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Gravens By Design: The Newborn Behavioral Observations System to Support Early Parent-Infant Relationships in the NICU

Lise C. Johnson, MD, Jessica Dym Bartlett, MSW, LICSW, PhD, J. Kevin Nugent, PhD

Parenting a child in the Neonatal Intensive Care Unit (NICU) is challenging, and transitioning from NICU to home can be daunting. The Newborn Behavioral Observations System (NBO) (1) was designed to sensitize parents and other primary caregivers to their baby's competencies, vulnerabilities, and individuality, to foster sensitive and responsive parent-infant interactions, and to contribute to the development of a positive parent-infant relationship from the very beginning. As such, the NBO may be a useful tool for various NICU professionals.

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Foundational Concepts:

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The latter half of the 20th century was marked by an explosion of research and understanding about the neurobehavioral capabilities of the human newborn. In our context, T. Berry Brazelton and colleagues published the Neonatal Behavioral Assessment Scale (NBAS) in 1973. (2) Brazelton's colleague Heidelise Als developed the Synactive Theory of Development (3) and the Assessment of the Premature Infant's Behavior (APIB), (4) and led the establishment of the Newborn Individualized Developmental Care and Assessment Program (NIDCAP), (5) which has since been adapted as a model of care in many NICUs around the world. During this era, psychological theories of development, among them Winnicott's, albeit earlier inquiry into the mother-infant relationship (6) and the work of Bowlby and Ainsworth on attachment (7,8), elevated the importance of primary caregiving relationships in early infant and child development.

The first decades of the 21st century have seen dramatic findings in the biological sciences (e.g., neuroscience, epigenetics) demonstrating down to the molecular level how the infant's experiences in the first days, months, and few years of life shape brain architecture and functioning. Over one million new neural connections form every second during a child's first years of life. This underscores the critical importance of early intervention to support safe, stable, nurturing relationships, beginning in the neonatal (or, arguably, the prenatal) period. (9)

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From Assessment to Observation:

Over the past 20 years, Kevin Nugent has led our team at the Brazelton Institute and its U.S. and international affiliates in operationalizing these foundational concepts with the NBO. The NBO moves from *assessment*, as in the NBAS or APIB, to *observation* to affirm and deepen the new parent's understanding of their baby's behavior. This understanding informs the sensitive caregiving that underpins healthy functioning for both infant and parent and all the emerging and changing relationships within the family system. In this way, the NBO is designed to support three critical transitions in the newborn period:

For the Infant: a major bio-behavioral shift from fetal to extrauterine life with accompanying rapid brain development

For the Parents: a formative stage in the transition to parenthood and a sensitive stage of both vulnerability and opportunity in the establishment of the early parent-infant relationship and family functioning

For Practitioners: a pivotal stage in the practitioner's relationship with the family: perhaps the "intervention moment par excellence."

The Contents of the NBO

The NBO consists of a series of 18 neurobehavioral items (Figure 1), which include observations of the infant's capacity to habituate to external light and sound stimuli (sleep protection), the quality of motor tone and activity level; the capacity for self-regulation (including crying and consolability); response to stress (indices of the infant's threshold for stimulation); and the infant's visual, auditory, and social-interactive capacities (degree of alertness and response to both human and non-human stimuli). Observations are made merely as a "moment in time" in terms of the strengths, vulnerabilities, and individuality that the newborn displays, and yet they provide parents with a framework to enable them to observe and respond to their child's behavioral communication in an ongoing way. The stance of the NBO is one of curiosity, and parents are

encouraged to share their observations and reflections throughout the encounter. The NBO seeks to "level the playing field" between professional and parent, asserting that, while the professional is an expert on babies *in general*, the parent is the expert on *their* baby from the very beginning. The NBO provides opportunities for confirming (or, at times, gently reframing) parental observations and tailoring anticipatory guidance. Listening closely to parents' meaning-making during shared provider-parent observation can also provide an entrée to exploring important attitudes, thoughts, and feelings accompanying the transition to parenthood. In the context of the NICU, the NBO also enables parents to process-related challenges, such as the loss of the birth experience they had hoped for, periods of separation from their baby with whom they are forging a new bond, and the emotional distress of the baby's medical challenges. (10)

