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Fragile Infant Forums for Implementation of IFCDC Standards Key Cornerstone of the IFCDC Standards – Environments Conducive to Developmental, Family-Centered Care

Robert D. White, MD

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Developmental and family-centered care in the NICU are deeply interdependent, beneficial practices that enhance the success of all other aspects of caregiving. Optimal outcomes for the newborn require that both aspects receive our full attention. This article will explore how the environment of intensive care can be enhanced to support these optimal outcomes.

The optimal NICU environment for the development of high-risk infant

Opinions regarding the optimal care environment for high-risk newborns have changed drastically over the relatively short history of NICU care. These opinions have often been based on assumptions rather than evidence; even today, convincing evidence is rare. Conducting properly controlled trials of large numbers of patients is difficult for many reasons, so most evidence is suggestive at best. Even so, several principles are emerging from both evidence and experience:

- Interaction with parents is important, especially for the most immature infants (1,2).
- Sensory deprivation is a misguided overreaction to the sensory overload typical of the early days of NICU care. For example, we have taken the pendulum from very noisy NICUs where infants were frequently exposed to unpleasant or painful interventions with little regard to their sleep state to now often proscribing any interaction during sleep, including parental rocking, singing, or conversation. We have known for many years that infants learn during sleep (3) and that many of these practices, such as rocking and soft music, support sleep, yet many NICUs caution families and caregivers against their use once the infant falls asleep.
- What we do not know on this topic is still far greater than what we do. For example, we do not have good information on the ideal sensory input to offer at specific stages of development or during specific stages of recovery from a stressful incident; for the most part, we are still relying on our best guesses.

"The 2-day conference allowed participants to engage in dialog about how systems impact interventions at the bedside for the emphasis of this forum--feeding practices."

With these principles in mind, we can still make some basic statements regarding the sensory environment of care for high-risk newborns with structural implications. These statements are presented in greater detail with appropriate references in the Recommended Standards for NICU Design (4).

- Visual - there is little evidence that visual stimuli are important for infant development until near term. At that point, they seem most attentive to faces, so apart from encouragement for families and caregivers to actively engage infants as they become more attentive, there is no convincing evidence to suggest that other visual stimuli are beneficial.
- Non-visual optic stimuli – the eyes receive circadian and visual information. Infants receive circadian information from their mother's hormones and activity while *in utero*; after birth, they continue to receive circadian information from their mother via circadian variation in hormone and nutrient

levels (5.6), but light becomes the primary stimulus for circadian information. The non-visual circadian pathway is intact by at least the beginning of the third trimester, and there is good evidence that cycled lighting benefits infants from this point on (7). There is no evidence to suggest that presenting this circadian stimulus prior to the beginning of the third trimester is harmful to infants, so the general environment of care should provide modest indirect lighting (200-600 lux at the baby's eyes) during the day (except for infants who are under specific protocols such as IVH prevention or post-dilation for ROP exams), with dim light (<100 lux) at night.

- Auditory – noxious auditory stimuli should be avoided whenever possible. Audio equipment alarms at the bedside are the predominant source of noxious stimuli but, in most cases, can be converted to visual or remote (e.g., to a personal communication device for the caregiver). Other sources of noxious stimuli include cleaning equipment, loudspeakers, loud conversation, and moving equipment across hard flooring; all of these can be mitigated with good design, which should also include extensive use of sound-absorbent surfaces.
- **Of equal importance to removing noxious stimuli is the provision of nurturing stimuli**. The auditory cortex is in a rapid stage of development in the third trimester, and the normal fetal environment includes auditory stimuli, especially the mother's voice, which term infants can recognize immediately after birth, indicating exposure and learning *in utero* (8). Human voice and music are the predominant nurturing stimuli that should be available to the developing brain, ideally presented not as disembodied stimuli but in concert with multisensory support, including touch (e.g., holding skin-to-skin) and kinesthetic (e.g., gentle rocking).
- Touch, movement, taste, and smell – these stimuli, while important, do not have specific requirements within the physical environment; that is, they should be provided regardless of the NICU setting as long as sufficient bedside space exists for a parent rocking chair and care is taken not to introduce noxious odors into the baby's microenvironment (incubator).

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The optimal NICU environment for family-centered care

As a first principle, optimal family-centered care requires the removal of all barriers to family participation. Some barriers originate outside the NICU, such as lack of parental leave or child care, transportation challenges, and hospital visitation policies. However, many subtle and unwritten barriers exist within the NICU, starting with a failure to make families fully aware of their importance to their baby's health. While this paper does not fully explore these barriers, their importance must not be overlooked if optimal outcomes are desired.

