship and Donation Request Form

___ Champion Sponsor ($100,000)

___ Titan Sponsor ($75,000)

___ Warrior Sponsor ($50,000)

___ Guardian Sponsor ($25,000)

___ Defender Sponsor ($15,000)

___ Protector Sponsor ($10,000)

___ Patron Sponsor (< $10,000)

Company Name:_____

Contact Person: _____

Title:_____

Email Address:_____

Phone Number:_____

Address:_____

Description of In-Kind Donation:

- ☐ Product(s)
- ☐ Gift Certificate
- ☐ Other (please specify)

Quantity/Value of Donation: _____

Expiration Date (if applicable):_____

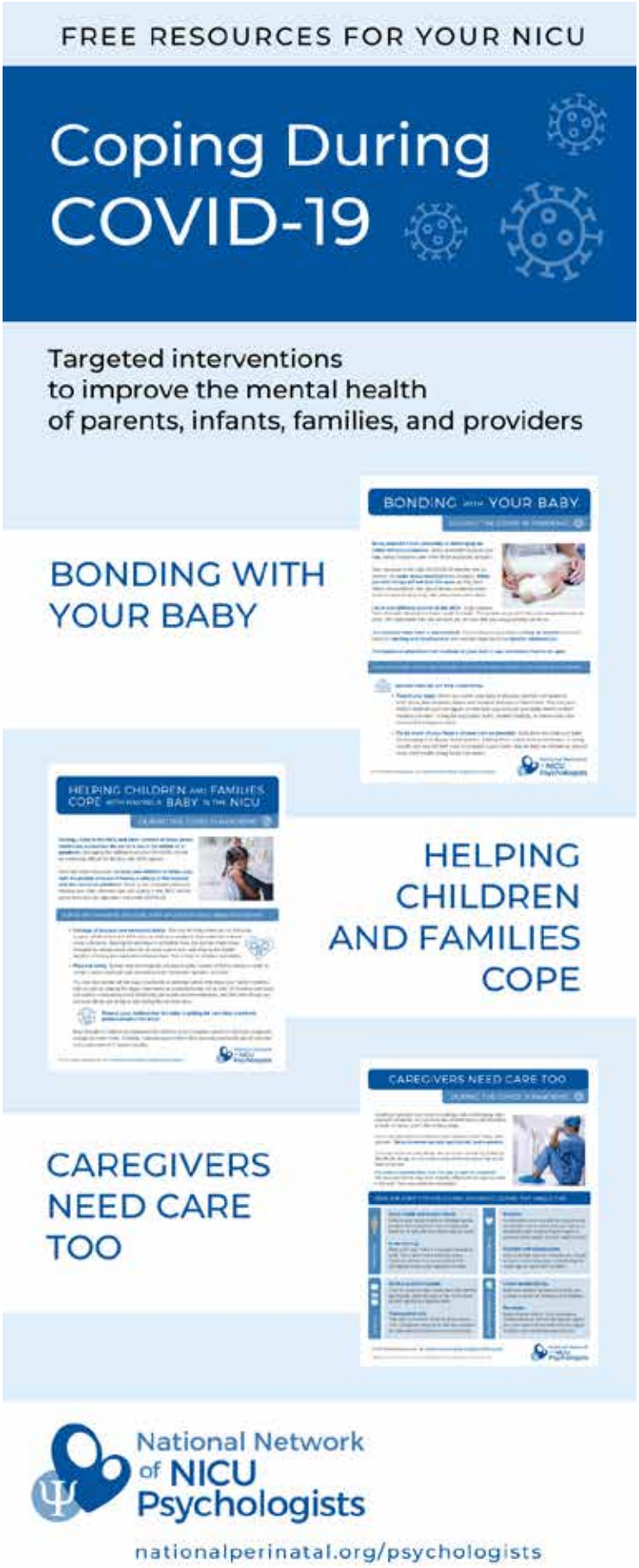
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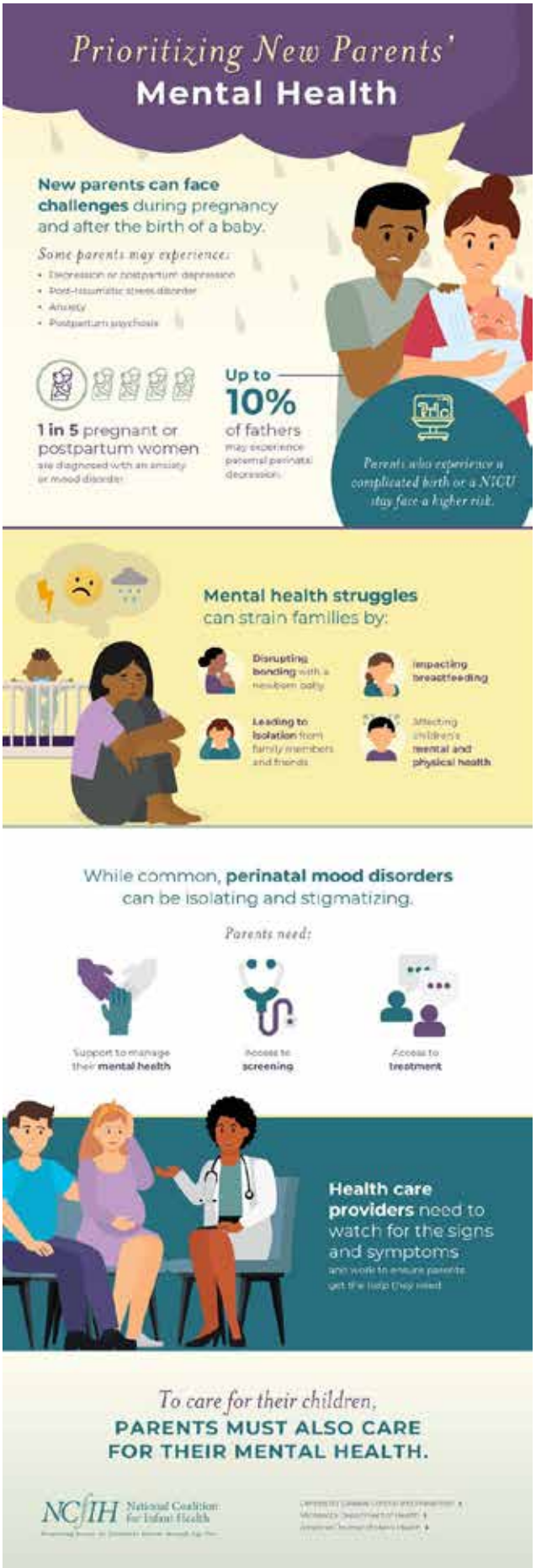
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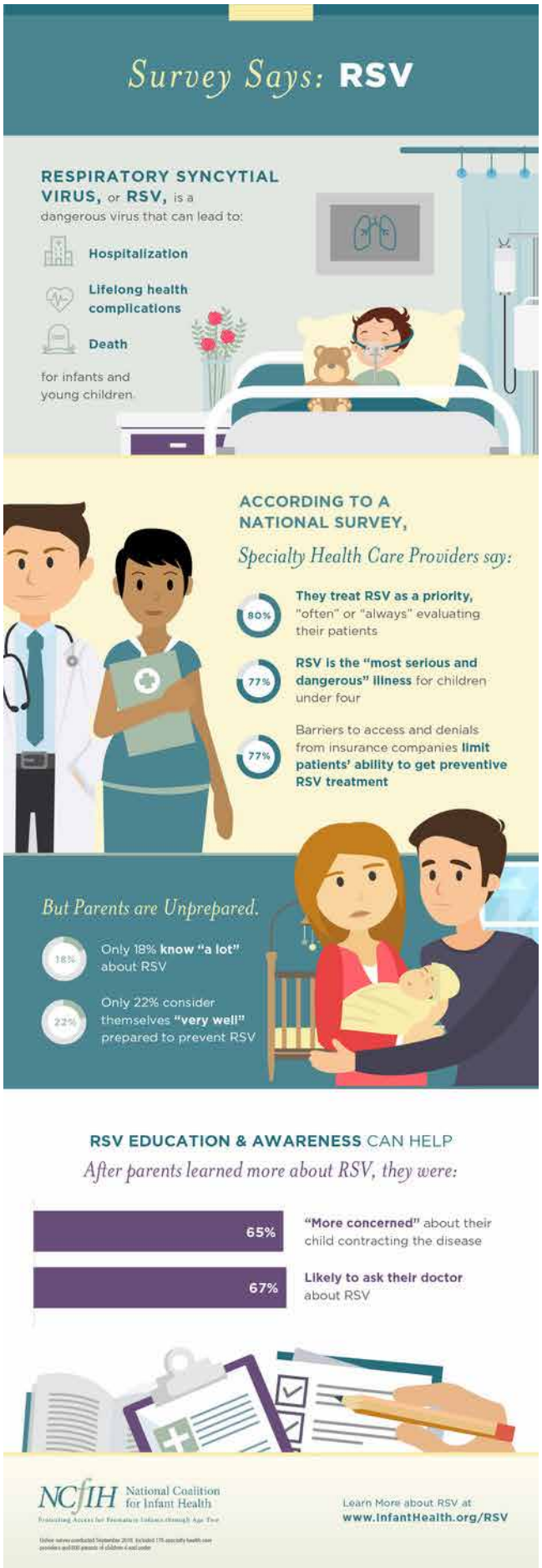
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PROTECT YOUR FAMILY FROM
RESPIRATORY VIRUSES
flu
coronavirus
pertussis
RSV
SOAP
WASH YOUR HANDS
often with soap and warm water.
GET VACCINATED
for flu and pertussis. Ask about protective injections for RSV.
COVER COUGHS AND SNEEZES.
Sneeze and cough into your elbow.
USE AN ALCOHOL-BASED HAND SANITIZER.
STAY AWAY FROM SICK PEOPLE
Avoid crowds. Protect vulnerable babies and children.
www.nationalperinatal.org
National Perinatal Association


FREE RESOURCES FOR YOUR NICU
Coping During COVID-19
Targeted interventions to improve the mental health of parents, infants, families, and providers
BONDING WITH YOUR BABY
HELPING CHILDREN AND FAMILIES COPE
CAREGIVERS NEED CARE TOO
National Network of NICU Psychologists
nationalperinatal.org/psychologists


Prioritizing New Parents' Mental Health
New parents can face challenges during pregnancy and after the birth of a baby.
Some parents may experience:
Depression or postpartum depression
Post-traumatic stress disorder
Anxiety
Postpartum psychosis
1 in 5 pregnant or postpartum women are diagnosed with an anxiety or mood disorder
Up to 10% of fathers may experience paternal perinatal depression
Parents who experience a complicated birth or a NICU stay face a higher risk.
Mental health struggles can strain families by:
Disrupting bonding with a newborn baby
Impacting breastfeeding
Leading to isolation from family members and friends
Affecting children's mental and physical health
While common, perinatal mood disorders can be isolating and stigmatizing.
Parents need:
Support to manage their mental health
Access to screening
Access to treatment
Health care providers need to watch for the signs and symptoms and work to ensure parents get the help they need
To care for their children,
PARENTS MUST ALSO CARE FOR THEIR MENTAL HEALTH.
NCIH National Coalition for Infant Health


Survey Says: RSV
RESPIRATORY SYNCYTIAL VIRUS, or RSV, is a dangerous virus that can lead to:
Hospitalization
Lifelong health complications
Death
for infants and young children
ACCORDING TO A NATIONAL SURVEY,
Specialty Health Care Providers say:
80% They treat RSV as a priority, "often" or "always" evaluating their patients
77% RSV is the "most serious and dangerous" illness for children under four
77% Barriers to access and denials from insurance companies limit patients' ability to get preventive RSV treatment
But Parents are Unprepared.
18% Only 18% know "a lot" about RSV
22% Only 22% consider themselves "very well" prepared to prevent RSV
RSV EDUCATION & AWARENESS CAN HELP
After parents learned more about RSV, they were:
65% "More concerned" about their child contracting the disease
67% Likely to ask their doctor about RSV
NCIH National Coalition for Infant Health
Learn More about RSV at www.InfantHealth.org/RSV

Peer Reviewed

Briefly Legal: Nursing and Medical Errors in Placement and Monitoring of Percutaneous Arterial Line Leads to Loss of Fingers

Maureen E. Sims, MD, Barry Schifrin, MD

A 26-year-old G6P2Ab3 mother arrived at the hospital in late active labor. She was 22 weeks gestation with a history of cervical incompetence for which diagnosis of a cervical cerclage had been placed weeks earlier. Her previous pregnancies included two babies delivered at term and three early terminations accomplished by D&C. Likely in relationship to the multiple pregnancy terminations, a diagnosis of cervical insufficiency was made, and a cervical cerclage was placed in the second trimester – only several weeks before the delivery. Group B streptococcus status was unknown. Moreover, because of the imminence of delivery, antenatal steroids were not administered. In her discussions before delivery, the mother insisted that despite the extreme prematurity, she wanted full intervention for her daughter.

"Her previous pregnancies included two babies delivered at term and three early terminations accomplished by D&C. Likely in relationship to the multiple pregnancy terminations, a diagnosis of cervical insufficiency was made, and a cervical cerclage was placed in the second trimester – only several weeks before the delivery."

At delivery, the 520-gram female infant received Apgar scores of 1, 2, and 2 at one, five, and ten minutes, respectively. Her growth parameters were all appropriate for gestational age. The baby's depression at birth required positive pressure ventilation, one dose of endotracheal epinephrine, and chest compressions. Her complete blood count (CBC) was unremarkable. Umbilical catheters were placed, and surfactant replacement and antibiotics were administered. The baby stabilized on low ventilator settings. By ten days of age, the umbilical catheters were removed. By week 2, a percutaneous intravenous central catheter (PICC) was placed for nutrition. A percutaneous arterial line (PAL) was inserted in the left radial artery to monitor blood pressure and gases and draw blood. Unfortunately, when the PAL was inserted, the physician failed to perform an Allen test, a test used to assess the collateral blood supply to the hand.

In the deposition, the nurse caring for the baby on the day of PAL insertion was questioned about the relationship of discoloration of the infant's hand concerning the timing of the PAL placement. She explained that she noted discoloration of the fingers shortly after PAL insertion but did not notify the neonatologist. The normally required hourly nursing assessments were absent from the medical record. About 24 hours after insertion of the PAL, the baby's left hand was pink, but the fingers were black. The neonatologist was informed and immediately removed the catheter. The left hand gradually became dusky over the next few days. Eventually, all the fingers on the left hand were lost.

"She explained that she noted discoloration of the fingers shortly after PAL insertion but did not notify the neonatologist. The normally required hourly nursing assessments were absent from the medical record. About 24 hours after insertion of the PAL, the baby's left hand was pink, but the fingers were black."

The hospital and the neonatologist were sued, and a settlement was agreed upon without trial.

Allegations

- The neonatologist failed to perform an Allen test
- The nurses failed to inform the neonatologist of the discoloration of the fingers.

Defense

- The Allen Test was done but not documented
- The nurses said they informed the physician but did not document
- The physician denied being informed by the nurse

Discussion

Cervical cerclage is one of the well-known surgical procedures carried out during pregnancy. It aims to provide mechanical support to the cervical canal and to keep the cervix closed, which serves as a mechanical barrier between the vagina and the uterine cavity. Still, cervical secretions also contain many immune components

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that protect the fetal compartment from ascendent infections.

A recent meta-analysis compared the therapeutic effects of emergency cervical cerclage and expectant treatment in preterm birth due to cervical insufficiency in singleton pregnancies. In this study, emergency cervical cerclage was found to be superior to expectant treatment for pregnancy prolongation, neonatal birth weight, neonatal Apgar 1 at one minute, number of live birth deliveries after 32 and 34 weeks, vaginal deliveries, and neonatal survivals. No difference between emergency cervical cerclage and expectant treatment was found in patients with chorioamnionitis. The authors concluded that in singleton pregnancies documented cervical insufficiency before the 28th week of pregnancy, cervical cerclage can significantly prolong the gestational week and improve the neonatal survival rate, compared to expectant management.

The benefits of cerclage notwithstanding, statistics do not exclude the potential for the cerclage to fail or to precipitate extremely preterm delivery as in this case. Perioperative complications of cervical cerclage include hemorrhage (2.3%), preterm premature rupture of membranes (2.5%), and laceration of the cervix (0.6%). Although rare, long-term complications of cervical cerclage include fistula formation, particularly vesicovaginal fistulas.

"Because of the potential risk of ischemic injury to the entire hand or arm, the ulnar, brachial, and axillary arteries are generally used for cannulation only if arterial access at the primary site is unsuccessful. The temporal artery placement procedure is no longer used because of the frequency of severe neurologic complications."

Insertions of intravascular catheters are commonly performed on neonates. Over the past several decades, they have become indispensable in caring for babies in the newborn intensive care unit. The catheters may be inserted in variably sized arterial or venous locations, such as large central or small peripheral vessels. These catheters may be used to monitor blood pressure, sample blood, and infuse fluids or medications. They are used during resuscitation, exchange transfusions, and perhaps most frequently for prolonged nutritional and medication support. The radial and posterior tibial arteries are the primary sites for cannulation. Because of the potential risk of ischemic injury to the entire hand or arm, the ulnar, brachial, and axillary arteries are generally used for cannulation only if arterial access at the primary site is unsuccessful. The temporal artery placement procedure is no longer used because of the frequency of severe neurologic complications.

Despite their obvious value, they all carry risks, including thromboembolism, vasospasm, infection, iatrogenic blood loss, cardiac tamponade, perforation of the pericardium, arrhythmia, peripheral nerve damage, rarely pseudoaneurysm, and arteriovenous fistula. The overall risk of ischemic injury secondary to radial or ulnar artery catheterization is approximately 5%. Precautions during the insertion, vigilance in the maintenance of catheters, removal as soon as medically feasible, and prompt discontinuation when signs of vascular compromise or local extravasation develop reduce the risks of complications. Blood flow to the site distal to the cannulation site depends on adequate collateral circulation. Frequent monitoring of the extremities, especially the tips of the fingers or toes, for signs of vascular compromise is crucial. Studies of Doppler flow of radial artery by Hack et al. showed complete occlusion in 63% of infants with radial artery catheterization, underscoring the need to assess the collateral circulation. Blood flow in the radial artery may not resume to normal even up to a month after catheter removal.

The Allen Test is performed before inserting a radial artery line to establish the presence of adequate collateral circulation to the fingers. This practice represents a minimal standard of care and should be documented in the records. Evaluation of the waveform helps determine how well the PAL functions. Flattening of the curve can be caused by obstructing the catheter from clot formation or from the catheter being pushed against the arterial wall or bent tubing. If an obstruction is suspected, the catheter should be gently aspirated. If no resistance is encountered and the catheter allows sampling, a 1 ml flush may be given.

"Vasospasm after introducing a catheter into the radial artery usually occurs within minutes to a few hours after insertion. In contrast, thromboembolic events after a radial artery placement of a PAL usually occur days or weeks after catheter insertion. Initially, the fingers or hand present with a blue, purple, or mottled discoloration, but with progressive ischemia, a change to a white or pale discoloration occurs. The fingers and hand may be cool to the touch, and the pulses may be decreased or absent. Without timely intervention, the progressive changes result in gangrene."

Vasospasm after introducing a catheter into the *radial artery* usually occurs within minutes to a few hours after insertion. In contrast, thromboembolic events after a radial artery placement of a PAL usually occur days or weeks after catheter insertion. Initially, the fingers or hand present with a blue, purple, or mottled discoloration, but with progressive ischemia, a change to a white or pale discoloration occurs. The fingers and hand may be cool to the touch, and the pulses may be decreased or absent. Without timely intervention, the progressive changes result in gangrene.

Although there are multiple case reports of ischemic injury with peripherally inserted arterial catheters, very limited data is available on their use in extremely low birth weight infants at the limits of viability. When peripheral ischemia is recognized immediately and appropriate action is taken, permanent loss of digits is generally avoided. Topical nitroglycerin effectively restored perfusion in a few cases where radial artery catheterization compromised fingers and hands. As stated, immediate catheter removal at the

earliest signs of ischemia is essential to prevent ensuing tissue loss. Flushing the PAL to remove a clot off the tip should never be attempted because this may result in severe embolic injury.

"Fluid other than heparinized saline flush solution should never be administered into a peripheral artery catheter. Less common complications of peripheral artery catheters include nerve injury, infections, hemorrhage from accidental dislodgement, and burns from transillumination during catheter insertion. Peripheral artery catheters should be removed at the earliest indication of vascular compromise, nerve impairment, clot formation, or infection."

