

STRESS IN THE NICU: RECOGNIZING AND REDUCING NEONATAL STRESS

IMPACT OF STRESS IN THE NICU

The neonatal intensive care unit (NICU) is an inherently stressful environment for fragile, preterm infants.¹ Neonatal stress has both acute and long-term negative effects and the consequences of repeated stress can be cumulative or additive over time.¹

Stress may be associated with neurodevelopmental changes, including sensitization to stimuli and cognitive defects.^{1,2} It is possible to reduce or minimize the stress experienced by NICU patients, thereby mitigating the deleterious effects and improving clinical outcomes.³⁻⁵ Various methods have been developed to recognize and measure neonatal stress, which enable clinicians to monitor stress levels and intervene when necessary.

SOURCES OF STRESS IN THE NICU

Respiratory Stress

- Preterm infants have immature lungs. In infants born before 32–34 weeks, insufficient surfactant leads to increased effort with every inhalation.⁶
- The difficulty of breathing results in fatigue and hypoxia in preterm neonates.⁶
- Respiratory stress leads to higher oxygen demand and calorie consumption which may affect a child's growth, development, and healing.⁷

Nutritional Stress

- Preterm infants have immature gastrointestinal (GI) tracts, characterized by immature motility, digestion, absorption, and circulatory regulation, and impaired GI host defenses.⁸
- The act of feeding can be stressful for neonates because of handling and feeding tubes.¹
- Appropriate nutrition is essential for neonates; malnutrition is linked to cognitive impairment and learning disabilities.⁹
- Improving nutrition promotes growth and improves neurodevelopmental outcomes.^{10,11}

Infection

- Preterm infants have immature immune systems, immature skin, and limited protective flora in the gut, predisposing them to infections.¹²
- Immunologic host defenses are impaired in preterm infants.⁸
- The skin of preterm infants is easily damaged and noninvasive procedures, such as removal of adhesives, can damage their skin.¹²
- Numerous invasive procedures put infants at risk of infection, such as catheter-related bloodstream infections and ventilator-associated pneumonia.¹²
- Infections increase the time neonates remain in the NICU.¹²



Sensory Stress

- Sensory stress comprises procedural and environmental stressors.
- Preterm infants have a lower threshold for pain than older infants.²
- Neonates experience 16 painful procedures (e.g. heel lance, adhesive removal)¹³ and more than 200 manipulations per day.¹
- The NICU is noisy¹⁴ and bright, making sleep difficult.¹⁵
- Sensory stress has short-term effects on heart rate, respiratory rate, and oxygen saturation.¹
- Sensory stress has long-term effects, affecting neural and cognitive development.¹⁶

“The assessment and management of stress would seem to be an important further step in the optimising of preterm infant development.”¹¹

MEASURING STRESS: THE NEONATAL INFANT STRESSOR SCALE

The Neonatal Infant Stressor Scale (NISS)¹ was developed to provide a structured, cumulative measure of stress. The use of such a scale might limit the variability inherent in individual clinician assessment of stress. The NISS is designed for assessment of neonates born at <28 weeks.

- The NISS consists of a list of acute and chronic interventions, in descending order of severity, which clinicians can mark as completed over a 24-hour period (in two-hour increments). [See NISS scale in Newnham, et al. *Early Human Development*. 2009;85:554.]
- This scale can help clinicians track the number and severity of daily interventions experienced by the infant and modify care accordingly.

Proposed NISS Implementation¹

1. Set a target NISS score for each two-hour period and manage care around that goal (e.g., delay care until a time period with fewer interventions, i.e., a lower NISS score).
2. Examine the relationship between NICU stress, as measured by NISS score, and outcomes. Determine the contribution that stress makes to infant developmental outcomes.
3. Use the NISS in conjunction with standard observations of pain. This combination may help to protect the infant from further stressors.

REDUCING STRESS

- Parental interventions, such as skin-to-skin contact, have been demonstrated to improve outcomes.³
- Changing the NICU environment to reduce sensory stress by reducing noise and light can improve outcomes.⁵
- Coordinated/clustered care to minimize disturbance of sleep and reduce the number of manipulations experienced within a certain time period can improve outcomes.⁴
- Respiratory stress may be reduced by using noninvasive ventilation options with leak compensation.¹⁷
- Using a stress scale such as the NISS can assist in the management of stress by increasing clinician awareness and subsequently altering care to maintain a daily score below a target level.¹

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