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The Infant AMOR

Over the first few months of life, newborns confront a series of challenges in self-regulation as they attempt to adapt to their new extrauterine world, both the world of objects and people. Echoing Als' Synactive Theory of Development, (3) the central conceptual framework of the NBO is given the acronym Infant "AMOR," which describes four self-regulatory systems within which all observations of newborn behavior can be categorized and interpreted:

Autonomic System: breathing, heart rate, temperature regulation, skin perfusion, gastrointestinal function, presence or absence of tremors, startles, hiccups, sneezes, yawns

Motor System: Central and peripheral tone, quality and quantity of movements, self-regulatory motor strategies, reflexes including root, suck, grasp

Organization of State System: quality and quantity of sleep and alert states and transitions among states, sleep protection, crying and consoling

Responsiveness System: the growing awareness of the environment and capacity to respond to social and inanimate stimuli, both visual and auditory

Organizing the infant's responses during NBO activities into the four AMOR systems reveals a profile for that moment, describing how the baby uniquely functions on a continuum from premature to mature regulation within each system. The baby's behaviors are their "voice," communicating to caregivers their strengths, challenges, intentions, and individuality to guide caregiving. The following is a brief example of the infant AMOR, as it might be observed during an NBO.

A brief example of Infant AMOR:

The two-day-old 37-week newborn turns readily to the mother's voice when swaddled and in an otherwise quiet and dimly lit room but squirms and flails turns red, hiccups, and becomes fussy when arms and legs escape the swaddle and are unsupported or with prolonged efforts at social engagement. In this example, we see all four Infant AMOR systems expressed:

Autonomic: turning red and hiccupping with overstimulation

Motor: swaddling contains uncontrolled movement of arms and legs, while loss of motor support or prolonged stimulation results in squirming and flailing

Organization of State: alertness is supported with swaddling and limited external noise and light; fussiness signals that the threshold for stimulation has been reached

Responsiveness: even in the first days, with support, the newborn can engage in social exchange, such as turning to the mother's voice

"Even healthy parent-child dyads are out of synchrony 70% of the time, and thus, the process of mismatch and repair is foundational to the development of secure attachment, self-regulation, and positive development over the life course. (12) The parent's observations, emotions, and reactions during an NBO provide an opportunity to consider what strengths and challenges they are bringing to the caregiving relationship and, consequently, what support might be helpful."

The Parent AMOR:

While infant-focused, the NBO also attends to the role of the parent within the encounter. To paraphrase Winnicott's words, "There is no such thing as an infant. There is an infant and a mother." (11) Early brain development occurs only in the context of the caregiving relationship and is shaped by the countless moments of match, mismatch, and repair between the child and his/her primary caregivers. Even healthy parent-child dyads are out of synchrony 70% of the time, and thus, the process of mismatch and repair is foundational to the development of secure attachment, self-regulation, and positive development over the life course. (12) The parent's observations, emotions, and reactions during an NBO provide an opportunity to consider what strengths and challenges *they* are bringing to the caregiving relationship and, consequently, what support might be helpful. Parents in the NICU may require particular support given the increased caregiving needs of the sick or preterm neonate and the stress of the parental NICU experience. A conceptual framework for considering the qualities necessary for early parenting may help provide individualized support. While different than the infant's developmental tasks, these parental qualities that will influence every interaction between parent and baby may be described as the "Parent AMOR." (13) This framework consists of:

Affect (Emotional) Regulation: The ability to regulate one's emotional state to be open and available for interaction and

emotional engagement with the newborn

Mentalization: The ability to be curious about the infant's experience and to wonder about the infant's intentions and responses, to attempt to see the world from the infant's perspective

Openness to the Real Baby: The ability to set aside fears as well as idealized fantasies about who the infant may or may not be and to be open to the actual person that the baby is

Responsiveness: The ability to read the baby's cues and respond in such a way that infant AMOR regulation and healthy back-and-forth interaction are promoted

Of course, our professional roles and the intensity and length of our relationship with families will impact our ability to reflect meaningfully on the various aspects of the Parent AMOR. Nevertheless, awareness of this framework brings helpful insight as we support families. While we bring this framework to the NBO, it can also be applied to many encounters, as shown below.