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Suggested Reading:

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

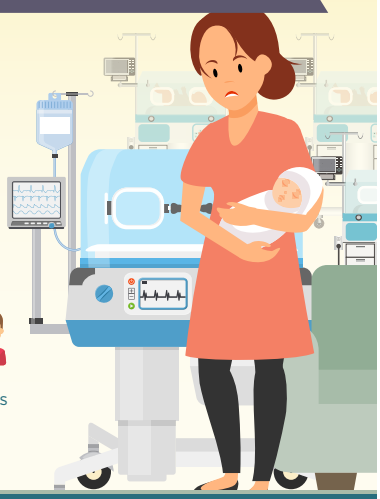
Preterm infants are:

2x more likely to have developmental delays

5x more likely to have learning challenges



1 in **3** preterm infants will require support services at school



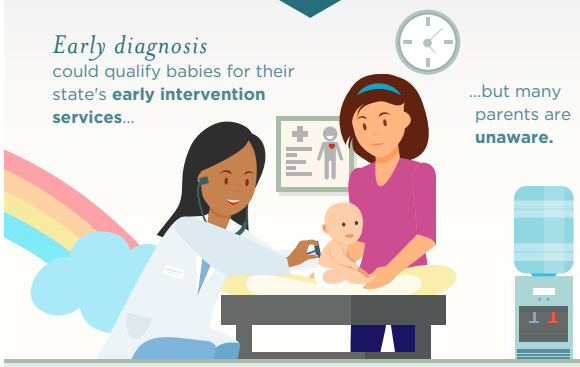
Early intervention can help preterm infants:

- Enhance language and communication skills
- Build more effective learning techniques
- Process social and emotional situations
- Address physical challenges
- Prevent mild difficulties from developing into major problems

Early diagnosis

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

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





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



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

NCFIH National Coalition for Infant Health

Protecting Access for Premature Infants through Age Two

www.infanthealth.org

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

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



1 DE CADA **7** MADRES AFRONTA LA DEPRESIÓN POSPARTO, *experimentando*

- Llanto incontrolable
- Sueño interrumpido
- Ansiedad
- Desplazamientos en los patrones de alimentación
- Ideas de hacerse daño a sí mismas o al bebé
- Distanciamiento de amigos y familiares





Sin embargo, sólo el 15% recibe tratamiento[1]

LA DEPRESIÓN POSTPARTO **NO TRATADA** PUEDE AFECTAR:



La salud de la madre

El sueño, la alimentación y el comportamiento del bebé a medida que crece[2]

La capacidad para cuidar de un bebé y sus hermanos

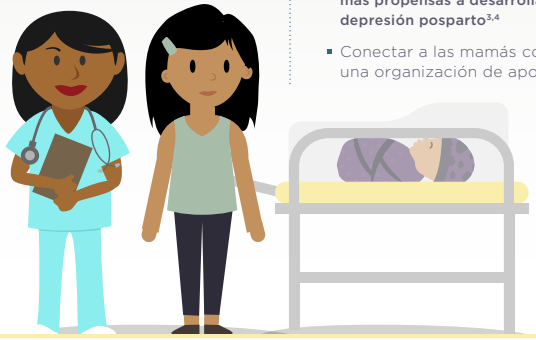
PARA AYUDAR **A LAS MADRES A ENFRENTAR LA DEPRESIÓN POSPARTO**

LOS ENCARGADOS DE FORMULAR POLÍTICAS PUEDEN:

- Financiar los esfuerzos de despistaje y diagnostico
- Proteger el acceso al tratamiento

LOS HOSPITALES PUEDEN:

- Capacitar a los profesionales de la salud para proporcionar apoyo psicosocial a las familias... **Especialmente aquellas con bebés prematuros, que son 40% más propensas a desarrollar depresión posparto**[3,4]
- Conectar a las mamás con una organización de apoyo



NCFIH National Coalition for Infant Health

www.infanthealth.org

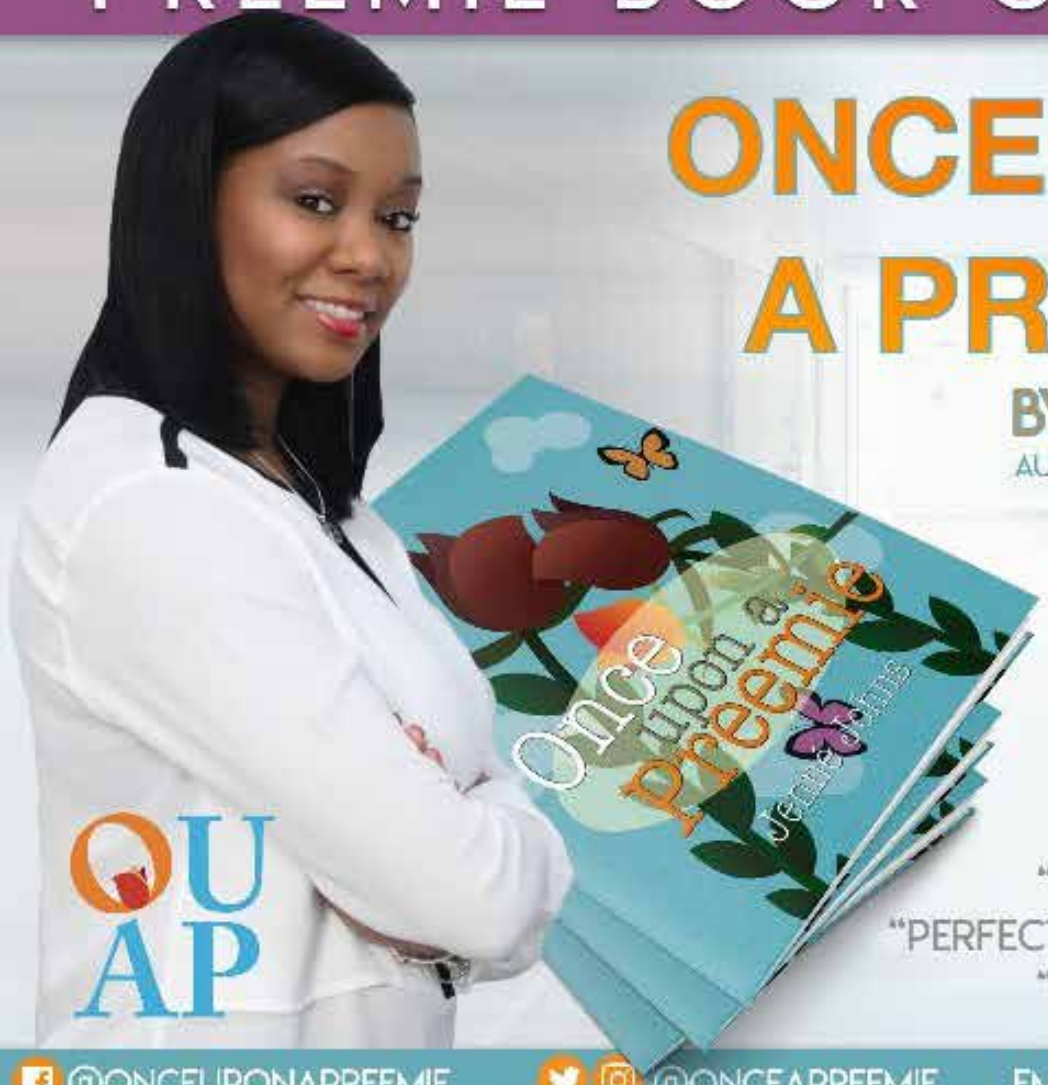
[1] American Psychological Association. Accesible en: http://www.apa.org/pi/women/resources/reports/postpartum-depression.aspx

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PREEMIE BOOK ON SALE



ONCE UPON A PREEMIE

BY JENNÉ JOHNS

AUTHOR | SPEAKER | ADVOCATE

QUAP

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"PERFECT FOR PREEMIE FAMILIES"
"ENCOURAGING"

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ONCE UPON A PREEMIE IS A BEAUTIFUL NEW WAY TO LOOK AT THE LIFE OF A PREEMIE BABY. IT EXPLORES THE PARENT AND CHILD NEONATAL INTENSIVE CARE UNIT (NICU) JOURNEY IN A UNIQUE AND UPLIFTING WAY.

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CONGRESSIONAL BLACK CAUCUS ANNUAL LEGISLATIVE CONFERENCE
NATIONAL MEDICAL ASSOCIATION ANNUAL CONFERENCE
HUDSON VALLEY PERINATAL PUBLIC HEALTH CONFERENCE
MATERNITY CARE COALITION ADVOCACY DAY

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The Joyner Report

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

NIH *Eunice Kennedy Shriver* National Institute of Child Health and Human Development

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Compiled and Reviewed by Benjamin Hopkins, DO

CDC: Drop in vaccinations could cause resurgence of measles, varicella and more

NEWS PROVIDED BY

American Academy of Pediatrics

By Melissa Jenco

Study: CDC: Drop in vaccinations could cause resurgence of measles, varicella and more

Current as of September 26, 2024

Vaccine coverage for children by 2 years of age was lower for those born during the COVID-19 pandemic compared to the two previous years, according to a new report.

The declines "could lead to a resurgence of vaccine-preventable diseases such as measles, varicella, and rotavirus and their associated morbidity and mortality," researchers from the Centers for Disease Control and Prevention (CDC) wrote in a new *Morbidity and Mortality Weekly Report*.

Children are recommended to receive vaccinations against 15 diseases by 24 months of age. Researchers analyzed data provided by parents and guardians in the National Immunization Survey-Child to look at trends in coverage rates.

Among children born in 2020 and 2021, coverage fell for most vaccines compared to children born in 2018 and 2019. The biggest decline was for two doses of influenza vaccine, which fell from 63% to 56%. A full series of *Haemophilus influenzae* type b (Hib) vaccine and the combined seven vaccine series each dropped about three percentage points.

Data from the survey on coverage by 24 months show rates of

- 92% for at least three doses of poliovirus vaccine,
- 91% for at least three doses of hepatitis B vaccine,
- 90% for at least one dose of measles, mumps, rubella vaccine,
- 90% for at least one dose of varicella vaccine,
- 81% for at least four doses of pneumococcal conjugate vaccine,
- 79% for at least four doses of diphtheria, tetanus and acellular pertussis vaccine,
- 77% for a full series of Hib vaccine,
- 75% for rotavirus vaccine by age 8 months,
- 67% for the combined seven vaccine series,
- 56% for at least two doses of influenza vaccine, and
- 46% for at least two doses of hepatitis A vaccine.

Just over 1% of children were completely unvaccinated by 2 years of age.

Children living below the poverty level, uninsured, using public insurance or living in rural areas tended to have lower vaccine coverage than their peers. Children who are Black, Hispanic, American Indian or Alaska Native had lower coverage for several vaccines compared to white children.

Health care disruptions and parental hesitancy may have contributed to some of the declines in vaccination rates. The data come as 262 cases of measles have been reported this year, the highest since 2019, according to CDC data. About 42% of cases this year have been in children under 5 years, and 88% of all patients were unvaccinated or had an unknown vaccination status.

Authors urged clinicians to recommend vaccination to patients at every visit, use reminder systems and address financial barriers and vaccine hesitancy.

"Implementation of these interventions can increase vaccination coverage, reduce disparities, and bring the nation closer to eliminating vaccine-preventable diseases for all young children," they wrote.

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Genetic testing can identify treatable neurodevelopmental disorders

NEWS PROVIDED BY

American Academy of Pediatrics

By Samantha A. Vergano, M.D., FAAP, and Bianca Russell, M.D.

Study: Genetic testing can identify treatable neurodevelopmental disorders

Current as of September 1, 2024

Neurodevelopmental disorders (NDDs) may have identifiable genetic etiologies in up to 40% of cases but only recently have treatments and medications been directed at their underlying mechanisms.

When assessing children with NDDs, it is nearly impossible to make a genetic diagnosis without testing. Access to testing has

improved thanks to broader insurance coverage and increased awareness of the benefits of genetic evaluations, leading to shortened diagnostic odysseys.

Rett syndrome and metachromatic leukodystrophy are two NDDs that general pediatricians may encounter for which treatment is available. Early identification of these disorders is the key to optimizing health and developmental potential and referral for possible targeted therapeutics.

Rett syndrome

Rett syndrome is an X-linked neurologic disorder caused by pathogenic variants in the *MECP2* gene (many additional genes may cause a Rett-like phenotype). The classic presentation is that of a female with typical development until about 4-6 months, after which development may regress.

Children with Rett syndrome lose previously acquired motor skills, and head growth slows (acquired microcephaly). Additional classic features may include hand-wringing or other stereotypies, hyperventilation, seizures, sleep disturbances and cardiac arrhythmias. Death may occur in adolescence or young adulthood, depending on the severity; neurologic deterioration and aspiration are frequent causes of mortality.

As with many conditions, there can be a broad phenotypic spectrum. Rett may present as mild to moderate global developmental delays with autistic features or with epilepsy as the central feature. While affected males are rare, mosaic individuals or those with milder variants can present with an extensive range of NDD features and seizures. Given the broad spectrum, Rett syndrome should be on the differential for any child with atypical development.

In March 2023, the Food and Drug Administration (FDA) approved the use of Daybue (trofinetide) to treat Rett syndrome in individuals with pathogenic variants in the *MECP2* gene. The drug is an IGF-1 analog and is thought to work by decreasing inflammation in the brain and improving synaptic formation and neuronal maturation. Studies showed improvement in several symptoms reported by caregivers, including sleep/nighttime behaviors, breathing, mood, eye gaze and others. The most common side effect reported was diarrhea.

While this medication is not a cure, the alleviation of even some symptoms and meaningful improvement in social interactions and engagement can be life-changing for families struggling with this devastating disorder. Earlier diagnosis and initiation of treatment may have a more significant long-term benefit.

Metachromatic leukodystrophy

Metachromatic leukodystrophy (MLD) is a progressive neurologic lysosomal storage disorder caused by a deficiency in the arylsulfatase A enzyme. Pathogenic variants in the *ARSA* gene result in the decreased or absent function of the enzyme.

Individuals with late-infantile or juvenile MLD (onset before 30 months of age or between 30 months and 16 years, respectively) experience neurologic degeneration, including regression in motor skills, gait disturbances, spasticity and deterioration in vision and hearing. Ultimately, individuals die from neurocognitive decline or subsequent morbidities, including aspiration pneumonia.

In March 2024, the FDA announced approval of Lenmeldy, a one-time gene therapy infusion for individuals with a known diagnosis of MLD who have not yet shown symptoms or who have mild symptoms. The gene therapy enables an individual's stem cells to produce functional copies of the *ARSA* gene and, subsequently, arylsulfatase A. Studies have shown that presymptomatic or mildly symptomatic individuals had a significantly longer symptom-free period (defined by loss of ambulation) or did not have any loss of motor skills.

Role of general pediatricians

Genetic testing, DNA-impacting technology and drug development continue to evolve rapidly, and NDDs are primed to benefit from some of these advancements. Early testing and diagnosis are essential.

General pediatricians have the unique opportunity to help patients achieve an early diagnosis with optimal benefits from novel treatments. While general pediatricians may not make the definitive diagnosis, identification of atypical neurodevelopmental growth is key, as are subsequent referrals to appropriate pediatric specialists, such as those in genetics, neurology or developmental-behavioral pediatrics.

Nov. 5 elections critical for children: how to get out the vote

NEWS PROVIDED BY

American Academy of Pediatrics

By Daniel DeBrakeleer

Study: Nov. 5 elections critical for children: how to get out the vote

Current as of September 1, 2024

Child health is on the ballot this fall.

Elections at all levels of government — from the presidency and U.S. Congress to state and local seats — will determine policies that impact children for their entire lives. Ballot initiatives in 31 states, Washington, D.C., and Puerto Rico pertaining to key issues like firearm violence prevention, reproductive rights and environmental protections also will have serious implications for child health.

With so much at stake, there are many ways for pediatricians to engage their communities and impact races ahead of Election Day on Nov. 5.

Get out the vote

The AAP once again is taking action to help educate and turn out voters, including members, parents, caregivers and young adults.

Health care-based voter registration is impactful in elections. A study published in *JAMA Health Forum* in June found that voters registered in health care settings leading up to the 2020 election were disproportionately younger and more racially and ethnically diverse, suggesting that "medical professionals can play an important role in voter registration and turnout during the 2024 US elections." (See story at https://publications.aap.org/

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aapnews/news/29860).

The Academy will work on several fronts to promote civic health this fall by providing pediatricians with tools to educate their communities on the stakes of this election. The hub of the Academy's get out the vote (GOTV) campaign is https://aap.org/votekids. There, members can find various resources to guide their civic health advocacy.

On the Get Out the Vote Tools page, users can request a free voter registration badge from AAP partner Vot-ER, a nonpartisan, health professional-driven organization working to integrate civic engagement into health care. Badges contain a QR code that patients can scan to check their voter registration status and learn more about registering.

The page also provides sample conversation starters to help guide pediatricians' discussions with their patients about voting, as well as information on which states allow 16- and 17-year-olds to preregister to vote.

The Spread the Vote Kids Message page has resources geared toward communicating the stakes of this election on social media, as well as sample messages and graphics.

Finally, a resource page for chapters lists ideas for how state leaders can get involved in mobilizing voters, like working with residency programs and encouraging member participation in state candidate forums.

The Academy will continue to share new tools and tips at https://aap.org/votekids.

Bringing Vote Kids message to AAP gatherings

The Academy is not limiting its involvement to the online space. Thousands of pediatricians attending the National Conference & Exhibition Sept. 27-Oct. 1 in Orlando, Fla., will have the opportunity to learn more about the Academy's civic engagement efforts.

Conference attendees can visit the advocacy booth to learn about their state's voter registration processes and share why "voting kids" is important. The National Conference takes place before any voter registration deadlines, allowing attendees to participate in meaningful get-out-the-vote work during and after the conference. Vote Kids buttons and Vot-ER badges also will be available for attendees to bring back to their workplaces and communities to spread the message.

National Conference attendees interested in learning about their role in educating others on the importance of voting should attend the interactive workshop "Get Out the Vote: What's at Stake for Child Health in the 2024 Election" from 1-2 p.m. EDT on Sept. 27. It will be led by Geoffrey Rosenthal, M.D., Ph.D., FAAP, chair of the AAP Committee on Federal Government Affairs, and Lisa M. Costello, M.D., M.P.H., FAAP, chair of the Committee on State Government Affairs.

The Section on Pediatric Trainees (SOPT) also will be engaging members at the National Conference. Partnering with Vot-ER on its Healthy Democracy campaign, SOPT members will engage in a friendly competition among AAP districts to promote voter registration. SOPT members also will come together to share their experiences and continue the campaign. Attending physicians are welcome to join in and can email SOPTchair@gmail.com for more information.

The Academy is not waiting for the National Conference to take action. The importance of this year's elections also was front and center at the annual Leadership Conference in July. Attendees wore Vot-ER badges and Vote Kids buttons throughout the conference, and several AAP leaders participated in filming a Vote Kids video, which can be found on the Academy's social media channels.

During their advocacy plenary at the Leadership Conference, Drs. Costello and Rosenthal emphasized the importance of voting, with Dr. Costello leading the room in singing "let's go vote!" to the tune of "Baby Shark."

During his address, AAP CEO/Executive Vice President Mark Del Monte, J.D., emphasized the role voting plays in the Academy's work. "Remember that every law that's ever been passed that protects children, that values children, that makes the world a little safer, a little better for children, started with a vote," Del Monte said. "A vote for people who put children first."

More to come

In early September, the AAP will host a webinar on civic engagement and ways pediatricians can get involved in this year's elections. It will feature voices from various groups within the Academy, including the Section on Minority Health, Equity and Inclusion. The webinar is open to all AAP members.

The Academy will continue to share resources and guidance for engaging patients and families on the stakes of this year's races.

Sept. 17 is National Voter Registration Day. Go to https://vot-er.org/act/ to make sure you are registered to vote and share the site with patients and families.

CDC: Flu deaths in children tie record, officials urge vaccination

NEWS PROVIDED BY

American Academy of Pediatrics

By Melissa Jenco

Study: CDC: Flu deaths in children tie record, officials urge vaccination

Current as of September 13, 2024

Flu deaths among children during the 2023-'24 season have tied a record high, according to new data from the Centers for Disease Control and Prevention (CDC).

The total grew to 199 after two more deaths were reported. That matches the 2019-'20 season and represents a record high for a non-pandemic season. In the 2009-'10 flu pandemic season, there were 288 pediatric deaths.

"Any number of pediatric deaths is a deeply

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tragic reminder that influenza can cause severe illness," the CDC said Friday.

Seventy-three of the children who died in 2023-'24 were under 5 years and 126 were ages 5-17, according to the CDC. Among children with known vaccination or medical status, 83% were not fully vaccinated and 49% had a pre-existing medical condition.

