Pain Management in Newborns

Richard W. Hall, MD[a], Kanwaljeet J. S. Anand, MBBS, D.Phil., FRCPCH[b,*]

KEYWORDS

• Analgesia • Sedation • Pain • Stress • NICU • Infant-newborn

KEY POINTS

- Neonatal pain should be assessed routinely every 4-6 hours or if clinically indicated using context-specific, validated, and objective pain assessment methods.
- Nonpharmacologic and environmental measures are effective for nonspecific distress or acute procedural pain, or can be used as adjunctive therapies for severe ongoing pain.
- Moderate or severe pain requires local/topical anesthetic agents, acetaminophen, NSAIDs, morphine, fentanyl, ketamine, or dexmedetomidine, singly or in combination to avoid side effects or tolerance/withdrawal.
- Evidence-based guidelines for pain management in the Neonatal Intensive Care Unit can be implemented and modified collaboratively using a Quality Improvement approach that is outlined.

INTRODUCTION

Historical Perspective

Routine assessment and management of neonatal pain has evolved to become an important therapeutic goal in the twenty-first century. During the twentieth century, however, most procedures and clinical practices established in neonatal intensive care units (NICUs) uniformly denied or disregarded the occurrence of neonatal pain. One unfortunate consequence was that infant surgery was conducted routinely with minimal or no anesthesia until the late 1980s.[1,2] Robust responses to painful stimuli were often dismissed as physiologic or behavioral reflexes and not related to the conscious experience of pain.[3] A recent historical analysis suggests that 4 related

Disclosure: None.
The authors would like to acknowledge the NIGMS IDeA Program award P30 GM110702 (R.W. Hall), the European Economic Commission – FP7 Programme, and the Oxnard Foundation (K.J.S. Anand) for research funding during the preparation of this article.
[a] Department of Pediatrics/Neonatology, University of Arkansas Hospital, 4305 West Markham Street, Little Rock, AR 72205, USA; [b] Department of Pediatrics/Critical Care Medicine, Le Bonheur Children's Hospital, University of Tennessee Health Science Center, 50 North Dunlap Street, Room 352R, Memphis, TN 38103, USA
* Corresponding author.
E-mail address: kanand@uthsc.edu

Clin Perinatol 41 (2014) 895–924
http://dx.doi.org/10.1016/j.clp.2014.08.010 **perinatology.theclinics.com**
0095-5108/14/$ – see front matter

causes contributed to a widely prevalent denial of infant pain[4]: (1) a Darwinian view that held newborns as less evolved human beings; (2) extreme caution and skepticism in interpreting scientific data that suggested infant pain; (3) a reductionistic approach whereby mechanistic behaviorism became the dominant model human psychology in the earlier half of the twentieth century (following J. B. Watson's[5] Behaviorist Manifesto in 1913); and as the behaviorist movement waned, it was followed by (4) an era placing undue emphasis on the structural development of the brain and its responses.[6–8]

This popular precept was challenged by accumulating data on hormonal-metabolic responses to surgical procedures performed under minimal anesthesia,[9,10] which were effectively reduced by giving potent anesthesia,[11–13] the identification of a pain system and initial data on its early development, as well as detailed observations on crying activity and other behaviors of newborns subjected to painful stimuli in the NICU—all of which contributed to a scientific rationale for neonatal pain perception and its clinical implications.[3] Once the existence of neonatal pain was acknowledged and methods for clinical assessment had been validated,[14,15] the stage was set for advances in neonatal pain management.

Importance of Neonatal Pain

The American Academy of Pediatrics (AAP) and the Canadian Pediatric Society (CPS) updated their guidelines in 2006,[16] recommending that each health care facility treating newborns should establish a neonatal pain control program that includes

- Performing routine assessments to detect neonatal pain
- Reducing the number of painful procedures
- Preventing or treating acute pain from bedside invasive procedures
- Anticipating and treating postoperative pain after surgical procedures
- Avoiding prolonged or repetitive pain/stress during NICU care

Numerous clinical studies have demonstrated that failure to treat pain leads to short-term complications and long-term physiologic, behavioral, and cognitive sequelae, including altered pain processing, attention-deficit disorder, impaired visual-perceptual ability or visual-motor integration,[17–19] and impaired executive functions.[20,21] Conversely, other studies showed needless analgesic therapy prolongs the need for mechanical ventilation, delays feeding, or leads to other sequelae, including impaired brain growth, poor socialization skills, and impaired performance in short-term memory tasks.[17,18] About 460,000 neonates in the United States require care in NICUs each year and are exposed to acute pain from invasive procedures or prolonged pain from surgery or inflammation.[22–24] Assessing neonatal pain is difficult to teach, time and labor intensive, often open to subjective interpretation, and a source of conflict in NICU care.[25–27]

PAIN ASSESSMENT

Current practice requires the nursing staff to make a global pain assessment of neonates or apply validated pain scoring methods before taking appropriate actions to ameliorate newborn pain or discomfort.[24,28,29] The current nursing workload in the NICU does not allow bedside nurses to assess neonatal pain accurately. Many pain scales lump together behavioral, physiologic, and other variables; but these variables may not respond to neonatal pain in similar or specific ways. The interrater reliability and subjectivity of human assessments are further limiting factors in their prevalent use.[27,30–32]