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A brief example of Parent AMOR:

The father of a 3-week-old ex-33-weeker who is advancing on oral feeds arrives for a NICU visit to bottle-feed his partner's expressed breast milk. He hangs up from an intense work call with his boss and then spends another minute texting on his phone. He then takes a deep breath, silences his phone, and tucks it into his pocket before heading to the sink to wash his hands. By the time the nurse hands the baby to him, he seems calm, seeking out his son's face and quietly greeting him (Affect Regulation). He chuckles and compliments how comfortable the baby looks when his nurse has swaddled him and worries that he will be able to do as good a job at home (Mentalizing the baby's experience). The baby can only finish a partial feeding before becoming too sleepy to continue. Rather than persisting, the father gently removes the bottle, rubs his back to encourage a burp, and reassures his son, "That's OK, sport. You're still learning, aren't you?" (Openness to the real baby and Responsiveness)

Practitioner AMOR:

During an NBO, the practitioner makes many decisions about what to do and what to say, each dictated by both the infant's and the parent's responses, moment by moment, to the activities of the NBO. Our flexibility and nonjudgment signal to both infant and parent that we are ready to meet them where they are, respond to their needs and provide the safety upon which relational trust is built. As we navigate the encounter, we must engage in a process parallel to that of the parent to meet our role's responsibilities. Given that we are in many ways "parenting the parent" as we offer support, the Practitioner AMOR framework (13) mirrors that of the Parent AMOR:

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Affect (Emotional) Regulation: The ability to regulate one's emotional state to be open and available to engagement with the newborn and with the family

Mentalization: The ability to be curious about the infant's experience and the parent's experience and to wonder about the infant's and the parent's intentions and responses, to attempt to see the world from their perspectives

Openness to the Real Baby and the Real Parents: The ability to see each infant and each parent as unique individuals within a unique family and community system, striving to become aware of cultural biases (knowing we can never fully succeed here!), to avoid stereotyping, and to approach every parent with respect and the assumption they want to be the best parent possible.

Responsiveness: The ability to read both baby and parent cues and to respond in such a way that the confidence and competence of the parent is supported and trust between parent and practitioner is built.

All of the qualities within the Practitioner AMOR can be found even in the briefest of encounters:

A brief example of Practitioner AMOR:

On discharge day for a one-week-old 36-weeker, the nurse practitioner (NP) weaves an NBO into her bedside visit, combining her physical examination with NBO activities. She has just walked out of another patient's upsetting family meeting and uses the routine of hand sanitizing to turn her focus to the next encounter mindfully. (Affect (emotional) regulation). The new parents of the 36 weeker appear excited, yet nervous. Sensing their anxiety (mentalization), the N.P. notes the baby's strong muscle tone and ability to hold up his head in the pull-to-sit maneuver and free his face when placed prone. The father then proudly shares how he has noticed the same neck strength when the baby is skin-to-skin with him, "He's stronger than I thought he'd be!" The N.P. endorses and

underscores the father's words by simply rephrasing them, "Yes, he's stronger than you thought he'd be." (Openness). The baby cries intermittently during the encounter, calming each time with a soothing voice, swaddling, and rocking. Noticing the mother's distress when the baby cries, the N.P. intentionally hands the baby back to his mother to hold as the encounter wraps up, reuniting and visibly calming both mother and baby (Responsiveness). She tailors her anticipatory guidance to include a conversation about coping with crying.

The tasks of the Practitioner AMOR retain relevance beyond the NBO and can be applied to many clinical situations with patients and parents. For providers in the NICU, where stress is ubiquitous, the Practitioner AMOR concepts can support meaningful relationships with families that help mitigate compassion fatigue, burnout, and turnover.