Across all ages, the CDC estimates flu caused at least 35 million illnesses, 400,000 hospitalizations and 25,000 deaths during the 2023-'24 season. Just 54% of children and adolescents were vaccinated, down from 62% in the 2019-'20 season.

The AAP and CDC recommend everyone 6 months and older get vaccinated.

"Flu vaccination can be lifesaving for children and has been shown in several studies to reduce the severity of illness in people," the CDC said.

Influenza vaccines in the U.S. will be trivalent for the 2024-'25 season. The influenza B Yamagata component has been removed since it hasn't circulated since 2020. The vaccines will have an updated influenza A (H3N2) component, while the influenza A (H1N1)pdm09 and influenza B Victoria lineage components are the same.

Kristina A. Bryant, M.D., FAAP, a member of the AAP Committee on Infectious Diseases (COID) and lead author of the flu policy statement and technical report, encourages pediatricians and others who care for children to offer a strong presumptive recommendation for flu vaccine. They can do so at the same time as they are recommending other immunizations and can administer them at the same visit.

AAP policy also suggests using consistent messaging and identifying high-risk patients for outreach with the help of electronic health record tools. To reduce disparities, pediatricians and others who care for children can provide information in patients' preferred language and consider expanded hours and vaccine-only clinics. The medical home is the best place to get immunized, especially for young children. However, alternative sites like school-based clinics, hospitals and pharmacies also may help reduce barriers to vaccination.

Sanofi shipping RSV immunization; manufacturers expand production of nirsevimab

NEWS PROVIDED BY

American Academy of Pediatrics

By Melissa Jenco

Study: Sanofi shipping RSV immunization; manufacturers expand production of nirsevimab

Current as of September 16, 2024

Manufacturers have expanded their capacity to produce nirsevimab (Beyfortus) to protect infants and toddlers from respiratory syncytial virus (RSV) and are shipping immunizations to clinicians.

The Food and Drug Administration has approved a new filling line to expand production following supply shortages that plagued last year's rollout. Sanofi, which works in collaboration with AstraZenecca, also implemented a reservation program.

Customers participating in the reservation program should receive reserved shipments this month and throughout the season. Those not participating in the program can order nirsevimab from October 2024 through February 2025 via http://www.vaccineshop.com.

"This upcoming season, we look forward to BEYFORTUS offering its demonstrated real-world protection to as many infants as possible," Thomas Grenier, M.Sc., M.B.A., head of vaccines for Sanofi, North America, said in a press release.

About two-thirds of infants get RSV, and nearly all children have had it by age 2 years. The virus causes about 50,000 to 80,000 hospitalizations and 100 to 300 deaths per year in children under 5 years, according to the Centers for Disease Control and Prevention (CDC).

"The majority of children hospitalized with RSV who are less than 2 years have no underlying medical conditions, so every young infant is at risk, which is why it's important to protect them all," CDC expert Katherine Fleming-Dutra, M.D., FAAP, said during a recent AAP/CDC webinar on preparing for the upcoming respiratory virus season. Dr. Fleming-Dutra leads the Vaccine Effectiveness and Policy Team in the Coronavirus and Other Respiratory Viruses Division of the CDC's National Center for Immunization and Respiratory Diseases.

The AAP recommends all infants be protected from RSV by receiving nirsevimab or through vaccination of their gestational parent with RSVpreF (Abrysvo). Children are eligible for nirsevimab if they are under 8 months during their first RSV season or 8 months through 19 months of age and at increased risk of severe RSV disease when entering their second season.

About half of infants were protected by nirsevimab or maternal vaccination during the 2023-'24 RSV season, according to the CDC. Data from the first season show nirsevimab was 91%-98% effective at preventing RSV-associated hospitalizations.

Clinicians can learn more about nirsevimab and RSVpreF during the AAP National Conference & Exhibition in Orlando, Fla. The AAP Section on Infectious Diseases and Section on Epidemiology, Public Health and Evidence will hold an H program on RSV from 1-5 p.m. EDT Sept. 28.

Youth E-Cigarette Use Drops to Lowest Level in a Decade

NEWS PROVIDED BY

Center for Disease Control

By CDC Media Relations

Study: Youth E-Cigarette Use Drops to Lowest Level in a Decade

Current as of September 5, 2024

Half a million fewer U.S. youth reported current use of e-cigarettes in 2024 compared to 2023, according to new data from the National Youth Tobacco Survey (NYTS) released today by the U.S. Food and Drug Administration and the U.S. Centers for Disease Control and Prevention. The nationally representative data featured in *Morbidity and Mortality Weekly Report* (MMWR) includes findings on e-cigarette and nicotine pouch use among U.S. youth, two categories of tobacco products the FDA and CDC are monitoring closely, particularly regarding youth use and appeal.

NYTS is an annual school-based, self-

administered survey of U.S. middle (grades 6–8) and high school (grades 9–12) students conducted Jan. 22 to May 22, 2024. Findings showed there was a significant drop in the number of U.S. middle and high school students who reported current (past 30 days) e-cigarette use – a decrease from 2.13 million (7.7%) youth in 2023 to 1.63 million (5.9%) youth in 2024. This decline was largely driven by reduced e-cigarette use among high schoolers (1.56 million to 1.21 million), with no statistically significant change in current e-cigarette use among middle school students within the past year. The number of youth who used e-cigarettes in 2024 is approximately one-third of what it was at its peak in 2019, when over five million youth reported current e-cigarette use.

“The continued decline in e-cigarette use among our nation’s youth is a monumental public health win,” said Brian King, Ph.D., M.P.H., director of the FDA’s Center for Tobacco Products. “This progress is a testament to the relentless efforts by the FDA, CDC and others, particularly over the past half decade. But we can’t rest on our laurels, as there’s still more work to do to further reduce youth e-cigarette use.”

Among youth who currently used e-cigarettes, 26.3% reported using e-cigarettes daily. The vast majority of youth who currently used e-cigarettes used flavored products (87.6%), with fruit (62.8%), candy (33.3%) and mint (25.1%) being the top three most commonly used flavors. Disposable e-cigarette products were the most common product type used; however, the most popular brands included both disposable and cartridge-based products. Among youth who currently used e-cigarettes, the most commonly reported brands were Elf Bar (36.1%), Breeze (19.9%), Mr. Fog (15.8%), Vuse (13.7%) and JUUL (12.6%).

Over the past year, a substantive drop occurred in youth reporting use of e-cigarette products under the Elf Bar brand - from 56.7% in 2023 to 36.1% in 2024. Elf Bar is not authorized by the FDA and has been the subject of focused compliance and enforcement actions by the agency since early 2023, including more than 1,000 warning letters and 240 civil money penalties to retailers and others in the supply chain. The FDA has also issued import alerts that include products under the Elf Bar brand, which places them on the “red list” and allows the agency to detain products without conducting a full inspection at the time of entry.

“Youth use of tobacco products in any form—including e-cigarettes and nicotine pouches—is unsafe,” said Deirdre Lawrence Kittner, Ph.D., M.P.H., director of CDC’s Office on Smoking and Health. “It’s essential that we remain vigilant and committed to public health efforts to ensure all youth can live healthy, tobacco-free lives.”

Youth nicotine pouch use did not show a statistically significant change from 2023 (1.5% in 2023 and 1.8% in 2024). Of the nearly half a million middle and high school students who reported current nicotine pouch use, 22.4% used them daily. The most commonly reported brands among that group were Zyn (68.7%), on! (14.2%), Rogue (13.6%), Velo (10.7%) and Juice Head ZTN (9.8%). Among those who currently used nicotine pouches, the vast majority used flavored products (85.6%), with mint (53.3%), fruit (22.4%) and menthol (19.3%) being the most commonly used flavors.

“While it’s encouraging to see these numbers currently remaining relatively low, the bottom line is that we are concerned about any youth appealing tobacco product,” King said. “Our guard is up. We are aware of the reported growing sales trends for nicotine pouches and are closely monitoring the evolving tobacco product landscape for threats to public health, particularly when it comes to kids.”

Keeping tobacco products out of the hands of youth remains a top priority for the FDA and CDC. As students head back to school, it is important for educators and parents to talk to teens about tobacco product use. The FDA and CDC have free information and resources available to assist these and other groups. For example, the FDA’s Vaping Prevention and Education Resource Center is an online hub with free science-based lesson plans and materials for teachers and parents to promote learning and conversations about youth tobacco product use. The FDA›s «The Real Cost» Youth E-Cigarette Prevention campaign also continues to reach approximately 90% of U.S. teens with its effective prevention messages. Additionally, CDC offers a suite of resources to help protect youth from the harms of vaping and other tobacco product use, including its «Empower Vape-Free Youth» campaign for middle and high school educators.

Around 560,000 children vaccinated in first round of polio campaign in Gaza

NEWS PROVIDED BY

World Health Organization

By WHO Media Team

Study: Around 560 000 children vaccinated in first round of polio campaign in Gaza

Current as of September 13, 2024

Around 560 000 children under ten years old were vaccinated against polio during the first round of an emergency vaccination campaign conducted in three phases from 1-12 September 2024 in the Gaza Strip.

The 12-day campaign provided novel oral polio vaccine type 2 (nOPV2) to 558 963 children, following meticulous planning and coordination. This involved the use of an extensive network of teams, vaccinating at selected fixed sites at health facilities and outreach posts. Mobile and transit teams actively reached out to families living in shelter homes, tents, and camps for the displaced, alongside community workers engaging families to raise awareness ahead of and during the campaign. For each phase, an area-specific humanitarian pause of nine hours daily was agreed to ensure the safety of communities and health workers, and enable vaccination efforts.

“Health and community workers have shown incredible resilience, carrying out this campaign at unprecedented scale and speed under the toughest conditions in Gaza. Swift action by the Global Polio Eradication Initiative—from the moment the virus was detected to the launch of the vaccination campaign—speaks to the effectiveness of the polio programme. In areas where humanitarian pauses took place, the campaign brought not just vaccines, but moments of calm. As we prepare for the next round in four weeks, we’re hopeful these pauses will hold, because this campaign has clearly shown the world what’s possible when peace is given a chance,” said Dr Richard Peeperkorn, WHO Representative for the occupied Palestinian territory (oPt).

“It was critical this ambitious campaign was carried out quickly, safely and effectively to protect children in the Gaza Strip and neighbouring countries from the life-altering poliovirus,” said Jean Gough, UNICEF Special Representative in the State of Palestine. “The progress made in this first round is encouraging, but the job is far from done. We are poised to finish the

task and call on all involved to ensure we can do so in the next round in four weeks' time, for the sake of children everywhere."

Partners at all levels recognize common operational challenges faced during these efforts, including devastated infrastructure, from health facilities to roads, limited trained healthcare workers, access issues due to insecurity, limited fuel for generators used to safely store vaccines and freeze ice packs, and constant population movements. However, these issues were addressed in a timely manner, with the key support of the Palestinian Ministry of Health and UNRWA, to enable planned vaccination activities.

Despite these challenges and the conditions that families in the Gaza Strip have endured over the past 11 months, families flocked to health facilities to get their children vaccinated. This can be attributed to traditionally positive health seeking behaviour among the Palestinian people and an impactful campaign to raise awareness and mobilize the public.

The original target for the campaign was 640 000 children, estimated in the absence of an accurate survey, which may have been an over-estimate, as the population continues to move from place to place, and people are fleeing and being killed due to the ongoing hostilities. During the campaign, trained monitoring teams were deployed to oversee vaccination efforts. As next steps, an additional 65 independent monitors are being deployed to cross-check the proportion of children vaccinated across the Gaza Strip to independently assess the level of coverage achieved in the first round. They need safe, unimpeded access so they can visit households, markets, transit points, and health facilities to check children for the prominent purple dye marked on their little finger when they are vaccinated. These efforts will provide an independent measure of the percentage of vaccination coverage achieved and reasons for any unvaccinated children.

A second round of the campaign will follow, ideally within four weeks, to provide a second dose of nOPV2 to children in Gaza to stop the outbreak and prevent its international spread.

To repeat this ambitious intervention, reach enough children, and successfully stop further transmission of the poliovirus, WHO, UNICEF and UNRWA are calling on all parties to the conflict to commit to another round of humanitarian pauses, with unimpeded access to children in areas that need special coordination.

Ultimately, we need a long-lasting ceasefire as all families in the Gaza Strip need peace so they can begin to heal and rebuild their lives.

Notes to editors:

The campaign was implemented as part of an urgent and robust response to the confirmation of circulating variant poliovirus type 2 (cVDPV2) in Gaza, which was found in the environment in July 2024, and in a 10-month-old child in August 2024. It was conducted by the Palestinian Ministry of Health (MOH), in collaboration with the World Health Organization (WHO), the United Nations Children's Fund (UNICEF), the United Nations Relief and Works Agency for Palestine Refugees (UNRWA) and partners. The Global Polio Eradication Initiative (GPEI) members, donors, WHO Member States and partners in oPt, including as part of the Health Cluster, played a key role in facilitating the campaign.

The campaign kicked off using 473 teams, including 230 mobile teams, and 143 vaccination sites, in central Gaza, followed by 91 fixed sites, complemented by 384 mobile teams in southern Gaza. It concluded in northern Gaza, reaching children through 127 teams at fixed sites and 104 mobile teams. Fixed sites comprised hospitals, medical points, primary health centres, temporary learning spaces, schools, and food and water distribution points. Additionally, 749 social mobilizers were trained and deployed to engage communities, before and during the campaign to nudge families to vaccinate their children and address concerns.

Novel oral polio vaccine (nOPV2) is a polio vaccine being used to stop transmission of variant poliovirus type 2 (cVDPV2), currently the most prevalent form of the variant poliovirus. nOPV2 is safe and effective and offers protection against paralysis and community transmission. It is the vaccine globally recommended for variant type 2 poliovirus outbreaks – the type that has been found in Gaza.

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How to protect your little ones from germs and viruses

Cold and flu season can be dangerous - especially for vulnerable infants and children. Fortunately, there are proven protective measures that we can take to stay healthy.

Here's what you can do...

Wash Your Hands

- This is the single, most important thing you can do to stop the spread of viruses.
- Use soap.
- Wash for more than 20 seconds.
- Use alcohol-based hand sanitizers.



Limit Contact with Others



- Stay home when you can.
- Avoid sick people.
- Wear a face mask when out.
- Change your clothes when you get home.
- Tell others what you're doing to stay safe.

Provide Protective Immunity

- Hold your baby skin-to-skin.
- Give them your breast milk.
- Stay current with your family's immunizations.



Take Care of Yourself

- Stay connected with your family and friends.
- Drink more water and eat healthy foods.
- Seek mental health support.
- Sleep when you can.



Get Immunized

Vaccinations save lives. Protecting your baby from RSV, COVID-19, flu, and pertussis lowers their risks for complications from respiratory infections.



WARNING

Never Put a Mask on Your Baby

- Because babies have smaller airways, a mask can make it harder for them to breathe.
- Face masks and their straps pose a risk of suffocation and strangulation.
- Remember, a baby can't remove their mask if they're having trouble breathing.



If you feel sick or are positive for COVID-19

- Wash with soap and water and put on fresh clothes before holding or feeding your baby.
- Wear a mask to help stop viruses from spreading.
- Watch out for symptoms like fever, confusion, or trouble breathing.
- Ask for help caring for your baby and yourself while you recover.



We can help protect each other.
www.nationalperinatal.org/rsv

National Perinatal Association

Peer Reviewed

Discerning HRO from Noise: Do We Have Effective HRO, or Are We in a White Noise Period?

Daved van Stralen, MD, FAAP, Sean D. McKay, Element Rescue, LLC, Thomas A. Mercer, RAdm, USN (Retired)

Abstract:

People are educated and trained in white noise environments, becoming acculturated to structured work settings and solving well-defined, information-sensitive problems. However, HROs operate in open systems with various patterns of energy fluctuations. The problems encountered are ill-structured and embedded into an environment. These problems are information-insensitive, problems we learn to solve through experience. Because academicians cannot observe granular operations without becoming part of a dangerous situation, the more salient and relevant principles of HRO become less visible and unnoticed. Neigther a gap nor a spectrum, HRO operates apart from white noise organizations. High reliability organizing operates with time as a dimension – both as environmental and operational characteristics. The caution: operating effectively in a reddened noise environment, using putative HRO capabilities, may simply be operating using conventional methods in a stable white noise environment.

"We rely on predictability and controllability to stabilize the organization in a fluctuating environment. However, what are we predicting? How are we predicting it? What are we controlling? High-reliability operations answer a big deal of these questions regarding reliability and resilience. "

Introduction:

How do we discern if we gained organizational stability from HRO or because we operate in a relatively stable environment? The prediction comes from the environment, which is the topic of this article. Controllability comes from operations and our actions, a topic for a subsequent article.

We rely on predictability and controllability to stabilize the organization in a fluctuating environment. However, what are we predicting? How are we predicting it? What are we controlling? High-reliability operations answer a big deal of these questions regarding reliability and resilience.

Predictability gives a sense of security and supports a sense of controllability. Though we think predictions come from history and our experience, the basis of prediction is the present state. We predict what may come, or we predict we are to be. Linear predictions come from a single environmental variable to control the immediate situation, focusing on homeostasis. Nonlinear predictions develop from the interactions of several variables to influence a trajectory toward the desired end-state while developing allostasis (1, 2).

"Uncontrolled energy disrupts stability and impairs prediction. Energy enters open systems as stochastic processes with differing patterns of fluctuations or frequencies. These patterns of power spectra are termed 'noise.' We use the analogy of light frequency and color to assign a color to different noise patterns."

Uncontrolled energy disrupts stability and impairs prediction. Energy enters open systems as stochastic processes with differing patterns of fluctuations or frequencies. These patterns of power spectra are termed 'noise.' We use the analogy of light frequency and color to assign a color to different noise patterns.

1. 'White noise' fluctuations are regulated by environmental constraints to produce a stationary environment. The stable white noise environment has a regulated variance.
2. 'Red noise' has powerful fluctuations that the system must respond to, and slow variations have greater strength and are called 'forcing functions.'
3. Pink noise' does not fluctuate; instead, it has a pseudo-stationary behavior of calm that runs between episodes of abrupt change. Pink noise differs from the others as its variance increases with a longer time between abrupt changes.
4. 'Brown noise' has random fluctuations named after its namesake – Brownian motion. There is no environmental regulation; it is an environment of randomness.

White noise characterizes the environments of healthcare and business operations, laboratory research, and many academic studies. Red noise characterizes the operational environment of public safety and the military, an environment of forcing functions that healthcare and businesses strive to prepare for. Pink noise describes the background fluctuations within an ecosystem (3). Abrupt catastrophic change after a period of calm, pink noise is the reason for public safety and the military.

We do not have an absolute reference frame because no absolute or privileged points exist in space or time. We do not have a singular frame from which we can reference time and events. Instead, we have multiple reference frames, also called inertial

reference frames, that do not move in uniform motion concerning each other. Later in this article, we discuss combinations of colors and the effect of time scale on the conversion of one color to another. The Special Theory of Relativity described frames of reference that moved at different speeds. The laws of physics are the same in all inertial frames of reference. [5, 14].

"The various energy fluctuations, characterized as colors of noise, describe the influence of time on energy flux in a system. Humans within these environments also experience the physical character of time and energy flux. During an engagement with the environment, the person experiences forward-moving time as a backward-linear model of time (4)."

The various energy fluctuations, characterized as colors of noise, describe the influence of time on energy flux in a system. Humans within these environments also experience the physical character of time and energy flux. During an engagement with the environment, the person experiences forward-moving time as a *backward-linear model* of time (4).

Backward-linear models propose a tree-like structure, acknowledging that the past is fixed and follows a linear trajectory, while the future will branch into multiple possibilities. The past is immutable, serving as the foundation for the present moment, which acts as a crossroads leading to various potential futures (5). This model gives a more nuanced and complex portrayal of time.

The High-Reliability Organization (HRO) was codified from organizations that cannot fail despite working with hazards or hazardous conditions, such as pink and red noise environments (6). The study of these organizations in the field, with academic observers participating in live-or-die operations, is severely limited. Thus, the ability to identify characteristics necessary in both dangerous and routine operations is absent, and their necessity in routine operations is unnoticed (7).

Because the more salient and relevant principles are less visible and often unnoticed, the codification of HRO and the translation of HRO theory into practice is incomplete. The borrowing of HRO, then, has been restricted (7). The mistranslation of HRO from field practice to healthcare or business operations impairs the effective implementation and utilization of HRO. Missing the granularity of nuance and subtle interactions makes it challenging to know if we have effectively incorporated HRO into our program. In a discussion with Karl Weick, the authors see this as failing to translate HRO to more generalized operations (7).

