

Gravens By Design: Rating your NICU's Developmental Support

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Caregivers in the NICU are entrusted with babies during a crucial time in their development – much or all of the third trimester and sometimes at least a month of the second trimester. *In utero*, an exceptionally rapid and extensive level of brain organization, growth, and development is occurring – unmatched by any other period of life. We are all cognizant of this and doing our best to support it, yet it seems likely that we have not yet settled on the best way.

In the early days of neonatology, NICUs were full of noxious stimuli - they were bright and noisy, and infants were frequently disturbed to check blood gases and vital signs, information that we now obtain mostly through non-invasive means. At the same time, babies were deprived of nurturing stimuli – parental presence was limited, and direct interaction with their babies was even more so.

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More recently, we have done much better to limit the noxious stimuli and improve parental interaction with their babies. However, in reaction to our earlier days of excessive noxious stimuli, the pendulum has now swung to sensory deprivation in many NICUs for many babies. A substantial driver of this newer trend was the development of bundles to prevent IVH in ELBW babies. In this more recent era, we have reduced the incidence of IVH but may, in the process, have introduced a new danger – that of sensory deprivation and isolation for these high-risk babies. In many cases, the bundles contain elements that were never adequately evaluated on merit – keeping the head in a midline position, for example. Often, the precautions studied for 72 hours continue beyond 72 hours and are applied to groups of babies who were never in-

cluded in RCTs, such as many long-term intubated infants. These practices are not well-supported by evidence and, although well-intentioned to protect babies, probably do not adequately consider potential harm.

If we understand that proper growth of the developing brain develops with both metabolic and sensory intake, NICU best practices might be best understood through the following matrix:

Stimulus	Nurturing	Deprivation	Noxious
Sound	Words, music, especially if delivered through a human, multisensory interaction (as opposed to a tape recording)	Silence	Loud, sudden noises, such as alarms
Touch/movement	Holding, stroking, gentle ROM	“hands-off”	Painful stimuli
Taste/smell	Mother’s milk	“sterile” environment	alcohol, cleaning solutions
Visual	Circadian lighting	Constant dim lighting	Bright, direct lighting

The crucial thing to understand in this concept is that eliminating noxious stimuli is not in itself enough if the baby is left with sensory deprivation. We must avoid noxious stimuli whenever possible but simultaneously provide appropriate amounts of nurturing stimuli to optimize what the baby’s brain can utilize for growth and development. What that looks like is certainly open to discussion; there are many well-structured systems for developmental support and parental interaction. However, it may be most important to adopt a philosophy of nurturing intervention and parental interaction rather than choosing a given program.

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So, how does your NICU rate – not only for your “feeders and growers,” but even more so for your highest-risk babies – the VLBW and ELBW babies who are no longer at risk for IVH but remain at high risk for abnormal neurodevelopment, with lifelong consequences? If your “matrix” trends more toward deprivation than nurturing stimuli, it may be time to embrace a system that enhances these stimuli, especially when incorporated as part of extensive parental interaction.

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To determine where the transition from “noxious” to “normal” and from “normal” to “deprivation” occurs, it is imperative to closely examine the sensory stimuli provided to infants in the NICU environment (1, 2). Caregivers must balance minimizing harmful stimuli and ensuring adequate sensory input for optimal brain development. In the past, NICUs were fraught with noxious stimuli, including bright lights and loud noises, while simultaneously lacking nurturing stimuli due to limited parental interaction. However, modern NICU practices have evolved to reduce noxious stimuli and enhance parental involvement, albeit sometimes swinging too far towards sensory deprivation, particularly in response to concerns like IVH prevention. This shift towards deprivation may inadvertently overlook the importance of nurturing stimuli for neurodevelopment. It is essential to understand that eliminating noxious stimuli is insufficient; we must also actively provide nurturing stimuli, such as gentle touch, soothing sounds, familiar scents, and visual comfort. Striking the right balance involves constant reassessment and adaptation of NICU protocols to ensure infants receive the optimal environment for healthy growth and development. Therefore, NICU evaluation should prioritize the absence of harmful stimuli and the presence of nurturing interactions, especially for the most vulnerable infants, to mitigate long-term neurodevelopmental risks.

References:

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