First impressions

For many parents, having a baby admitted to the NICU is the first major crisis of their adult life. Especially if the baby is transferred from a community hospital to a medical center they may have never entered before, those first hours of communication, wayfinding, and introduction to a frightening new world are often the source of extreme anxiety and fear – but even if the birth hospital is also the location of the NICU, most parents are unprepared for this experience. There are many aspects to consider, but since this article is focused only on the environment of care, those structural aspects of importance include the following:

- Clear signage allows families to easily find their way to the NICU from wherever their baby was born.
- A welcoming, non-intimidating entrance to the NICU should be a warm, attractive space free of intimidating signs and broken equipment and staffed by an individual whose job description specifically includes welcoming and assisting families.
- A pathway to the baby's room should contain warm, encouraging messaging, both implicit and explicit, rather than grim reminders that one is about to enter a critical care space.

"While care of the infant is necessarily the first priority in the patient care space, families should not be a second thought; their importance to the care of the baby should be considered at every step. For example, the headwall design for equipment placement must consider not only the needs of the staff but should also facilitate easy transfer of the infant from the bed surface to the parent's arms,"

The patient care space

While care of the infant is necessarily the first priority in the patient care space, families should not be a second thought; their importance to the care of the baby should be considered at every step. For example, the headwall design for equipment placement must consider not only the needs of the staff but should also facilitate easy transfer of the infant from the bed surface to the parent's arms, even when the child requires considerable support. Unless this space is planned to include the family as an integral part of the care team, there will inevitably be inconveniences that will, at times, reduce the likelihood that the infant will benefit fully from this care. **The mindset should be that of a bedroom with high-tech capabilities rather than of a critical care room with family space as an add-on.** This philosophy will be evident to parents for years after the design process is complete since struc-

tural decisions convey numerous unspoken messages about the priorities of the hospital's caregiving team.

Family support areas

A family lounge within the NICU that supports family interaction and decompression space outside of the NICU, such as a garden area that affords some degree of privacy, are essential elements of the environment of care for families. For many parents, relationships with other families that begin in the NICU last for a lifetime and can provide support in ways NICU staff cannot, so there should be both structural and programmatic strategies to enhance these interactions. At times, though, the NICU can become a war zone for some families, so an escape space that does not require leaving the hospital grounds can be crucial to getting through difficult days.

Considerations for staff

The needs of staff within the environment of care should not be overlooked when attempting to provide the ideal environment for patients. Staff need suitable task lighting and communication systems that permit them to do their work without impinging on the protections noted above intended for infants. Equipment location and work surfaces/seating should be designed using modern ergonomic principles.

> ***"NICU leaders can learn a great deal from the hospitality industry. One would never find a cleaning cart or broken equipment in the public hallways of a hotel or even a Wal-Mart. One would never find supplies on the front counter of a nice hotel or even a Motel (6)."***

Final thoughts

NICU leaders can learn a great deal from the hospitality industry. One would never find a cleaning cart or broken equipment in the public hallways of a hotel or even a Wal-Mart. One would never find supplies on the front counter of a nice hotel or even a Motel (6). Yet in most NICUs, these are common occurrences except in the days leading up to and during a JCAHO inspection. To some degree, these are failures of good design, but far more often, they are simply decisions made by hospital staff that they would never make when welcoming visitors to their own home but do not consider the message families receive when they see these practices. Leaders who wish to provide the optimal environment of care for NICU families must use fresh eyes to evaluate every step a family takes from a referring hospital to their baby's bedside to appreciate the unspoken messages, good and bad, conveyed by the physical environment of our NICUs.

References:

1. *Fathi O, Nelin LD, Shepherd EG, Reber KM. Development of a small baby unit to improve outcomes for the extremely premature infant. J Perinatol 2022; 42:157-64.*
2. *Banerji AI, Hopper A, Kadri M, Harding B, Phillips R. Creating a small baby program: a single center's experience. J Perinatol 2022; 42: 277-280.*
3. *Sleep and infant Learning. Tarullo AR, Balsam PD, Fifer WP. Infant Child Dev 2011; 20:35-46.*
4. *Committee on Recommended Design Standards for Advanced Neonatal Care. Recommended standards for newborn ICU design, 9th edition. J Perinatol 2020; 40:Suppl 1;2-4.*
5. *White RD. Circadian Variation of Breast Milk Components and Implications for Care. Breastfeeding Medicine, 2017;12:398-400.*
6. *Caba-Flores MD, Ramos-Ligonio A, Camacho-Morales A, et all. Breast milk and the importance of chrononutrition. Front Nutr 2022; May 12;9:867507.*
7. *Morag I, Ohlsson A. Cycled light in the intensive care unit for preterm and low birth weight infants. Cochrane Database Syst Rev 2011; Jan 19;(1):CD006982.*
8. *Kisilevsky BS, Hains SMJ, Lee K, et al. Effects of experience on fetal voice recognition. Psychol Sci 2003; 14:220-4.*

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Corresponding Author

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