We can more readily act if the difference between our approach and HRO consists of gaps or a spectrum of varied, related ideas. We can engage gaps between different domains of distinct operating methods, particularly between theory and practice (7, 8). Engagement is the initial enactment phase toward creating high reliability (9). If the difference lies along a spectrum, we can select from a range of relevant concepts and the degree of their importance. This will 'fit' HRO into our program.

However, as described above, a spectator or distant observer will miss the subtle and nuanced actions necessary to contain dangers. The difference would not become apparent until we engage in a situation. In the HRO, the most challenging test occurs during active engagement.

The differences between HRO and conventional healthcare or business management do not arise from gaps or differing positions along a spectrum. The differences form a discontinuity(10): the discontinuity develops from:

- Frames of reference that do not have uniform motions and accelerations.
- The environment regulates white noise energy fluctuations, and red noise energy fluctuations force the environment.
- Environmental threat and the individual's response to that threat – a measure of controllability.

White noise stability has a different timescale, which is discontinuous with reddened noise-forcing functions and the pink noise of our ecosystem. These relations cannot be approximated to each other or be made continuous – whether by reconceptualizing, collecting more data or calculating answers. Our cognitive abilities cannot translate operations across the discontinuity (10).

"White noise stability has a different timescale, which is discontinuous with reddened noise-forcing functions and the pink noise of our ecosystem. These relations cannot be approximated to each other or be made continuous – whether by reconceptualizing, collecting more data or calculating answers. Our cognitive abilities cannot translate operations across the discontinuity (10)."

Introducing HRO concepts by specific characteristics or degree of usage disrupts routine operations of conventional systems. During a crisis, native and established organizational structures and relations will not be coherent with high-reliability operations.

Time as a dimension separates the white noise from red or pink noise environments. How an individual perceives and responds to the environment creates varying frames of reference in the field. The perception of threat generates a new environment and changes the frame of reference – the high-reliability situation. The organization responding adaptively toward allostasis becomes a self-organizing HRO.

The colors of noise describe all environments in which individuals and organizations operate. Colors are physical and perceptual in that people, standing side-by-side, may experience white, red, or pink noise activity separately. For example, while resuscitating a child with a small airway blockage, one of the authors [DvS] noticed peaked T-waves on the EKG monitor. He alerted staff to

prepare for a cardiac arrest. For the author, this was a predictable white noise event. It was an unpredictable pink noise, an abrupt catastrophic event for staff. For the minutes leading to the cardiac arrest, various people explained to the author about a knob that changes the amplitude of the waveform and that the child was neither a cardiac patient nor had heart disease. The team successfully resuscitated the child and experienced a real-time learning experience.

The vignette demonstrates two distinct axes:

1. HRO actions as the team had smoothly moved from routine ventilator management to respiratory resuscitation, then quickly started a cardiac resuscitation.
2. Energy flux of varying colors of noise
    a. Perceptually pink noise to staff as a sudden and unexpected cardiac arrest,
    b. Physically red noise because the acidosis developed over time and
    c. Experientially white noise to the author from his knowledge and experience.

Neither a gap nor a spectrum, HRO operates apart from white noise organizations. HROs work along uncorrelated orthogonal axes: the axis of necessary HRO actions that will temper the axis of energy flux. High reliability organizing operates with time as a dimension – both as environmental and operational characteristics.

"Neither a gap nor a spectrum, HRO operates apart from white noise organizations. HROs work along uncorrelated orthogonal axes: the axis of necessary HRO actions that will temper the axis of energy flux. High reliability organizing operates with time as a dimension – both as environmental and operational characteristics. "

The Color of Noise:

We use the color of noise to describe the environment and remove any bias toward the event's cause. We may best consider a disaster, or any large crisis, as a "victim generator" (personal communication, Jim Denney, Captain, Los Angeles Fire Department, US Navy Seabee, Vietnam Veteran with two combat tours, and EMS management for numerous disasters).

> Responding as the EMS Captain to a series of five or six close locations with auto-pedestrian injuries, the Incident Commander (IC) asked Denney for his operational plan. Denney responded, "We are going to take the victims from here to the hospital over there." To the IC, the scene was an abrupt pink noise catastrophe. To Denney, it was a variance in a white noise environment. [It was later learned that someone drove a car up several blocks of sidewalk, hitting multiple pedestrians.]

"What you do every day is what you do in an emergency," another quote from Capt. Denney. Denney offered this observation to reassure paramedics and firefighters who have yet to experience a disaster, instill trust in lower-ranking members' capabilities, bring disaster plans closer to routine operations, and sway training away from any specific "disaster" thinking and behaviors. In discussions with one of the authors (DvS), Denney aimed to teach routine actions that would adapt to a crisis. He worked against the idea that organizations have an "emergency" mode they shift into during a crisis. If this were true, people in a group would unreliably change their behaviors because the change would be contingent on the individual recognizing the disaster. Such identification depends entirely on the person's perceptions of the situation, restricted experience, and limited capabilities.

With this perspective, we use characteristics of the colors of noise to describe entropic energy flux that creates characteristic environments. The variation of pink or red noise has more power at lower frequencies. White noise is uncorrelated in time, with its variance spread equally across time (1). We can remove sections of time for study, research, and planning. To the novice, the variance of white noise appears as reddened frequencies.

"With this perspective, we use characteristics of the colors of noise to describe entropic energy flux that creates characteristic environments. The variation of pink or red noise has more power at lower frequencies. White noise is uncorrelated in time, with its variance spread equally across time (1). We can remove sections of time for study, research, and planning. To the novice, the variance of white noise appears as reddened frequencies."

White Noise

It would appear that the summation of fluctuations in natural processes over different timescales would create a white-noise environment. That is a misunderstanding of white noise. White noise has fluctuations, but they are purely random. While white noise contains all the frequencies of power spectra, no frequency becomes dominant. White noise occurs over shorter timescales, decreasing a frequency's dominance (3).

We can apply the Gaussian distribution to white noise environments to produce descriptive statistics and predictive probabilities. Increased data will narrow the variance, making information sensitive to white-noise environments. The error will then become more visible, altering the salience and function of information, particularly disconfirming information. This depends on which side of the discontinuity a person operates from. From the white noise perspective, an error indicates a deviation from a norm. For the reddened noise frame of reference, error makes the limits of knowledge and capabilities visible.

Red Noise

Longer timescales reveal slow variations (long-time segments)

that carry more power – the forcing function. These low-frequency, less common events have a more significant influence on the system than more common high-frequency events, having more energy but carrying less power (blue noise) (3, 11). Over a longer timescale, we see a shift from white to red noise environments. The random, low-power fluctuations of white noise will give way to the low-frequency forcing functions of red noise.

Pink Noise

Pink noise lies between the predictability of white noise (no correlation in time) and the randomness of brown noise (no correlation between increments). The power of pink noise increases as event frequency decreases, causing rare environmental events to gain equivalent weight in a pink environment (11). However, between episodes of abrupt change, there are periods of stability. The variance of pink noise differs from other red-spectrum noises in that *variance continues increasing* regardless of the length of the measured time series.

Ecologically, environmental pressure from pink noise favors a balance of generalization and specialization (12). Fluctuations occurring over shorter timescales have as much influence as fluctuations on timescales a magnitude greater. This is a connection between pink noise and the idea of fractals (3). (Fractals are discussed in complexity and chaos theories, which are beyond the scope of this article. We mention fractals solely to connect the color of noise to complexity and chaos for those who wish to pursue it.)

Brown Noise

Brown noise emphasizes longer time scales without regulation; the random variable can drift. The position is a random brown noise process, but its motion is a white noise process. Brown noise processes are non-stationary (3).

"Timescales affect how we interpret the color of noise. When using a short timescale, we may have selected a segment between two forcing functions or abrupt changes. Averaging short time scales together can blunt any signal hidden in the noise. Selecting a long timescale may blunt reddened signals by averaging events (13)."

Autocorrelation of Noise:

Timescales affect how we interpret the color of noise. When using a short timescale, we may have selected a segment between two forcing functions or abrupt changes. Averaging short time scales together can blunt any signal hidden in the noise. Selecting a long timescale may blunt reddened signals by averaging events (13). A smaller signal amplitude contributes to misidentification in these settings, a problem when auditors do not recognize the salience or meaning of the signals.

There are benefits to using such time-averaged data for prediction. However, time averaging to produce a longer timescale can obscure underlying dynamical processes found in a short timescale. Each process in a system has its timescale, which we experience as environmental noise or an unexpected disruption (13).

Autocorrelation, internal feedback, reddens white noise. This occurs with a long time lag in the feedback, which a selection of time segments or the length of the chosen segment can miss. Because we cannot know when this reddening occurs, we may have the illusion of operating in a white-noise environment. We see this with the veteran's experience versus a novice or a person with a mid-level experience.

"There are benefits to using such time-averaged data for prediction. However, time averaging to produce a longer timescale can obscure underlying dynamical processes found in a short timescale. Each process in a system has its timescale, which we experience as environmental noise or an unexpected disruption (13)."

The veteran's longer timescale places the veteran in a red noise environment; the novice experiences the red noise environment as minor fluctuations and must be engaged, which is the method of learning by doing in an HRO environment. The mid-level veteran is more likely to succumb to the feel of white noise when the environment has a long period of reddened noise or during the pseudo-stable inter-event period between abrupt catastrophic failures. Individuals who enter a red-noise environment during such a period may believe they are operating in a stable environment, much like a shifting baseline (14)

Autocorrelation and Predictability

Organizations respond to and anticipate environmental variation. Feedback systems respond to the organization's internal state, allowing it to respond to fluctuations. Feedback only occurs in response to the environment, causing a time lag between the event and response. On the other hand, feedforward mechanisms are initiated by environmental cues and allow for anticipated environmental change. These are adaptive mechanisms to increase fitness in fluctuating environments (1). Feedforward systems can become autocorrelated with the environment, gaining stability for the organization.

Predictability increases from temporal autocorrelation in a single environmental variable. For two or more distinct environmental variables, predictability emerges from cross-correlations between the variables. Cross-correlations allow the organization to predict and anticipate environmental fluctuations (1).

Information Sensitivity and the Color of Noise:

We, too, readily plan for an orderly, white-noise world with linear logic and environmental variance reduced by information and data. Perhaps we too readily respect those who are objective, logical, and not swayed by emotion, stress, or fear. In this frame, information supports prediction, and change occurs from direct action. The irrelevance of time makes this an Euclidean space

consisting solely of three dimensions described with points and straight lines. Relativity space adds time to give four dimensions (5).

However, we live in a reddened and pink noise world that changes from forcing functions and abrupt events. Information and data increase the variance of the mental model we rely on. Time is a dimension creating a relativity space of frames of reference in continuous motion. Novel emergent properties of uncontrolled movement interfere with predictions – incapacitating stress impairs cognition. Movement brings threats into dangerous proximity, eliciting fear-circuit behaviors (15-18). The inherent vice of stress-impaired cognition and fear-circuit behaviors increases our effectiveness (17, 18).

The gathering of information in both situations, it would seem, can help. Instead, understanding the use of information and the effect of information on variance will support better performance. For white noise, with its Gaussian distribution, increased information and data will reduce variance – white noise is information-*sensitive*.

"The gathering of information in both situations, it would seem, can help. Instead, understanding the use of information and the effect of information on variance will support better performance."

Reddened or pink-noise environments are information *insensitive*. More information (or data) makes the data messier or reveals covert, unexpected influences. With events in flux, current information quickly becomes antecedent information, entrained energy changes circumstances, and what was once relevant becomes irrelevant. We operate more in a mystery, searching for and testing clues using a complete spectrum analysis (19).

Decision theories and problem-solving developed in white noise environments tend to be information-sensitive, linear, and deterministic. Within the forcing function of red noise or the abrupt catastrophe from pink noise, white noise approaches *become* the problem. Using white noise predictions of what would happen during forcing functions or catastrophes is a matter of life or death – inaccurate models could kill (20).

Time and Nonlinearity:

The color of noise and temporal autocorrelation demonstrate the presence of time in the high-reliability environment. Objects exist in time and change properties over time. Logic systems must accommodate the flux during change. In temporal logic, the possible worlds become time instants, and the relation is in terms of temporal precedence called *temporal frames* (4).

Time and Relativity

HROs operate in environments that *become* unstable and dangerous *because* time has dimension. Autocorrelation, internal feedback, creates environmental energy frequencies, red noise, with forcing functions that people and a system must respond to or cause abrupt, destructive change. When noise occurs at a specific frequency, $1/f$ or f^{-1}, it causes abrupt, severe change. Red or pink noise, resulting from feedback with various time lags, changes context. Time as a dimension has broad, penetrating influences in these environments.

Time as a dimension and context also influences how we perceive, think, and communicate about the environment. Understanding time and context affects our focus on the cause of our responsive behaviors and actions and how we adapt to these events.

How we perceive time influences our study and use of time. We may perceive time as continuity or a series of instances. Most likely, we perceive time as a quantitative continuum that we add to – how much time? We discriminate quantitative measures by 'prothetic,' or additive, processes. Time as a quantitative continuum is a prothetic process. When considered linear measurements, time will be confounded by nonlinearity (21).

Continua for type and position are "metathetic" processes, physiological ones that substitute additions rather than adding to existing measurements. These are qualitative measures as we are changing the quality of the process (21). Consideration of time as a prothetic process means we discriminate categories based on our sensitivity to differences.

"Time as a dimension and context also influences how we perceive, think, and communicate about the environment. Understanding time and context affects our focus on the cause of our responsive behaviors and actions and how we adapt to these events."

The fundamental distinction in the realm of instant-based time models reflects contrasting perspectives on the nature of temporal progression. One pivotal categorization within this domain revolves around the dichotomy between linear and backward-linear models, each offering unique insights into time structure.

Nonlinearity of Time

Linear models present time as a straightforward progression, akin to a continuous line extending from the past through the present and into the future. This representation implies a singular, unidirectional flow, suggesting a coherence in the temporal narrative. Here, time unfolds in a seamless, unbroken sequence, with each instant following the one before it in an orderly fashion. The linear model encapsulates that the future is undetermined and open to unfolding events, making it a canvas for countless potentialities.

In contrast, backward-linear models of time, with their tree-like structure and branching futures, allow us to consider divergent future paths. With time as a dimension, we gain an open future with multiple unfolding scenarios – a future we can influence (5).

Linear models of time simplify the temporal narrative into a continuous stream, highlighting the openness of the future, while backward-linear models acknowledge the fixed nature of the past and the branching possibilities that lie ahead. This disregards the effect of time on thinking and actions. We use the lateral prefrontal cortex when we take purposive, unrehearsed, or unplanned actions. The longer we continue to act, the more we use the lateral prefrontal cortex.

Other factors include complexity, novelty, uncertainty, or ambiguity of the information. However, time is the stimulus that places thought and action into the lateral prefrontal cortex, the only part of the cortex that can coordinate actions. The lateral prefrontal cortex executes elaborate behavior, speech fluency, and creative activity (22).

"Other factors include complexity, novelty, uncertainty, or ambiguity of the information. However, time is the stimulus that places thought and action into the lateral prefrontal cortex, the only part of the cortex that can coordinate actions. The lateral prefrontal cortex executes elaborate behavior, speech fluency, and creative activity (22)."

Temporal Logic

In high-reliability operations, the concern for inference using time is 'future' and 'past,' with the past already fixed and the future branching. A deterministic view of time requires using linear time for the future (23). Temporal logic modifies concepts of time. For example, X is always true, while Y is only sometimes. Temporal logic addresses problems of causality and mechanism, continuous change, planning actions, concurrent or discontinuous events, and the persistence of a fact rather than the truth of a fact.

In terms of logic, time is 1) discrete, 2) occurring as intervals, or 3) time is continuous, flowing onward as instants.

- Scientifically, we assume continuous instants for scientific logic, computer programs, processes, protocols, and algorithms.
- For categorization and data collection, we use time sequences as discrete intervals.
- For real-world operations, time has a duration that occurs within intervals, and these intervals can:
    - Overlap or be embedded within other events,
    - Run parallel with other independent or interdependent events,
    - Jump to other events, or
    - It Depends on the initiation or completion of different events.

Temporal logic is vital for any logic system operating in red or pink noise environments. The time series changes white noise to red or pink noise. White noise has discrete time intervals independent of the next interval in the series. A time sequence builds on the previous time interval, a type of feedback. The events at any one time will correlate with events in the past, the definition of autocorrelation, and the development of stochastic resonance.

Branching time in temporal logic necessitates the branching plans found in epistemic logic. In the logic of practice, we simultaneously increase the probability of the preferred end state while reducing the probability of the unwanted end state. This often leads to simultaneous plans to act on both outcomes.

"Branching time in temporal logic necessitates the branching plans found in epistemic logic. In the logic of practice, we simultaneously increase the probability of the preferred end state while reducing the probability of the unwanted end state. This often leads to simultaneous plans to act on both outcomes."

Fluctuations and Logic

"Handling contradictory data is one of the most complex and important problems in reasoning under uncertainty" (24). Paraconsistent logics allow contradiction without allowing any solution, thus treating inconsistencies as informative. Paracomplete logic allows us to work with entities undergoing continuous change, so there is no need to assume "A" or "not-A." Nonmonotonic logics allow us to change our solutions as events evolve.

Forcing functions and catastrophes from red or pink noise release energy from the environment into our well-designed systems. Information entropy corrupts information. The give and take of interacting systems, increasing feedback, rapid oscillating processes, the frequency of the forcing functions, and the loss of the Gaussian distributions disintegrate the utility of inferences from classical logic. Events of lesser time scales and smaller magnitudes do the same. We will experience contradictions and the need to infer across quantitative and qualitative data collected from heterogeneous systems in many states.

Rejection of inconsistencies and contradictions creates risk in dangerous contexts (25). Describing reliance on laboratory research to support Mount Everest climbing expeditions, Vanessa Heggie (20) wrote, "Predicting what would happen to the first human beings to climb that high was, therefore literally, a matter of life or death – here inaccurate models could kill. Consequently, high-altitude respiratory physiology has prioritized not the laboratory, but the field."

"The reflection that apparent contradictions are everywhere around us and that treating them as anomalies may not be the best way to go" (26). We easily collect contradictory data, accumulate inconsistent information, and find that increasing information increases the variance (3, 24, 27). We invalidate and change our conclusions and derived solutions, processes not permitted in monotonic classical logic (28, 29). "Handling contradictory data is one of the most complex and important problems in reasoning under uncertainty" (24). These are the paraconsistent logics. Formalized modes of *nonmonotonic reasoning* give "rules of conjecture" rather than "rules of inference." Adding new assumptions can disconfirm conclusions appropriate in one set of assumptions (30).

Reddened noise environments give us partial (incomplete) and excessive (contradictory) information. "A logic is called

paraconsistent if it 'tolerates contradictions' and paracomplete if it does not 'enforce completeness/exhaustiveness'" (31). Paraconsistent and paracomplete logic meet the needs for rapidly changing, conflicting information and adjusting solutions. This is the operator, working contextually "bottom-up" from within the trajectory, inside events, feeling the pressure of elements. Thus, paraconsistent logic does not have the "principle of explosion." If we accept a contradiction in classical logic, everything follows – the explosion. Paraconsistent logic allows us to make logical inferences with contradictions. Paracomplete logic does not have the "law of excluded middle" (either the proposition is true or false), allowing the use of gradations and shared qualities.

Paraconsistent and paracomplete logic systems can support our navigation through the fluctuating environment if we maintain guarded respect for the limits of classical logic (32). 'Para' initially referred to 'quasi' or 'similar to' but now seems to be accepted as a different meaning, 'beyond' (33). Classical logic avoids paradoxes and explosion into triviality by restricting sets with the law of excluded middle. Weakening classifications by weakening the excluded middle allows more detailed distinctions and nuanced inferences. We can weaken the logic system for the possibility of non-trivial inconsistency (34). Paraconsistency logic weakens formulations of logical inference with limitations to the choice of variables (35).

"We easily collect contradictory data, accumulate inconsistent information, and find that increasing information increases the variance (3, 24, 27). We invalidate and change our conclusions and derived solutions, processes not permitted in monotonic classical logic (28, 29)."

Polychronic Time:

The HRO operates as a 'high context' culture where the environment, or context, contains necessary information (5). High-context cultures depend on local information or identify information from the environment (36). High-context cultures orient differently to time using a 'polychronic time' system where time is not seen as a tangible resource. There is little pressure to complete tasks within a *specified* time block. Time preference is about *how* people allocate time to tasks rather than how quickly those tasks are done (37).

Multitasking in a polychronic time system differs from the familiar concept of a person performing two or more tasks simultaneously. The individual readily integrates different activities, working on several tasks by (1) multitasking and (2) task-switching.