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Evidence for the Use of the NBO to Support Early Relationships:

There is a growing body of evidence demonstrating the value of the NBO in supporting early parenting, with studies targeting a variety of outcomes, including parental knowledge, confidence, anxiety, and depression; quality of parent-infant interaction; and provider knowledge and confidence. Many studies have found that using the NBO is associated with mothers' greater understanding of their babies' behavior and communication capacities (14) (15) (16). In contrast, others have shown salutary associations with maternal mental health, including reduced postpartum depression symptoms (17,18) and reduced anxiety. (19,20) Nugent et al. found that NBO was associated with enhanced mother-infant engagement in low-risk dyads at four months on the Care Index. (17) In a study of mothers at high risk for postpartum mental health disorders, Nicolson et al. found the NBO to be associated with enhanced sensitivity and nonintrusiveness on the Emotional Availability Scales at four months. (20)

Although longer-term follow-up studies are needed to assess developmental effects better, the NBO may provide meaningful developmental support. Using the Bayley Scales Infant Development-III and the Battelle Developmental Inventory-2 at six months corrected gestational age in their randomized controlled study of the NBO in Early Intervention (E.I.) services, McManus and colleagues found the use of the NBO to be associated with greater gains in cognitive and adaptive functioning at 6-months compared to usual E.I. care. McManus also found that using the NBO in E.I. services was associated with increased confidence among parents and higher perceived confidence among service providers working with at-risk infants. (21)

Research has also examined the effects on practitioners of learning and using the NBO. Two studies have found that practitioners who trained and implemented the NBO in their daily practice demonstrated more confidence in working with high-risk newborns and a higher understanding of infant competence. (14,22)

Using the NBO in the NICU Setting:

The NBO can be flexibly used in inpatient and outpatient settings. In NICUs, it can be adapted for physicians, nurses, advanced practice providers, and allied health professionals, including physical, occupational, and speech-language therapists, lactation consultants, and social workers. The NBO will look slightly different in the hands of each practitioner, and any one encounter will include only the subset of NBO items relevant to the baby's state, the parent's needs, and the goals of the moment. Indeed, at its heart, the NBO is as much the "how" of the clinical encounter as it is the "what."

NBO Training:

Practitioners wishing to learn the NBO should have ongoing access to newborns in their professional capacities and feel comfortable handling young infants. Training is provided by certified faculty from the Brazelton Institute at Boston Children's Hospital and affiliates. Group training workshops are delivered in person or remotely over two full days or three partial days. Workshops are followed by two mentoring meetings over the ensuing four months. Trainees practice the NBO and then submit documentation for NBOs conducted with five families to achieve certification. More information can be found at https://www.childrenshospital.org/research/centers/brazelton-institute-research or by contacting the Brazelton Institute at institute@chldrens.harvard.edu.

Resources for families about understanding baby behavior can be found at the Brazelton Centre U.K. website: https://www.brazelton.co.uk/. An introductory video titled "What is the NBO" has been produced by NBO Australia and can be found on YouTube: https://www.youtube.com/watch?v=hPUnq0HB2FY.

"Ending where we began, parenting a child in the NICU is challenging, and transitioning from NICU to home can be daunting. The NBO is a clinical tool that can be used flexibly by various practitioners to mitigate this stress, supporting the early parent-infant relationship in service of the baby's developmental needs, parental well-being, and the health of the family system. "

Conclusions:

Ending where we began, parenting a child in the NICU is challenging, and transitioning from NICU to home can be daunting. The NBO is a clinical tool that can be used flexibly by various practitioners to mitigate this stress, supporting the early parent-infant relationship in service of the baby's developmental needs, parental well-being, and the health of the family system. The NBO also promotes positive family-practitioner relationships, adding to

the satisfaction and meaning that sustains our professional lives.

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Disclosures: *Drs Johnson and Nugent are authors of the Understanding Newborn Behavior and Early Relationships: The Newborn Behavioral Observations (NBO) System Handbook. They receive royalties on public sales of the book. They do not receive royalties on sales of the book that are associated with NBO Training tuition.*

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Corresponding Author

Lise C. Johnson, MD
Director, The Brazelton Institute
Division of Developmental Medicine
Boston Children's Hospital
Newborn Hospitalist
Department of Pediatric Newborn Medicine
Brigham and Women's Hospital
Assistant Professor of Pediatrics
Harvard Medical School
617 448 4026
Email: Lise.Johnson@childrens.harvard.edu

Corresponding Author

Jessica Dym Bartlett, MSW, LICSW
President and Co-Founder, Thriving Together
Newton, MA

J. Kevin Nugent, PhD
Founder and Director of the Brazelton Institute
Division of Developmental Medicine
Children's Hospital, Boston.
Professor Emeritus
University of Massachusetts at Amherst
Lecturer in Psychology
Harvard Medical School