- Multitasking divides focus among many tasks, using very short periods, if not instantaneously. This is not simultaneously or at the same time.
- Task-switching is to shift attention or move back and forth between tasks within the same time block.
- Granularity refers to the length of time units used and the level of detail.

'Monochronic time' is linear, tangible, and divided into blocks of time, much like an economic approach. A monochronic time system operates one at a time, segmenting time into precise, small units. Time is scheduled, arranged, and managed. Monochronic time emphasizes planning and the establishment of schedules (38).

People who use 'monochronic time' tend to focus on one thing at a time with a commitment to schedules and promptness. They do not like interruptions in their work. Individuals working in polychronic time are more receptive to interruptions, often change plans easily, and will feel comfortable doing many things at once (39).

"Multitasking in a polychronic time system differs from the familiar concept of a person performing two or more tasks simultaneously. The individual readily integrates different activities, working on several tasks by (1) multitasking and (2) task-switching."

The characteristics of polychronic systems contain elements of HRO: vigilance for interruptions and multitasking. Polychronic traits support sensemaking and can be lifesaving. Karl Weick found, "A thread among many discussions of sensemaking is that the process boils down to managing interruptions and recoveries, discontinuity and continuity, differences and sameness across situations." Sensemaking is an ongoing attempt to reconcile the continuity of experience with the discontinuity of understanding (40).

Conclusion:

HRO operates on the granular level using local information, jumping from momentary to momentary homeostasis. We best analyze these operations through proximal causation. HRO works through strategies to achieve a desired endpoint and stability through change – allostasis. We can then analyze the HRO through its ultimate functions.

We cannot observe granular operations without becoming part of the situation. The more salient and relevant principles become less visible and unnoticed. Therefore, the codification of HRO and the translation of HRO theory into practice is incomplete.

Further impeding our knowledge and the acceptance of HRO, we are educated and trained in white noise environments. We become acculturated to structured work settings, solving well-defined, information-sensitive problems.

However, the HRO operates in an open system with energy fluctuations of different patterns. The problems we encounter are ill-structured and embedded into an environment, which can be internal or external. These problems are information-insensitive environments, problems we learn to solve through experience.

As we encounter information-insensitive problems amidst energy and behavioral fluctuations, we likely do not recognize functional feedback autocorrelation within individuals, teams, and systems, particularly when the time lag for feedback is delayed or prolonged.

Time as a dimension also shifts interactions from having a perspective (how often do we hear, "There are two perspectives"?)

to multiple frames of reference fluctuating during interactions. We deal with these fluctuations through engagement. Multitasking divides focus among many tasks, using very short periods, if not instantaneously. This is not simultaneously or at the same time. Task-switching is to shift attention or move back and forth between tasks within the same time block.

"As we encounter information-insensitive problems amidst energy and behavioral fluctuations, we likely do not recognize functional feedback autocorrelation within individuals, teams, and systems, particularly when the time lag for feedback is delayed or prolonged."

Neither a gap nor a spectrum, HRO operates apart from white noise organizations. HROs work along several axes: necessary actions, time as a dimension, energy fluctuations, and the perceptions of each individual. High reliability organizing operates with time as a dimension – both as environmental and operational characteristics.

This use of time as a dimension brings forward the branching of time and the ability to influence the trajectory of events. With time as a dimension, we gain an open future with multiple unfolding scenarios – a future we can influence.

Operating effectively in a reddened noise environment, using putative HRO capabilities, may simply be operating with conventional methods in a stable white noise environment.

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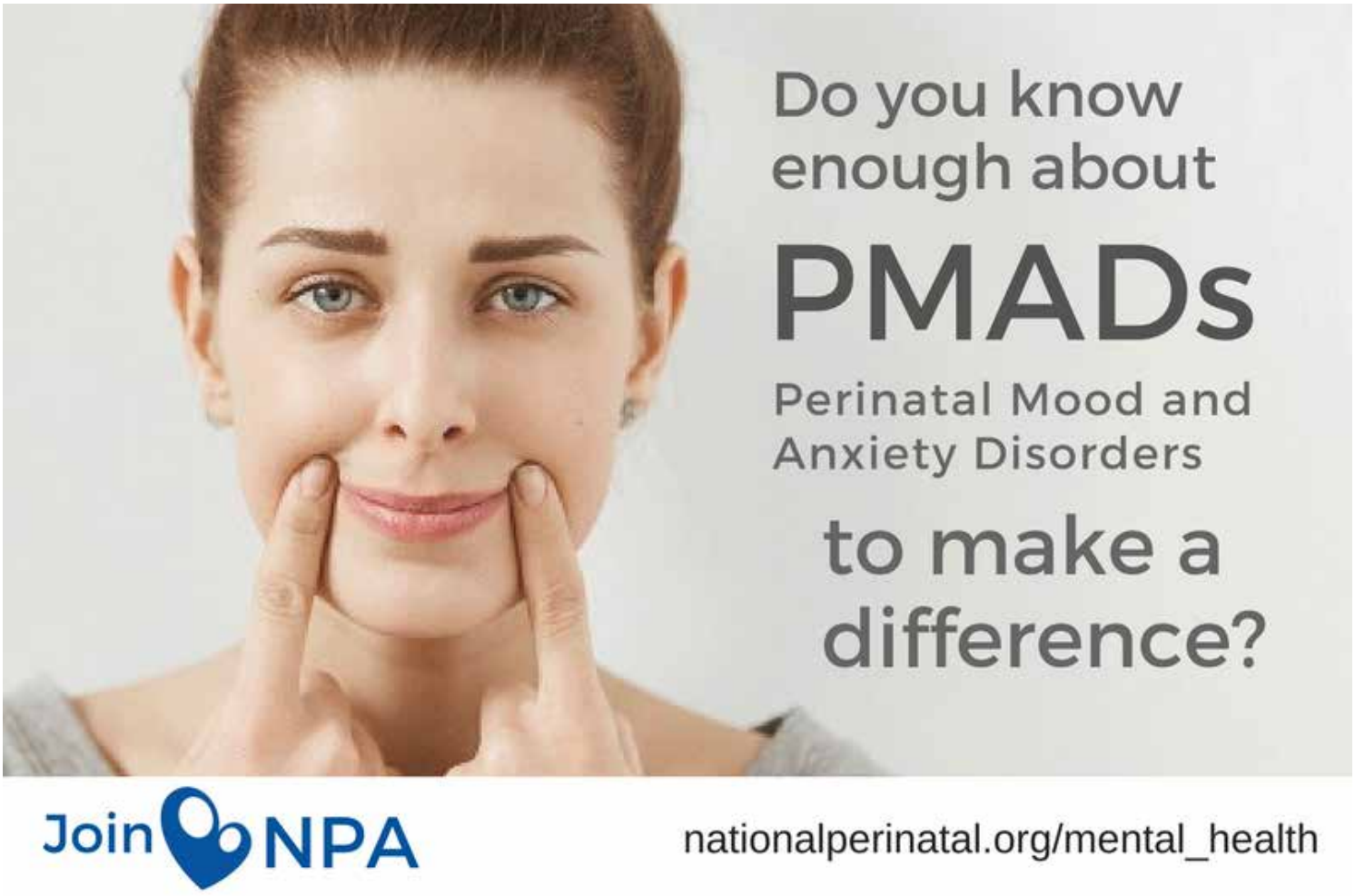
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Keeping Your Baby Safe
from respiratory infections

RSV
COVID-19
colds
flu

How to protect your little ones from germs and viruses

Cold and flu season can be dangerous - especially for vulnerable infants and children. Fortunately, there are proven protective measures that we can take to stay healthy.

Here's what you can do...

Wash Your Hands

- This is the single, most important thing you can do to stop the spread of viruses.
- Use soap.
- Wash for more than 20 seconds.
- Use alcohol-based hand sanitizers.



Limit Contact with Others



- Stay home when you can.
- Avoid sick people.
- Wear a face mask when out.
- Change your clothes when you get home.
- Tell others what you're doing to stay safe.

Provide Protective Immunity

- Hold your baby skin-to-skin.
- Give them your breast milk.
- Stay current with your family's immunizations.



Take Care of Yourself

- Stay connected with your family and friends.
- Drink more water and eat healthy foods.
- Seek mental health support.
- Sleep when you can.



Get Immunized

Vaccinations save lives. Protecting your baby from RSV, COVID-19, flu, and pertussis lowers their risks for complications from respiratory infections.



WARNING

Never Put a Mask on Your Baby

- Because babies have smaller airways, a mask can make it harder for them to breathe.
- Face masks and their straps pose a risk of suffocation and strangulation.
- Remember, a baby can't remove their mask if they're having trouble breathing.



If you feel sick or are positive for COVID-19

- Wash with soap and water and put on fresh clothes before holding or feeding your baby.
- Wear a mask to help stop viruses from spreading.
- Watch out for symptoms like fever, confusion, or trouble breathing.
- Ask for help caring for your baby and yourself while you recover.



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

Advocacy

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

Consultation

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

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How to Care for a Baby with Signs of Withdrawal

Use the Right Words

I was exposed to substances in utero. I am not an addict. And my parent may or may not have a Substance Use Disorder (SUD).

Treat Us as a Dyad

Parents and babies need each other. Help us bond. Whenever possible, provide my care alongside my parents and teach them how to meet my needs.

Support Rooming-In

Babies like me do best in a calm, quiet, dimly-lit room where we can be close to our caregivers.

Promote Kangaroo Care

Skin-to-skin care helps me stabilize and self-regulate. It helps relieve the autonomic symptoms associated with withdrawal, promotes bonding, and helps me sleep.

Try Non-Pharmacological Care

Help me self-soothe. Swaddle me snugly in a flexed position that reminds me of the womb. Offer me a pacifier to suck on. Protect my sleep by "clustering" my care.

Provide Lactation Support

Human milk is important to my gastrointestinal health and breastfeeding is recommended when my parent is HIV-negative and receiving medically-supervised care. Help my family reach our pumping and feeding goals.

Treat My Symptoms

If I am experiencing signs of withdrawal that make it hard for me to eat, sleep, and be soothed, create a care plan to help me wean comfortably.

Academy of Perinatal Harm Reduction
www.perinatalharmreduction.org

National Perinatal Association
www.nationalperinatal.org

H1015: Section on Neonatal Perinatal Medicine Program: Day 1

Friday, September 27

ONTPD Meeting

9:00 AM – 4:00 PM	**Organization of Neonatal Training Program Directors (ONTPD) Meeting***
	Megan Gray and Deirdre O'Reilly – ONTPD Co-Chairs

Opening Session

4:00 PM	**Welcome and Opening Remarks***
	Brian Hackett – Program Chair
4:10 PM	**Section on Neonatal Perinatal Medicine Update***
	Munish Gupta – SONPM Executive Committee Chair
4:30 PM	**Thomas Cone Lecture**
	Evidence, Experience, Emotions, and Egos: a History of Evidence-Based Neonatology
	Kanekal Gautham
	Sponsored by Abbott
5:15 PM	**Gerald Merenstein Lecture**
	Big Data, Big Challenges: Navigating the Landscape and Landmines of Neonatal Genomic Sequencing
	Jill Maron
	Sponsored by Abbott
6:00 PM	**Adjourn**

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



H2012: Section on Neonatal Perinatal Medicine Program: Day 2

Saturday, September 28

Artificial Intelligence in the NICU

8:00 AM	**Introduction of Session***
	Moderator: James Barry
8:05 AM	**Bytes, Babies, and Bots: Charting Artificial Intelligence in the NICU**
	Kristyn Beam
8:50 AM	**AI-Powered Risk Prediction for Early Detection of Neonatal Sepsis**
	Brynne Sullivan
9:35 AM	**Break***
9:45 AM	**Using AI to Analyze Biological Big Data from the NICU**
	Thomas Hooven
10:30 AM	**Ready or Not: Is AI Poised to Revolutionize the NICU?**
	Ryan McAdams
11:05 AM	**Panel Discussion and Questions**
	Kristyn Beam, Brynne Sullivan, Thomas Hooven, Ryan McAdams
11:45 AM	**Adjourn***

SONPM Poster Fair

12:00 PM to 1:30 PM	**SoNPM Poster Fair***

Original Abstracts

1:40 PM	**Welcome and Opening Remarks***
	Alexis Davis – Abstract Chair
1:45 PM	**Scientific Abstract Oral Presentations**
	Best abstracts sponsored by Reckitt Mead Johnson
3:00 PM	**Presentation of Marshall Klaus Research Awards***
	Hendrik Wëitkamp – SONPM Research Chair
	Awards sponsored by: Reckitt Mead Johnson, Section on Neonatal Perinatal Medicine, Beth Israel Deaconess Medical Center Department of Neonatology
3:15 PM	**Break***
3:30 PM	**Scientific Abstract Oral Presentations**
	Best abstracts sponsored by Reckitt Mead Johnson

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

H2012: Section on Neonatal Perinatal Medicine Program: Day 2 (continued)

Saturday, September 28

Section Awards

4:45 PM	**Section on Neonatal Perinatal Medicine Awards***
	Munish Gupta – SONPM Executive Committee Chair
4:55 PM	**Presentation of the Avroy Fanaroff Neonatal Education Award**
	Presenter: Gil Martin
	Awardee: Stephen Pearlman
	Sponsored by Reckitt Mead Johnson
5:10 PM	**Presentation of the Neonatal Landmark Award**
	Presenter: Henry Lee and Jochen Profit
	Awardee: Jeffrey Gould
	Sponsored by Reckitt Mead Johnson
5:25 PM	**Presentation of the Virginia Apgar Award**
	Presenter: Eric Eichenwald
	Awardee: Ann Stark
	Sponsored by Abbott
5:40 PM	**Adjourn**

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

H3003: Joint Program: Section on Bioethics, Section on Hospice and Palliative Care Medicine, and Section on Neonatal Perinatal Medicine

Sunday, September 29

When External Factors Limit Options: Caring for Birthing Families

8:00 AM	**Announcement of SONPM Young Investigator Awards***
	Alexis Davis – Abstract Chair
	Sponsored by Reckitt Mead Johnson
8:05 AM	**Presentation of William G. Bartholome Award for Ethical Excellence***
	Presenter: Steven Leuthner
	Awardee: Brian S. Carter
8:35 AM	**Introduction of Session**
	Moderators: Amy Trowbridge, Dalia Feltman, Brian Hackett
8:40 AM	**Constraints on Available Neonatal-Perinatal Care Options**
	DonnaMaria Cortezzo
9:15 AM	**Ethical and Moral Implications of Constraints in Neonatal Perinatal Care Options**
	April Dworetz
9:50 AM	**Update from AAP staff on advocacy for shared decision making and physician support**
10:00 AM	**Break***
10:20 AM	**The Dance of Shared Decision-Making: How Honest Human Connection Can Make All the Difference**
	Ashley Waddell Tingstad, Courageous Parents Network
10:55 AM	**Catalysts and Constraints to Shared Decision-Making—Helping Birthing Families Create a Path Forward**
	Terri Major-Kincade
11:30 AM	**Panel Discussion and Audience Q&A**
	Terri Major-Kincade, Ashley Waddell Tingstad, April Dworetz, DonnaMaria Cortezzo
12:15 PM	**Adjourn**

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

H3038: Section on Neonatal Perinatal Medicine Program: Day 3

Sunday, September 29

Women in Neonatology (WiN): WiNning together: rising stronger with goal setting, coaching, mentorship, allyship

1:00 PM	**WiNning together: rising stronger with goal setting, coaching, mentorship, allyship** *Gina Geiss*
2:00 PM	**Career development part I: Craft your WiNning circle: rising stronger with coaches, mentors, and allies** *Marilyn Escobedo*
3:00 PM	**Career development part II: WiNning at goal setting: rising stronger through personal strategy development** *Kris Reber*
4:00 PM	**WiN Reception*** *Sponsored by Reckitt/Mead Johnson Nutrition*

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

Review Committee for Pediatrics (RC-Peds) Nominee Qualifications

To qualify to be nominated to the RC-Peds for this position, the candidate:

- must be a board-certified pediatrician or pediatric subspecialist with a background in education and expertise in graduate medical education.
- should have at least three years of experience as a program director of an ACGME-accredited pediatrics residency program or pediatric subspecialty fellowship or three years of experience as a designated institutional official. The nominee's program must be in good standing with a status of Continued Accreditation.
- must have a current or past association with graduate medical education.
- should participate in major specialty societies.
- must be skilled in the use of computers (communication with staff is primarily through email, and members will use electronic systems for receipt of agenda materials, program reviews, reimbursement of expenses, and peer evaluations).
- must demonstrate fairness, the ability to work collaboratively, and express views clearly and concisely.
- must be able to attend an observation meeting, April 10-11, 2025, prior to the start of the term.
- must devote sufficient time to prepare for and participate in three RC meetings per year (January, April, and September), two-three days per meeting, as well as contribute to RC-Peds subcommittee work as assigned.
- ideally, will not hold the same subspecialty certifications as the members of the RC-Peds at the time of appointment. The RC-Peds strives to maintain a balance of specialties; it is preferable that individuals from the following specialties are not nominated:
    - General Pediatrics
    - Internal-Medicine Pediatrics
    - Pediatric Hospital Medicine
    - Pediatric Emergency Medicine
    - Neonatal-Perinatal Medicine
    - Pediatric Critical Care Medicine
    - Pediatric Endocrinology
- must not be at the same institution as any member of the RC-Peds at the time of appointment.
    - *Same-Institution Disqualification: Although the RC-Peds may have multiple members from the same state, they may not be from the same institution. Accordingly, individuals must not be nominated from the following institutions:*
        - UC Davis (Davis, CA)
        - Stanford University (Stanford, CA)
        - University of Colorado (Aurora, CO)
        - Advocate Children's Hospital (Park Ridge, IL)
        - Mayo Clinic (Rochester, MN)
        - Columbia University College of Physicians & Surgeons (Yonkers, NY)
        - Goryeb Children's Hospital-Atlantic Health System (Morristown, NJ)
        - University of North Carolina School of Medicine (Chapel Hill, NC)
        - Cincinnati Children’s Hospital Medical Center (Cincinnati, OH)
        - University of Texas Health San Antonio (San Antonio, TX)
        - University of Washington/Seattle Children's (Seattle, WA)

The RC-Peds expects the AAP to consider diversity and inclusion when submitting its nominations.



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Medicolegal: Risk Management and Pneumothorax

Jay P. Goldsmith, MD, Jonathan K. Muraskas, MD

"A term newborn is delivered via emergency C-section due to suspected uterine rupture. An infant male is born limp and pale with no respiratory effort. The initial resuscitation steps are performed with no significant improvement. Positive pressure ventilation with a facemask is initiated; however, the heart rate remains less than 100 beats per minute."

A term newborn is delivered via emergency C-section due to suspected uterine rupture. An infant male is born limp and pale with no respiratory effort. The initial resuscitation steps are performed with no significant improvement. Positive pressure ventilation with a facemask is initiated; however, the heart rate remains less than 100 beats per minute. The appropriate ventilation corrective steps (MR SOPA) are performed, including increasing the inflating pressure; however, bradycardia persists. There appears to be some chest rise with ventilation. A 3.5 mm endotracheal tube is promptly placed with visualization of the cords. A pulse oximeter is placed on the right hand, but a reliable signal cannot be achieved. Auscultation of the chest reveals persistent bradycardia. Because of the poor clinical response, the infant is reintubated with another 3.5 mm endotracheal tube visualized through the vocal cords. Breath sounds are auscultated bilaterally, although chest rise appears less than optimal despite higher inflating pressures. Chest compressions are initiated, and an umbilical venous catheter is prepared and inserted. After 60 seconds of coordinated compressions and ventilation with 100% oxygen, an appropriate dose of epinephrine is given through the umbilical venous catheter. After three more minutes of ventilation and compressions, another dose of intravenous epinephrine is given with no significant response. A stat chest x-ray is ordered during the code to assess endotracheal tube placement. Apgar scores of 1 at 1 minute, 1 at 5, and 1 at 10 minutes are documented. Breath sounds continue to be auscultated bilaterally; however, minimal chest rise is noted.

"A chest x-ray was performed shortly afterward at 25 minutes after birth, and the official interpretation was a large right-sided tension pneumothorax with satisfactory endotracheal tube position."

At 15 minutes of age, an Apgar score is 0, and after discussion with the family, active care was discontinued, and this unfortunate infant male was pronounced dead at 19 minutes of life. A chest x-ray was performed shortly afterward at 25 minutes after birth, and the official interpretation was a large right-sided tension pneumothorax with satisfactory endotracheal tube position. The question is: Was there a deviation in the standard of care during this resuscitation?

When air collects in the pleural space surrounding the lung, it is called a pneumothorax. If the pneumothorax becomes larger, the pressure from trapped air can cause the lung to collapse. Blood flow within the chest can be compromised, leading to respiratory distress, oxygen desaturations, and bradycardia (1) Tension pneumothorax is a life-threatening emergency due to restricted lung excursion and low cardiac output that can lead to rapid death if not treated promptly and properly. Significant risk factors for pneumothoraces include meconium aspiration, respiratory distress syndrome, transient tachypnea of the newborn, pulmonary hypoplasia, prematurity, positive pressure ventilation, and prolonged resuscitations. The recognition and management of a pneumothorax is part of NRP training.

"The recognition and management of a pneumothorax is part of NRP training."

Although small pneumothoraces are usually asymptomatic and may occur during the first few breaths, they rarely require treatment. Large pneumothoraces can have multiple signs that include:

- Agitation
- Tachypnea
- Cyanosis
- Bradycardia
- Hypoxia
- Hypercarbia
- Hypotension
- Asymmetrical chest movement
- Diminished breath sounds
- Shift of heart sounds
- Abdominal distension (pushes the diaphragm down and causes the abdomen to distend)
- Failure to respond to resuscitation efforts.

Although breath sounds should be diminished on the side of the pneumothorax, this finding can be misleading. In a code situation, when using high inspiratory pressure, breath sounds can be easily

transmitted across a newborn's chest, giving a false impression of normal and equal breath sounds.

Classically, a chest x-ray with an anterior and posterior view will show a mediastinal shift with a tension pneumothorax. One can see ipsilateral depression of the diaphragm with a tension pneumothorax and displacement of the lung on the affected side away from the chest wall. As infants lie flat, the free air is anterior to the lungs; therefore, the edge of a collapsed lung may not be visible. In reading a CXR for potential air leaks, the lateral film can be helpful when there is a clear cardiac border on the anteroposterior film. The lateral film may show that the clarity is an increased lucency due to free air. (2)

"Rapid transillumination can be performed by placing a fiberoptic light probe under each axilla with a transillumination light source subxiphoid. With transillumination, light on the side with the pneumothorax will appear to spread further and light up the affected hemithorax greater than the opposite side."

Rapid transillumination can be performed by placing a fiberoptic light probe under each axilla with a transillumination light source subxiphoid. With transillumination, light on the side with the pneumothorax will appear to spread further and light up the affected hemithorax greater than the opposite side. Transillumination might be unreliable in low birthweight newborns due to thin skin and subcutaneous tissue. It can be falsely positive in cases of subcutaneous emphysema and severe pulmonary interstitial emphysema and falsely negative in the event of too much ambient light, thick chest wall, darkly pigmented skin, or a weak fiberoptic light (3). A recent study demonstrated that lung ultrasonography was more sensitive and specific for early detection of pneumothoraces compared with CXR (4), but point of care ultrasound (POCUS) is not available in every NICU.

" A recent study demonstrated that lung ultrasonography was more sensitive and specific for early detection of pneumothoraces compared with CXR (4), but point of care ultrasound (POCUS) is not available in every NICU."

Thoracocentesis can provide lifesaving evacuation for tension pneumothorax. Accepted landmarks are the second intercostal space in the midclavicular line or the fourth intercostal space in the anterior axillary line. Anatomically, one should avoid the breast bud and the vascular bundle under the rib. In our experience in the era of surfactant and antenatal steroids, the placement of a chest tube has become a rare procedure. Traditionally, newborns requiring mechanical ventilation with symptomatic air leaks required chest tube placement. Chest tube placement should be done using a sterile technique, and depending on the situation, appropriate analgesia is recommended. However, chest tube placement is not benign and requires experience and skill. The incidence of symptomatic pneumothorax is about 0.05% and 5% in term and preterm newborns, respectively. Both straight chest tubes and pigtail catheter placement can result in life-threatening complications (5). Air is generally anterior if a newborn is supine but may be elsewhere, and the pigtail system only works if the air can flow freely in the hemithorax and is anterior. Sometimes, the air is posterior, especially if the pneumothorax is recurrent, and an anterior tube will not drain the free air. Here, a straight chest tube placed posteriorly is necessary.

"Air is generally anterior if a newborn is supine but may be elsewhere, and the pigtail system only works if the air can flow freely in the hemithorax and is anterior. Sometimes, the air is posterior, especially if the pneumothorax is recurrent, and an anterior tube will not drain the free air. Here, a straight chest tube placed posteriorly is necessary."

Some studies have demonstrated that initial needle aspiration of symptomatic pneumothoraces in newborns is adequate and reduces the need for a chest tube(6). However, if a needle thoracentesis is performed and successful, the incidence of recurrence of the pneumothorax is increased, and the appropriate personnel may be needed emergently to repeat the thoracentesis or place a chest tube. There is little evidence to support that the administration of 100% oxygen does hasten the resolution of a symptomatic spontaneous pneumothorax (7)

From a medical-legal perspective, an acute tension pneumothorax requires immediate action. There might not be time to wait for a transilluminator, CXR, or point-of-care ultrasound to confirm the diagnosis. Inserting an 18 - 22 gauge percutaneous catheter-over-needle perpendicular to the lateral chest wall over the top of the rib with anterior direction should result in no contact with the heart, mediastinum, or lung lobe. In a prolonged resuscitation, when 1-5/100 newborns do not respond to appropriate airway and ventilation management, the prompt recognition of a tension pneumothorax can be lifesaving with a satisfactory neurodevelopmental outcome.

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Disclosure: *No disclosures are indicated.*

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

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

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

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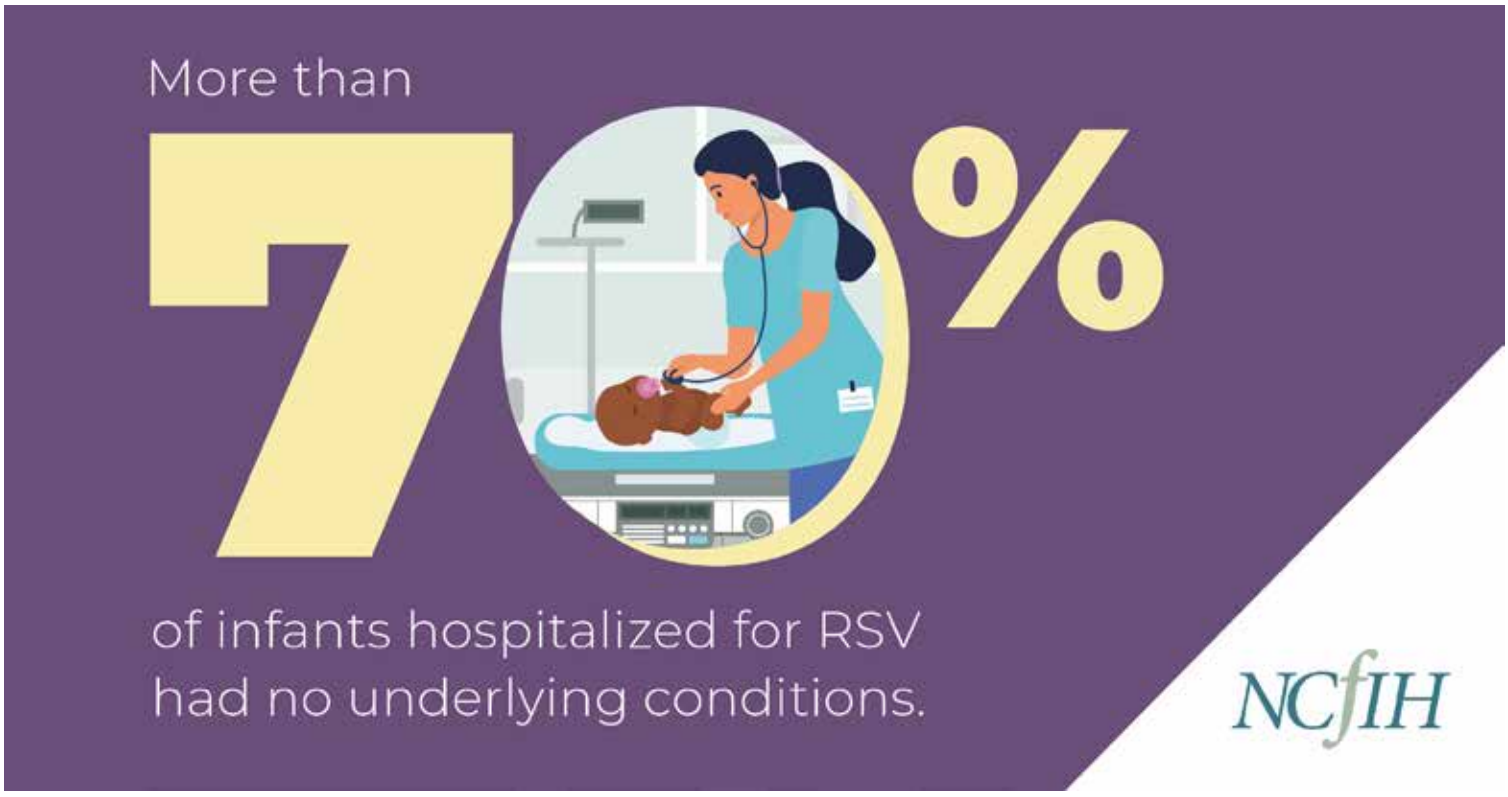
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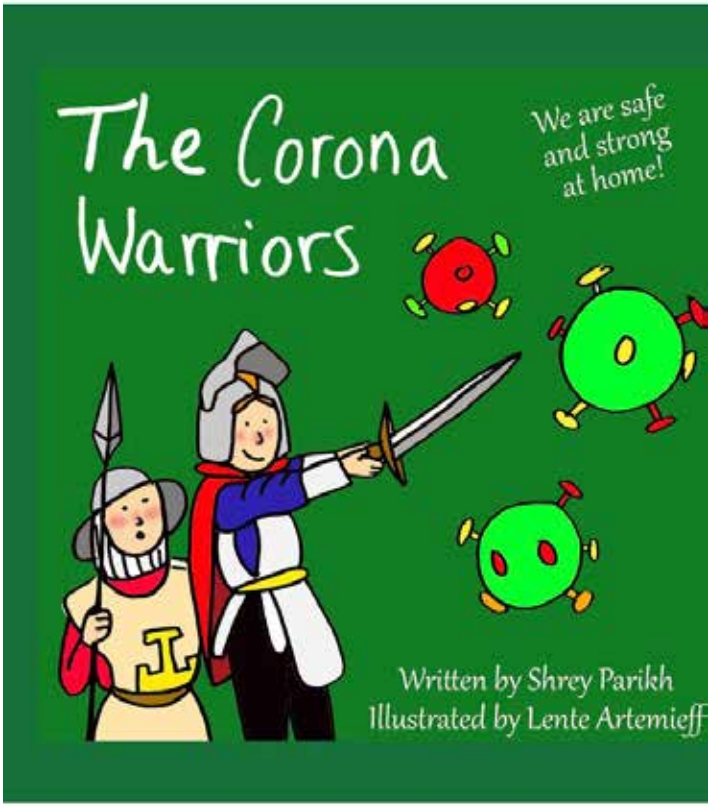
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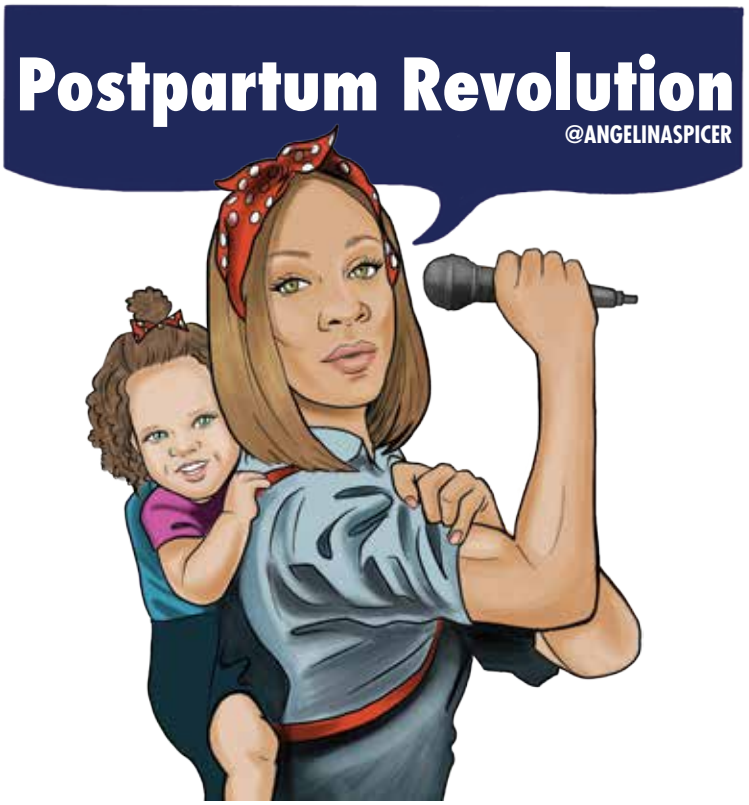


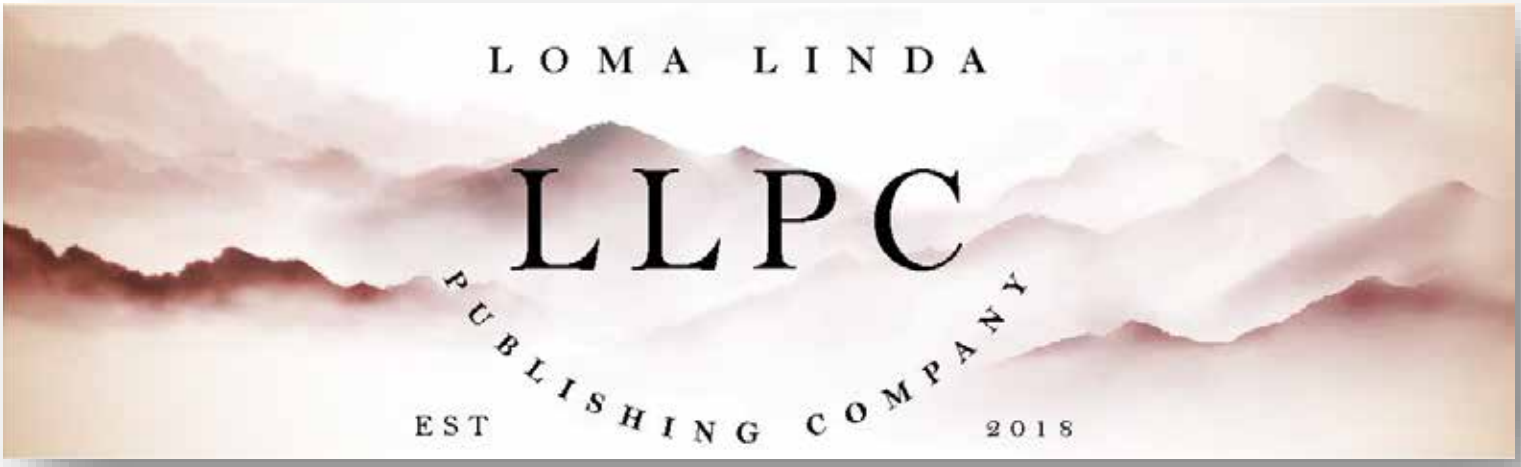
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Genetics Corner: COL4A1-Associated Brain Small Vessel Disease with or without Vascular Anomalies in an Infant with Schizencephaly and Congenital Intracranial Calcifications: A Genetic Disorder that can Mimic Congenital CMV Infection

Gabriel S. Espinoza, MD, Ann T. Ly, CGC, Robin D. Clark, MD

Case Summary

A small for gestational age female infant was born at 36 weeks gestation by C-section for non-reassuring fetal heart tones. All growth parameters were below the 3rd percentile: length, weight, and head circumference. She had intrauterine drug exposure to methamphetamine, cannabis, and nicotine, and methamphetamine exposure was confirmed on a meconium drug test. She denied alcohol and tobacco use. A head ultrasound (Figure 1) showed nonspecific bilateral thalamic echogenicities, suspicious for calcifications, infarcts, or hemorrhages. A brain MRI (Figures 2 and 3) suggested schizencephaly, hyperintense material within both cerebral and cerebellar hemispheres, and an abnormal signal throughout the cerebellum, which is seen in the setting of CMV/TORCH infection, but hemorrhage could not be ruled out. A brain CT scan showed extensive supratentorial cortical/periventricular calcifications and bilateral cerebellar encephalomalacia (Figure 4). These findings were suspicious for perinatal infectious sequelae from a congenital TORCH infection. Following the recommendations of a neurosurgical consultant, she had biweekly head ultrasounds, and her head circumference was monitored. An EEG showed cortical activity dysfunction involving the left occipital and right central regions but no epileptiform discharges. An ophthalmology evaluation was negative for chorioretinitis, optic atrophy, or pigmentary retinopathy. She passed her hearing screen during her NICU admission.

TORCH evaluation for congenital infection was positive only for IgG for CMV but negative for IgG and IgM for Toxoplasma and

"A small for gestational age female infant was born at 36 weeks gestation by C-section for non-reassuring fetal heart tones. All growth parameters were below the 3rd percentile: length, weight, and head circumference...methamphetamine exposure was confirmed on a meconium drug test...A head ultrasound showed nonspecific bilateral thalamic echogenicities, suspicious for calcifications, infarcts, or hemorrhages. A brain MRI suggested schizencephaly, hyperintense material within both cerebral and cerebellar hemispheres, and an abnormal signal throughout the cerebellum, which is seen in the setting of CMV/TORCH infection, but hemorrhage could not be ruled out."

Figure 1. Head US showing calcifications and nonpecific bilateral thalamic echogenicity, most suspicious for calicifications (see red arrows), but infarct or hemorrhage were also considered.



Figure 2. Coronal cross-section image of brain MRI reveals hyperintense material within both cerebral and cerebellar hemispheres, with a mass defect on the left temporal lobe, with findings that may be seen in CMV/TORCH infection, calcification, and hemorrhage.

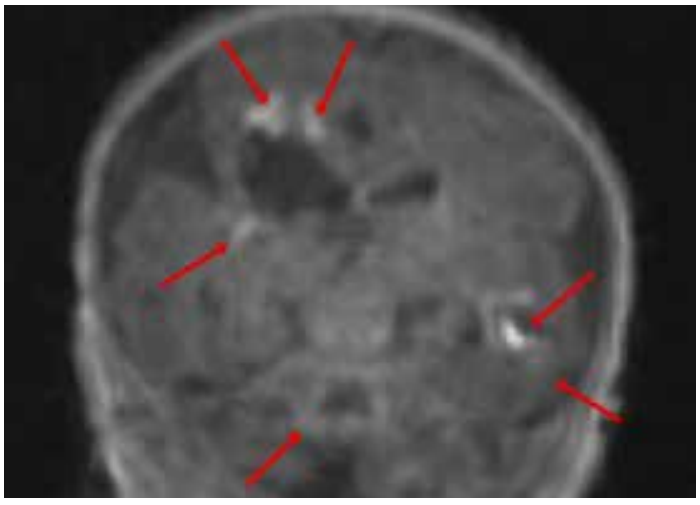


Figure 3. An axial cross-section image from a brain MRI was obtained with low resolution due to movement artifact. The defect adjacent to the left ventricle demonstrates schizencephaly

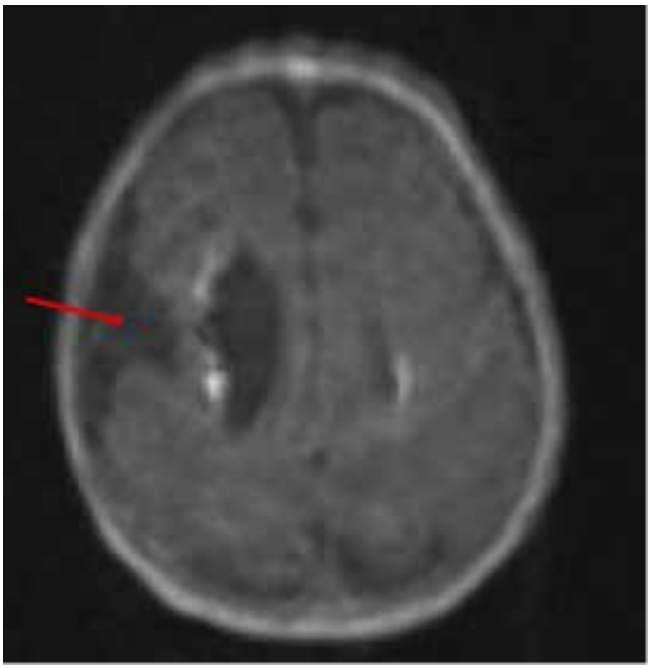
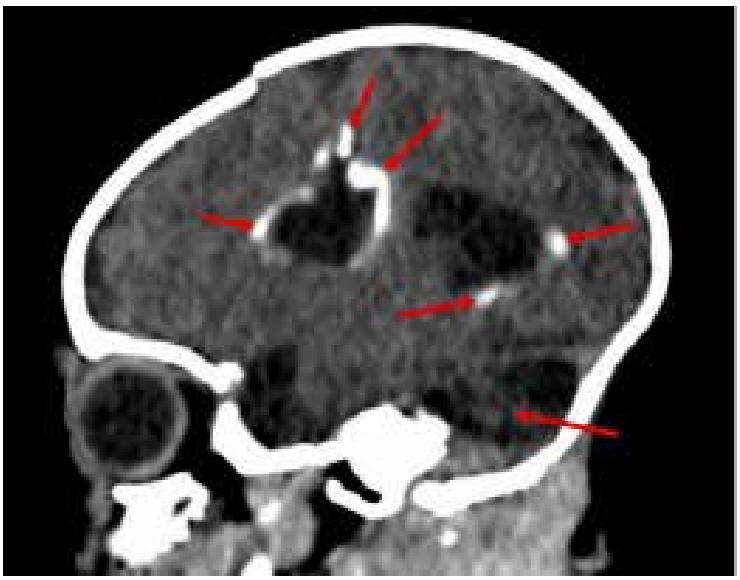


Figure 4. A sagittal cross-section image of a CT scan shows extensive supratentorial cortical/periventricular calcifications and bilateral cerebellar encephalomalacia. These findings are suspicious for perinatal infectious sequela and demonstrative of schizencephaly.



revealed immunity for rubella. Evidence of CMV infection could not be confirmed: IgM <0.2 IU/mL on day 1, two negative urine CMV PCR tests on days 2 and 9, and a negative blood PCR test on day 9. Following the recommendation of an infectious disease consultant, she began a 6-month course of valganciclovir for presumed CMV infection based on imaging studies (CNS calcifications) and symmetric IUGR.

On the advice of the genetic consultant, a brain malformation gene panel (163 genes, Invitae) was ordered, but results were not available before discharge on day 48. She returned as an outpatient to a genetics clinic at 14 weeks of age to review these results. Family history was negative for early or recurrent strokes, hemiplegia, or other evidence of microvascular disease. The mother was 33, and the father was 43 years of age at the time of the baby's birth. They had no significant health concerns other than substance abuse. The brain malformations gene panel identified a *de novo* likely pathogenic heterozygous missense variant in *COL4A1:* c. 2797G>C (p.Gly933Arg). Parental testing was negative.

Discussion:

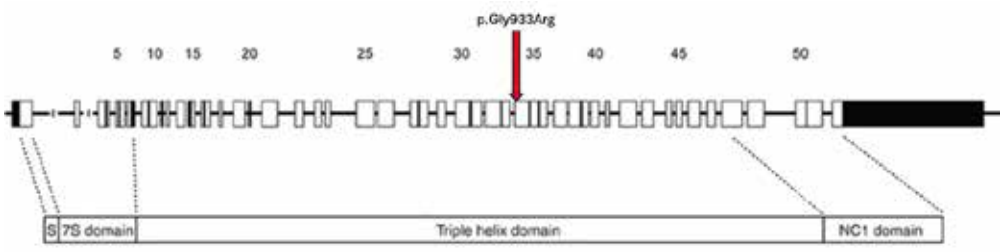
Congenital CMV infection is often the first diagnostic consideration in an infant with congenital intracranial calcifications because timely antiviral treatment for congenital CMV improves outcomes. This baby was also treated for presumptive congenital CMV infection based on symmetric IUGR and CNS imaging until genetic testing revealed that she had a genetic etiology for her disorder, and testing identified a *de novo* likely pathogenic gene variant in *COL4A1*.

The differential diagnosis of intracranial calcifications in a newborn includes all causes of intracranial hemorrhage and inflammation, including many congenital infections: syphilis, varicella zoster, herpes, parvovirus B-19, toxoplasma, rubella and, especially cytomegalovirus (CMV) (1). Genetic diseases are less common causes. The differential diagnosis includes Aicardi-Goutieres syndrome (AGS, MIM #225750), a rare monogenic disorder (2) and band-like calcifications with polymicrogyria, also called Pseudo-TORCH syndrome (BLC-PMGMIM #251290) and others that mimic TORCH in the absence of infection (Pseudo-TORCH syndrome 2, MIM #617397). Among these monogenic causes of congenital intracranial calcifications, *COL4A1* should not be overlooked.

"The differential diagnosis of intracranial calcifications in a newborn includes all causes of intracranial hemorrhage and inflammation, including many congenital infections: syphilis, varicella zoster, herpes, parvovirus B-19, toxoplasma, rubella and, especially cytomegalovirus (CMV). Genetic diseases are less common causes."

Pathogenic variants in *COL4A1* cause a spectrum of autosomal dominant cerebral small vessel disorders (OMIM #120130), variably associated with eye abnormalities and other systemic findings. Our patient's schizencephaly, calcifications, and microcephaly are consistent with the *COL4A1*-associated disorder called brain small vessel disease with or without vascular anomalies. Increased vessel fragility causes susceptibility to hemorrhage and retinal and renal vascular defects (3). Clinical features reflect the location and severity of the vascular defect and may include impaired neurologic development or function, hemiplegia, seizures, and

Figure 5. This diagram of *COL4A1* shows the location of the patient's variant (red arrow), resulting in a glycine substitution within the triple helix domain of the protein. Diagram adapted from Meuwissen *et al*. (8).



ocular anomalies. Brain imaging may demonstrate sequelae of intracranial vascular insufficiency or hemorrhage: porencephaly, hemosiderin deposition, calcifications, lacunar infarcts, enlarged ventricles, schizencephaly, and leukoencephalopathy. Penetrance is expected to be close to 100%. Fewer than 100 affected families have been identified so far. Given the rarity of this spectrum of disorders, there is little phenotype-genotype correlation. Treatment is symptomatic.

"Pathogenic variants in COL4A1 cause a spectrum of autosomal dominant cerebral small vessel disorders (OMIM #120130), variably associated with eye abnormalities and other systemic findings. Our patient's schizencephaly, calcifications, and microcephaly are consistent with the COL4A1-associated disorder called brain small vessel disease with or without vascular anomalies. Increased vessel fragility causes susceptibility to hemorrhage and retinal and renal vascular defects."

COL4A1 encodes the alpha subunit of collagen type IV, an essential component for the structural integrity and function of the basement membrane (4, 5). Although our patient's specific variant (Figure 5) has not been previously reported, its pathogenicity is clear as it alters one of the highly conserved glycine residues within the Gly-X-Y repeats in the triple helical domain. When this triple helix formation is impacted, the COL4A1 protein cannot form a heterodimer with the COL4A2 protein, which can no longer be secreted into the basement membrane. Poorly formed basement membrane in the vascular system impairs physical support of the vessels, compromises mechanical barriers such as the blood-brain barrier, decreases angiogenesis, and alters cell signaling (6).

It is challenging to know the role *in utero* drug exposure played in the etiology of our patient's CNS anomalies. We speculate that impairment of the blood-brain barrier in our patient due to *COL4A1*-associated brain small vessel disease may have made her more susceptible to the effects of *in utero* drug exposures, or put another way, *in utero* drug exposures may have had a greater effect in our patient, including as hemorrhage, because her cerebral vascular system was already weakened by defective COL4A1 protein.

"COL4A1 encodes the alpha subunit of collagen type IV, an essential component for the structural integrity and function of the basement membrane. Although our patient's specific variant has not been previously reported, its pathogenicity is clear as it alters one of the highly conserved glycine residues within the Gly-X-Y repeats in the triple helical domain. When this triple helix formation is impacted, the COL4A1 protein cannot form a heterodimer with the COL4A2 protein, which can no longer be secreted into the basement membrane."

"...in utero drug exposures may have had a greater effect in our patient, including as hemorrhage, because her cerebral vascular system was already weakened by defective COL4A1 protein."

Schizencephaly is a rare cortical malformation characterized by a polymicrogyric cortex lining a cleft extending from the surface of the pia mater to the lateral ventricles. It does not represent the arrest of a normal developmental process but is postulated as the aftermath of an intrauterine vascular event. Even without calcifications, schizencephaly or polymicrogyria alone should raise concern for an underlying vascular event or a vascular or microvascular disorder. Cavallin and colleagues (7) demonstrated

this in their study of 9 infants with polymicrogyria with or without schizencephaly, mainly asymmetrical, with porencephaly or ventriculomegaly. In their cohort, 3/9 had pathogenic variants: one *de novo* missense variant in *COL4A1* and two in *COL4A2*. The authors "emphasize[s] the need to search for both COL4A1 and COL4A2 mutations in children presenting with uni- or bilateral polymicrogyria with schizencephaly, even in the absence of intracranial microbleeds, calcification or associated systemic features."

"Schizencephaly is a rare cortical malformation characterized by a polymicrogyric cortex lining a cleft extending from the surface of the pia mater to the lateral ventricles. It does not represent the arrest of a normal developmental process but is postulated as the aftermath of an intrauterine vascular event. Even without calcifications, schizencephaly or polymicrogyria alone should raise concern for an underlying vascular event or a vascular or microvascular disorder."

Practical Applications:

- Recall that schizencephaly and porencephaly imply a disruption, not an interruption, of normal CNS morphogenesis. They are postulated to be caused by vascular or hypoxic events *in utero*.
- Consider vascular etiologies and the monogenic disorders that can compromise the cerebral vasculature when evaluating an infant with intracranial calcifications and structural brain abnormalities, primarily when an infectious disease workup for TORCH/CMV infections is non-diagnostic.
- Recall that *COL4A1 and COL4A2*-related microvascular disorders have variable presentations in the newborn.
    - Microcalcifications may not be present in all affected infants, and not all affected infants have schizencephaly or polymicrogyria.
- Be aware that any underlying vascular or microvascular disease may potentiate the adverse effects of intrauterine drug exposure and vice versa.

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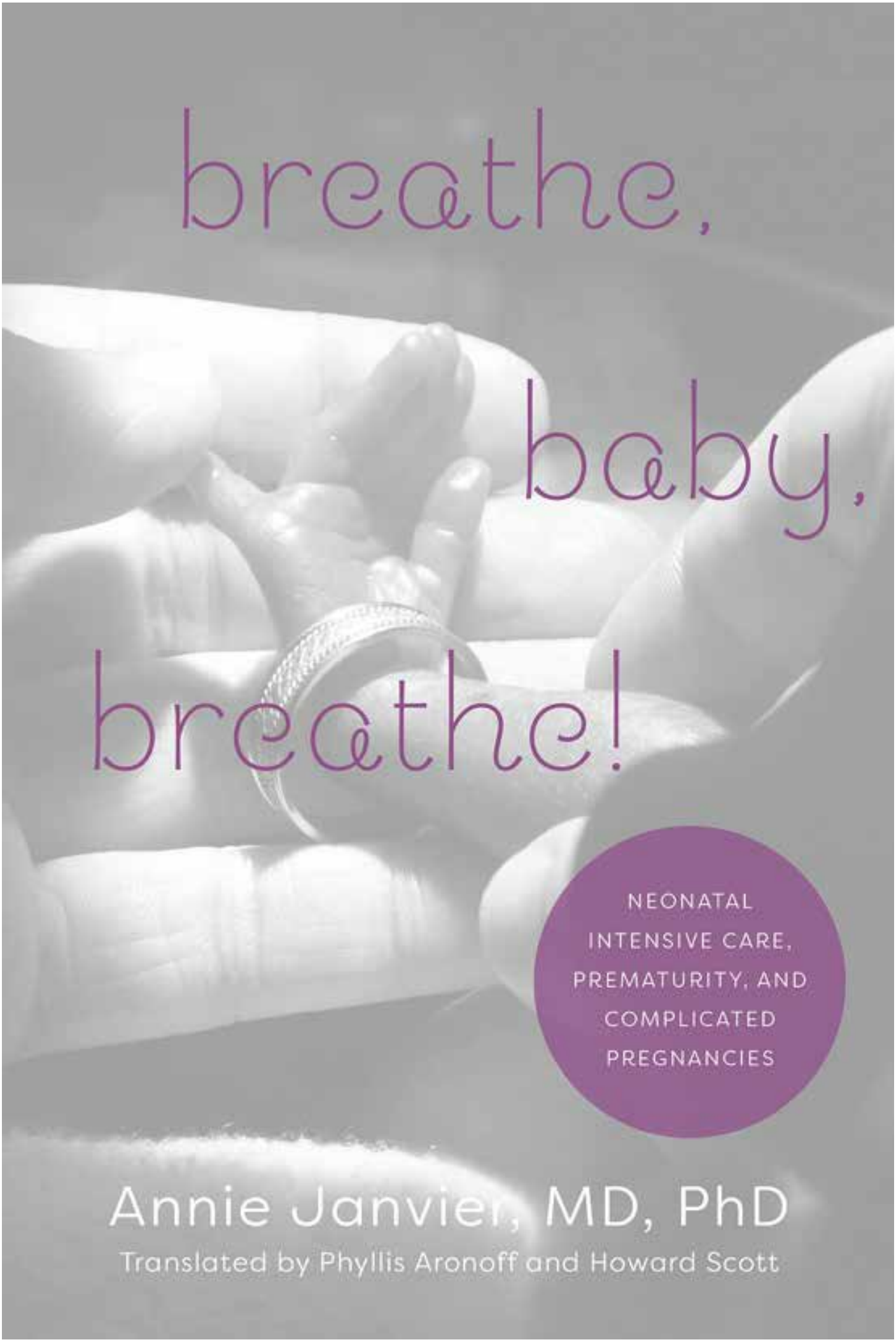
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Which Infants are More Vulnerable *to Respiratory Syncytial Virus?*

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%

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Family-Centered Care (FCC) Taskforce How do you know you're truly delivering Family-Centered Care in the NICU?

Morgan Kowalski

"We are excited to share that the FCC Taskforce's NICU Family-Centered Care Measures survey pilot is ready to launch! Our journey to develop this assessment tool has been a collaborative effort, spanning 17 months of dedicated work by FCC Taskforce leadership."

We are excited to share that the FCC Taskforce's NICU Family-Centered Care Measures survey pilot is ready to launch! Our journey to develop this assessment tool has been a collaborative effort, spanning 17 months of dedicated work by FCC Taskforce leadership. We have worked tirelessly with our Executive Council of family partners and multidisciplinary healthcare professionals to ensure its effectiveness. We have included researchers outside our organization to review survey questions and further validate our efforts.

"Using the QR Code below, share contact information for your unit's clinical leader, medical director, or FCC champion to receive a REDCap survey link unique to your NICU. For successful survey completion, we recommend printing a PDF of the NICU FCC measures survey using the link we will provide."

Using the QR Code below, share contact information for your unit's clinical leader, medical director, or FCC champion to receive a REDCap survey link unique to your NICU. For successful survey completion, we recommend printing a PDF of the NICU FCC measures survey using the link we will provide. Next, collaborate with your colleagues to complete the survey using the printed PDF. Then, transcribe your answers into the online version of the survey using the original link, which can be saved along the way in case you need to come back later.

"We need your feedback to improve. After completing the survey, please share any comments on how we can refine our project to optimize this questionnaire better and capture FCC in the NICU. Once the survey is completed, you will receive results automatically and can review them with FCC Taskforce leadership."

We need your feedback to improve. After completing the survey, please share any comments on how we can refine our project to optimize this questionnaire better and capture FCC in the NICU. Once the survey is completed, you will receive results automatically and can review them with FCC Taskforce leadership. You can collaborate with other NICUs to join topic-specific quality improvement work.

We appreciate your dedication to providing Family-Centered Care in your unit and look forward to collaborating with you!

Disclosure: *This work is supported by an educational grant from Chiesi Inc. USA and a Seed 1 Partnership Award from Stanford Impact Labs. Thank you to Reckitt/Mead Johnson for supporting our work.*

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The Signs & Symptoms of RSV

RESPIRATORY SYNCYTIAL VIRUS

Know the Signs & Symptoms of RSV

- Cough
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- Difficulty Eating
- Lethargy
- Wheezing

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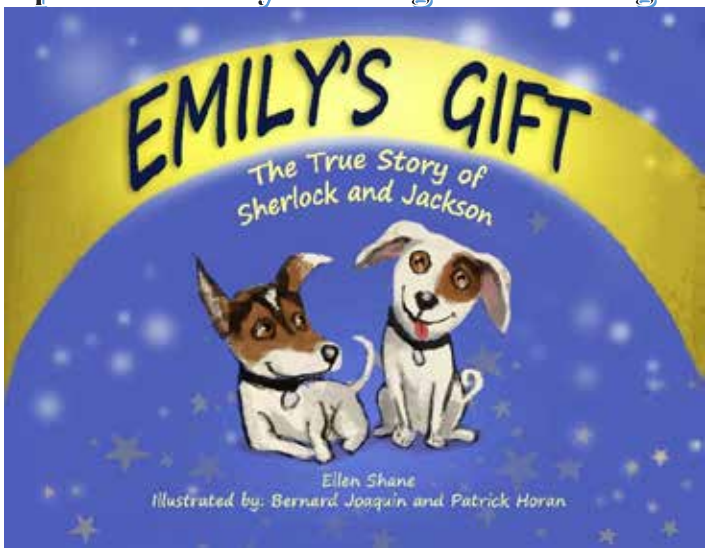
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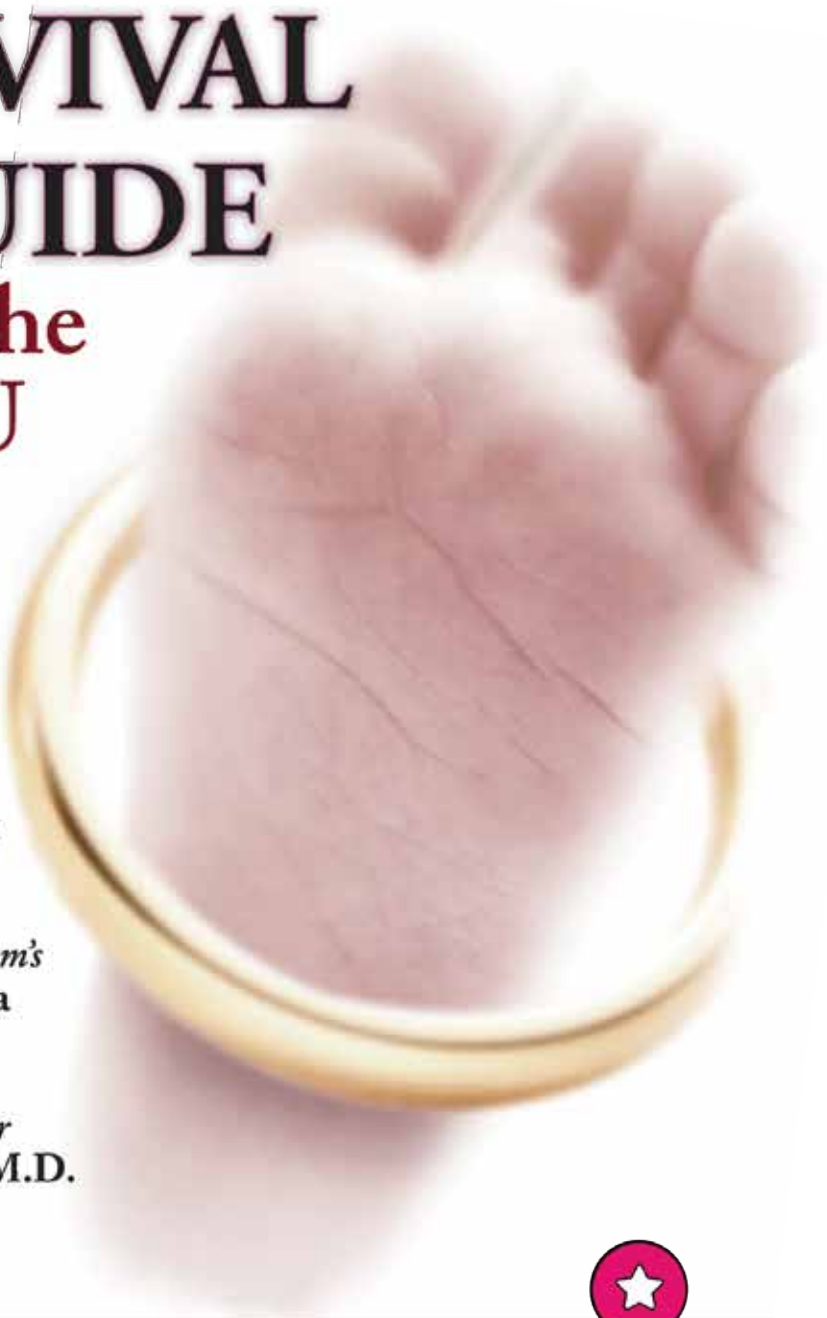




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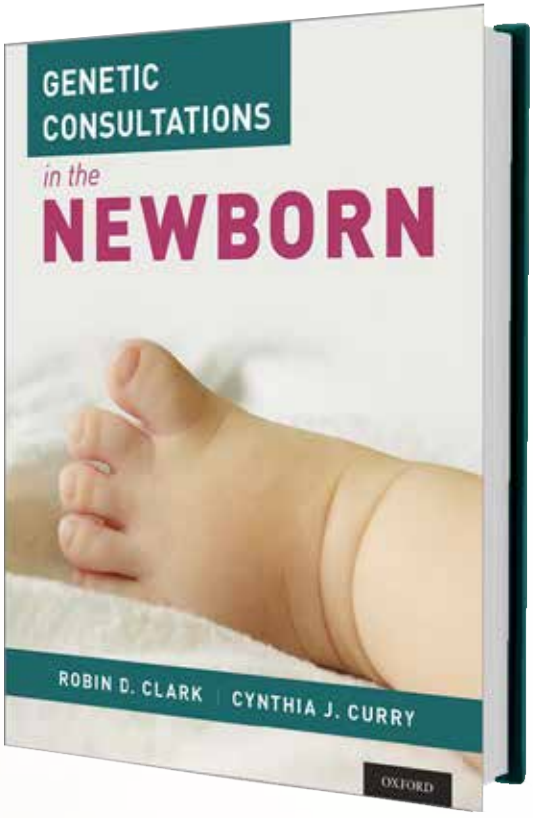
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Clinical Pearl: Variety is the Spice of Life – Heart Rate Variability in Neonates

Gustave H. Falciglia, MD, MSCI, MSHQPS, Joseph R. Hageman, MD, Leslie Caldarelli, MD, Lolita Alkureishi, MD

"With improved measurements over time, Carl Ludwing determined that heart rate varied with the respiratory rate in the 19th century. (1) Further improvements in automated and standardized heart rate data acquisition yielded further discoveries in the 20th century."

Introduction:

For centuries, there has been curiosity about heart rate and how it varies. In 500 BCE, Qin Yueren, a Chinese physician, qualitatively described heart rate characteristics. (1) With improved measurements over time, Carl Ludwig determined that heart rate varied with the respiratory rate in the 19th century. (1) Further improvements in automated and standardized heart rate data acquisition yielded further discoveries in the 20th century. Hon *et al.* discovered that fetal heart rate variability decreased during antenatal stress. (1) The association between decreased heart rate variability (HRV) and mortality following myocardial infarction has provided cardiologists with a means to stratify patient's risk and need for an automated implantable defibrillator. (1)

What information can HRV yield about infants in the NICU? The number of studies evaluating HRV in infants is increasing each year. In this article, we will review why heart rate varies, how HRV is calculated, what HRV can tell us about infants, and what HRV might be able to tell us.

"HRV exists due to intracardiac and extracardiac factors. (2) The capacity for the neonatal myocardium to stretch is limited; therefore, heart rate is a primary driver of cardiac output. parasympathetic systems."

Why does heart rate vary?

HRV exists due to intracardiac and extracardiac factors. (2) The capacity for the neonatal myocardium to stretch is limited; therefore, heart rate is a primary driver of cardiac output. The heart is also responsive to the autonomic nervous system, including the sympathetic and parasympathetic systems. Although immature in neonates, these nervous systems respond to pressure and chemical influences via baroreceptors and chemoreceptors. An immature parasympathetic nervous system and high metabolic demand result in higher heart rates for neonates. (2)

"The heart is also responsive to the autonomic nervous system, including the sympathetic and parasympathetic systems. Although immature in neonates, these nervous systems respond to pressure and chemical influences via baroreceptors and chemoreceptors. An immature parasympathetic nervous system and high metabolic demand result in higher heart rates for neonates. (2)"

How is HRV calculated?

There are several methods to calculate HRV, including linear and nonlinear methods. (1–3) A system is linear when broken down into constituent parts and analyzed. Nonlinear systems cannot reliably be analyzed by reducing a system to its part. An inconsistent relationship between input and output may change over time. (4) Raising children comes to mind – different children, toddlers, and teenagers have different needs. The most common linear methods to calculate HRV include the time and frequency domain, which will be discussed in detail. Each measure has strengths and weaknesses. Some are intuitive to understand, while others may yield more insight. (3)

The simplest methods are the time domain methods. After cleaning heart rate data to remove artifacts and ectopy, the normal RR interval, the time between two R-wave peaks, is calculated in milliseconds. (1) It is also called the normal-to-normal interval (NN) because it describes the beat-to-beat variation without

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abnormalities due to measurement error or arrhythmia. From here, the variation in NN intervals is measured using a statistical measure of dispersion, such as standard deviation. (3,5) A common time domain measure is the SDNN or standard deviation of the NN interval; however, there are many more, including the root mean squared of successive differences (RMSSD) and the square root of the squared changes in consecutive RR lengths. (3) HRV depends on the length of data capture because HRV naturally increases over time. Therefore, the time of acquisition between two samples should be consistent. (6)

"Frequency domains use a different approach to analyze HRV. These methods assume that the observed heart rate and HRV is a composite of underlying heart rate frequencies of varying strength."

Frequency domains use a different approach to analyze HRV. These methods assume that the observed heart rate and HRV is a composite of underlying heart rate frequencies of varying strength. This is analogous to visible light. The afternoon sun may appear yellowish white; however, passing sunlight through a prism reveals a rainbow from the individual spectrum. (3) The Fourier transformation, a mathematical tool, reveals the spectrum of underlying heart rate frequencies. Common frequencies are low frequency (LF), which ranges from 0.04 to 0.15Hz, and high frequency (HF), which ranges from 0.25 to 1Hz. There are additional frequencies, including very low frequency and the LF-to-HF ratio. (3)

Additional methods include geometric methods and nonlinear methods, as well as entropy and fractal analyses. Geometric methods transform the NN interval into a geometric figure. (6) Entropy analyses determine how much of the HRV is regular. Greater regularity indicates less entropy or disorder. (7) Fractal analyses determine how much of the HRV is self-repeating, analogous to self-repeating branches in a large tree. (1,8)

"Additional methods include geometric methods and nonlinear methods, as well as entropy and fractal analyses. Geometric methods transform the NN interval into a geometric figure. (6) Entropy analyses determine how much of the HRV is regular. Greater regularity indicates less entropy or disorder. (7)"

What information can HRV yield about infants in the NICU?

A scoping review evaluated the breadth of studies evaluating HRV in neonates. (5) The review included any observational or interventional study (case reports and reviews were excluded) from 2000-2020 in neonates from birth to one month. The authors found 286 articles, mostly observational, with 40% published within the last five years. About half of the articles were devoted to term infants, while a quarter evaluated very preterm infants 28 to 31 and 6/7 weeks. The most common methods of analysis were frequency and time domain analyses used in 73% and 49% of studies (studies frequently evaluate HRV using many metrics). HF, LF, and LF/HF ratios were found in 66%, 59%, and 41% of studies. The frequency ranges, however, were inconsistently defined. Studies found associations between HRV and physiologic states, including age, weight, sleep, and sex; pathologic conditions, including sepsis or infection, necrotizing enterocolitis, respiratory distress syndrome (RDS), extubation failure; and response to stimuli including, pain, light, sound, touch, kangaroo care, and maternal bonding; and outcomes including cerebral palsy and neurodevelopmental. (5)

"An observational study of 92 preterm infants evaluated the association between RDS and HRV. (9) The study, conducted before the surfactant era, found that HRV decreased with the severity of RDS based on respiratory support and increased with age."

An observational study of 92 preterm infants evaluated the association between RDS and HRV. (9) The study, conducted before the surfactant era, found that HRV decreased with the severity of RDS based on respiratory support and increased with age. A prospective study evaluated HRV and sepsis, including culture positive and culture negative (i.e., sepsis-like syndrome) in 63 infants and 26 controls. (10) They found decreased HRV the day before clinical recognition. Other findings include a direct association between HRV and improved neurodevelopmental outcomes at two years, an inverse association between HRV and small for gestational age (SGA) status, and a significant genetic contribution to HRV. (2)

Additional Areas for Analysis:

HRV is under significant input from the parasympathetic and sympathetic nervous systems. Some frequency ranges are associated with these systems. Studies suggest the parasympathetic nervous system and HF range are correlated in older populations, while the sympathetic nervous system and LF/HF ratio are correlated. (6) There is debate whether the LF range is associated with the sympathetic or both nervous systems. Increased parasympathetic activity is thought to be associated with increased HRV. (1) In adolescents, females were observed to have more HRV than males, which was thought to be secondary to higher parasympathetic; this difference also varied by physical fitness. (11) Perhaps HRV can be used to assess infants' parasympathetic and sympathetic tones.

The random fluctuations on the heart rate monitor hide signals that provide information on infants in the NICU. It is up to the field to parse out the signal from the noise to improve neonatal care.

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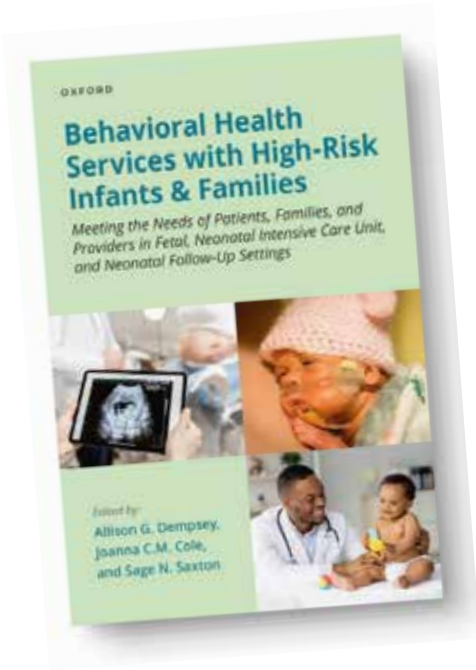
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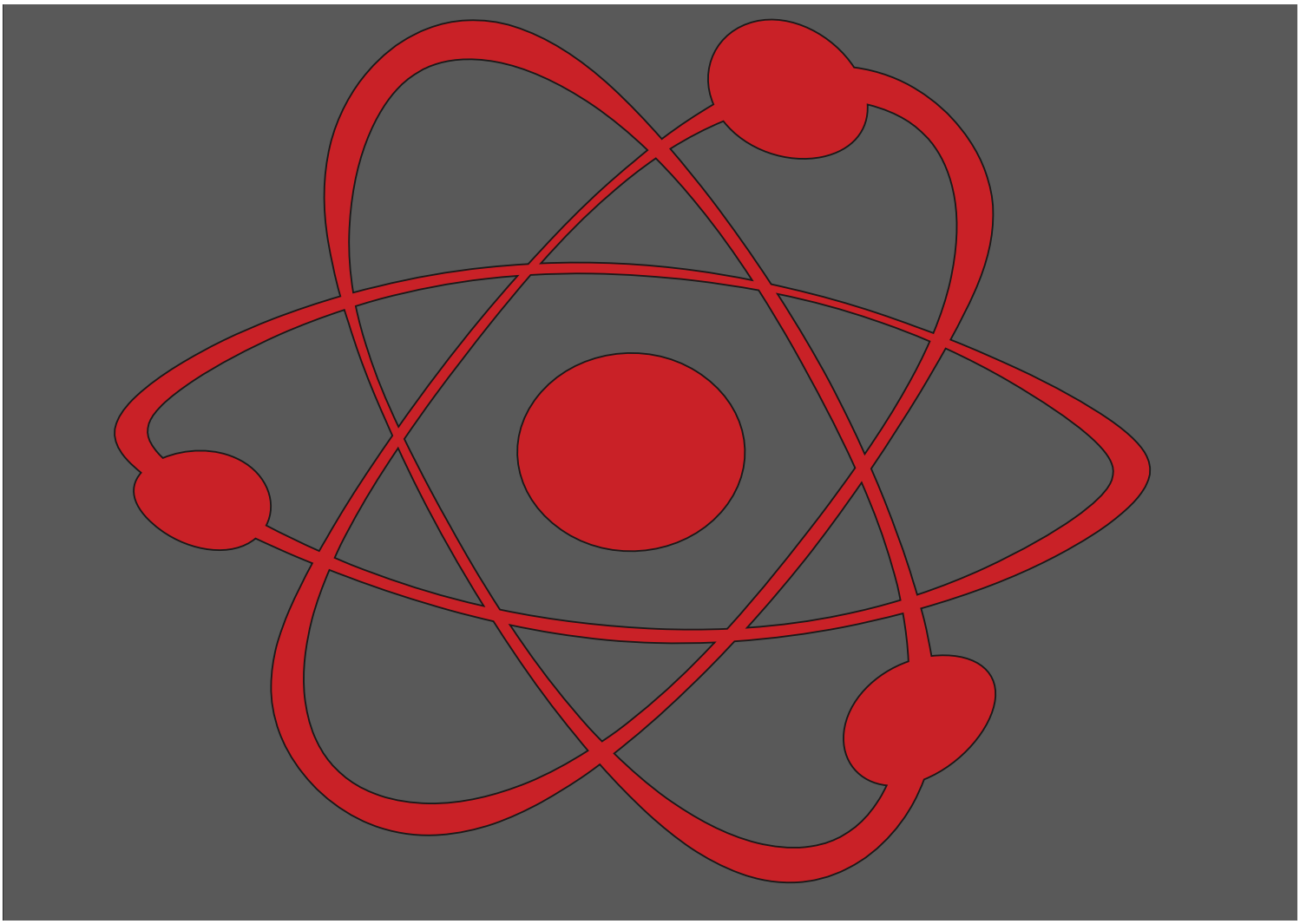
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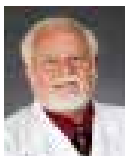
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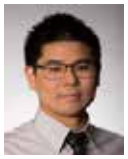
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Neonatology and the Arts

This section focuses on artistic work which is by those with an interest in Neonatology and Perinatology. The topics may be varied, but preference will be given to those works that focus on topics that are related to the fields of Neonatology, Pediatrics, and Perinatology. Contributions may include drawings, paintings, sketches, and other digital renderings. Photographs and video shorts may also be submitted. In order for the work to be considered, you must have the consent of any person whose photograph appears in the submission.

Works that have been published in another format are eligible for consideration as long as the contributor either owns the copyright or has secured copyright release prior to submission.

Logos and trademarks will usually not qualify for publication.

This month we continue to feature artistic works created by our readers on the next to last page as well as photographs of birds on rear cover. For this edition, our art was again graciously provided by Colleen Kraft, MD. It is a work called "Heroes for Ghosts" done by her son Tim. Our Bird is an Parrot from Mita Shah, MD taken at a Farmer's Market.



Lily Martorell, MD
Arts Editor
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Manuscript Submission: Instructions to Authors

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

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

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

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

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

6. An abstract may be submitted.

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

8. References should be included in standard "NLM" format (APA 7th is no longer acceptable). Bibliography Software should be used to facilitate formatting and to ensure that the correct formatting and abbreviations are used for references.

9. Figures should be submitted separately as individual separate electronic files. Numbered figure captions should be included in the main file after the references. Captions should be brief.

10. Only manuscripts that have not been published previously will be considered for publication except under special circumstances. Prior publication must be disclosed on submission. Published articles become the property of the Neonatology Today and may not be published, copied or reproduced elsewhere without permission from Neonatology Today.

11. NT recommends reading Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals from ICMJE prior to submission if there is any question regarding the appropriateness of a manuscript. NT follows Principles of Transparency and Best Practice in Scholarly Publishing(a joint statement by COPE, DOAJ, WAME, and OASPA). Published articles become the property of the Neonatology Today and may not be published, copied or reproduced elsewhere without permission from Neonatology Today.

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NEONATOLOGY TODAY is interested in publishing manuscripts from Neonatologists, Fellows, NNPs and those involved in caring for neonates on case studies, research results, hospital news, meeting announcements, and other pertinent topics.

Please submit your manuscript to: LomaLindaPublishingCompany@gmail.com

NICU Baby's Bill of Rights

1- The Right to Advocacy
My parents know me well. They are my voice and my best advocates. They need to be knowledgeable about my progress, medical records, and prognosis, so they celebrate my achievements and support me when things get challenging.

2- The Right to My Parents' Care
In order to meet my unique needs, my parents need to learn about my developmental needs. Be patient with them and teach them well. Make sure hospital policies and protocols, including visiting hours and rounding, are as inclusive as possible.

3- The Right to Bond with My Family
Bonding is crucial for my sleep and neuroprotection. Encourage my parents to practice skin-to-skin contact as soon as and as often as possible and to read, sing, and talk to me each time they visit.

4- The Right to Neuroprotective Care
Protect me from things that startle, stress, or overwhelm me and my brain. Support things that calm me. Ensure I get as much sleep as possible. My brain is developing for the first time and faster than it ever will again. The way I am cared for today will help my brain when I grow up. Connect me with my parents for the best opportunities to help my brain develop.

5- The Right to be Nourished
Encourage my parents to feed me at the breast or by bottle, whichever way works for us both. Also, let my parents know that donor milk may be an option for me.

6- The Right to Personhood
Address me by my name when possible, communicate with me before touching me, and if I or one of my siblings pass away while in the NICU, continue referring to us as multiples (twin/triplets/quads, and more). It is important to acknowledge our lives.

7- The Right to Confident and Competent Care Giving
The NICU may be a traumatic place for my parents. Ensure that they receive tender loving care, information, education, and as many resources as possible to help educate them about my unique needs, development, diagnoses, and more.

8- The Right to Family-Centered Care
Help me feel that I am a part of my own family. Teach my parents, grandparents, and siblings how to read my cues, how to care for me, and how to meet my needs. Encourage them to participate in or perform my daily care activities, such as bathing and diaper changes.

9- The Right to Healthy and Supported Parents
My parents may be experiencing a range of new and challenging emotions. Be patient, listen to them, and lend your support. Share information with my parents about resources such as peer-to-peer support programs, support groups, and counseling, which can help reduce PMAD, PPD, PTSD, anxiety and depression, and more.

10- The Right to Inclusion and Belonging
Celebrate my family's diversity and mine; including our religion, race, and culture. Ensure that my parents, grandparents, and siblings feel accepted and welcomed in the NICU, and respected and valued in all forms of engagement and communication.

Presented by:

NPN
NICU PARENT NETWORK

NICU Parent Network

Visit nicuparentnetwork.org to identify national, state, and local NICU family support programs.

*** The information provided on the NICU Baby's Bill of Rights does not, and is not intended to, constitute legal or medical advice. Always consult with your NICU care team for all matters concerning the care of your baby.**

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SAUL'S LIGHT

Children's Hospital New Orleans
LCMC Health

4TH ANNUAL

NICU HEALTH & EQUITY SUMMIT

SEPT. 19, 2024
8 AM



Dr. Aunchalee Palmquist



Dr. Julie Gallois



Rep. Jason Hughes



Dr. Mark Kline

Scan to register

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Wings and Waves of Achievement

An Autumn Carnival for All!

Pepperdine University - Alumni Park

Sunday, October 20th | 11:30 AM to 2:30 PM

This free event is made possible by your participation in our

$100 From 100 CAMPAIGN

CLICK HERE to BE ONE OF OUR 100!

Contribute today to ignite positive change for underserved children supported by our SEA Program.

EVENT HIGHLIGHTS

For Children:

- Petting Zoo
- Inflatables
- Carnival Games
- Art Station
- Face Painting

Community Involvement:

- Special Guest: Senator Ben Allen
- Vendor Tables **Details Here!**
- Community Organization Tables **Details Here!**

More to Enjoy!

- Food Trucks: Scooter's Sweet Shack, D'Amore's Pizza, and Others!
- Art Installation by Acclaimed Malibu Artist Ann Krasner
- Live Musical Entertainment Showcasing Noted Jazz Artist Les Sabler/ Performance by Malibu Middle and High School Musicians
- Cornhole Tournament
- 50/50 Raffle
- Online Silent Auction

PCH Safety/Driving Safety and Education:

Office of Traffic Safety (OTS)
California Highway Patrol (CHP)
Lost Hills/Malibu Sheriff's Station
California Department of Transportation (CalTrans)

and more!

THE EVENT WILL CULMINATE IN A SPECTACULAR BUTTERFLY RELEASE!

Event Sponsorship Opportunities: CLICK HERE!

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