JOGNN PRINCIPLES & PRACTICE

The Fifth Vital Sign: Implementation of the Neonatal Infant Pain Scale

Ana-Maria Gallo

Several psychometric tools are available to assess pain in the neonate. Although clinically tested, most of these tools have not been integrated into the assessment of the well newborn. Information is lacking regarding the implementation of such tools and their effects in clinical practice. The Neonatal Infant Pain Scale provides a measure of the intensity of an infant's response to pain. This article describes a hospital's implementation of the Neonatal Infant Pain Scale, including the education provided to nurses and utilization of the tool in the assessment of well newborns. *JOGNN, 32,* 199–206; 2003. DOI: 10.1177/0884217503251745

Keywords: Assessing neonatal pain—Infant behavioral cues—Infant pain—Neonatal Infant Pain Scale

Accepted: May 2002

Integrating comfort measures in daily patient care is inherent in the compassionate, caring profession of nursing, especially in the neonatal setting. Published guidelines and position statements have highlighted the importance of comfort measures and pain relief (Jorgensen, 1999; National Association of Neonatal Nurses, 1995). Recently, however, pain assessment and its management has become a focus of care across the United States. Current mandates in state law (e.g., California) and by regulatory agencies (Joint Commission on Accreditation of Healthcare Organizations, 2001; Legislative Counsel State of California, 2000) require health care professionals to assess pain each time they record a patient's vital signs. Although pain assessment and management have been essential and integral to the care of adults, they often have been inadequately provided to newborns (Anand & International Evidence-Based Group, 2001). Until recently, neonatal pain was assessed and managed only occasionally. In those instances where infant pain was addressed, documentation often was absent or inadequately recorded.

The absence of pain assessment may be due to a limited understanding of neonatal pain and to the difficulties of implementing assessments and interventions for this population. As a result, procedures often are completed without assessment of pain, pain-relieving interventions, or documentation of the comfort measures provided to the newborn (Anand & International Evidence-Based Group, 2001). Routine procedures, such as a heel stick for blood glucose testing, intravenous line placement, circumcision, or intramuscular injections, are performed on newborns. Each procedure causes some degree of pain. Nurses comfort newborns and also encourage their mothers to assist in comforting them. Nurses provide little if any documentation, however, of the newborn's pain level and the interventions used to address it. Such lack of documentation was identified as a consistent problem at a large tertiary women's hospital in southern California. An educational program was introduced to address the mandated requirements of pain assessment in the neonate (Joint Commission on Accreditation of Healthcare Organizations, 2001; Legislative Counsel State of California, 2000) and the adequate documentation of nurses' current interventions. The purpose of this article is to describe the implementation of the Neonatal Infant Pain Scale (NIPS) in well newborns.

Background

Pain in the Neonate

The concept of neonatal pain has been a recent focus in health care. Historically, it was thought that newborns were incapable of experiencing pain (National Association of Neonatal Nurses, 1995; Stevens, Johnston, & Grunau, 1995). Misinformation was based on the perception that infants lack pain transmission mechanisms. The following reasons were the basis for this misperception: the incomplete myelinization and immaturity of the infant's nervous system, the infant's inability to exhibit discernible responses to painful procedures, the infant's inability to remember pain, and the fear of addiction associated with the use of pain medication (National Association of Neonatal Nurses, 1995; Stevens et al., 1995). Recently, through research, these beliefs have been dispelled. Studies have shown that infants are capable of experiencing pain and that they respond to noxious stimuli. Healthy full-term infants display vigorous gross movement and withdrawal from the painful stimuli (Stevens et al., 1995). Physiological and behavioral responses have been seen in the neonate in response to noxious stimuli (Stevens et al., 1995). Recently, evidence-based guidelines for the management of neonatal pain have been introduced as a result of collaboration among experts from several different countries (Anand & International Evidence-Based Group, 2001).

Although pain is multifactorial, behavioral cues offer one component in assessing neonatal pain.

Although pain is multifactorial, an awareness of behavioral cues is one component of neonatal pain assessment. Behavioral responses include facial expression, body movement, and crying (Johnston & Stevens, 1990; Jorgensen, 1999; "Pain in Newborns," 2000; Stevens & Johnston, 1993; Stevens et al., 1995). Pain in newborns is often unidentified because of their inability to communicate, or is unappreciated or misunderstood (Buchholz, Karl, Pomietto, & Lynn, 1998; Franck, 1998; Jorgensen, 1999). Nevertheless, the communication of infant pain is identified through the recognition of these behavioral cues.

In addition to such behavioral indicators, neonates exhibit a wide range of physiological responses to painful stimuli as a result of the activation of the sympathetic nervous system (Stevens et al., 1995). Precise, objective, quantifiable information concerning the neonate's responses to noxious stimuli can be identified through these physiological responses (Stevens et al., 1995). Changes in physiological indicators include increased heart rate, respiration, blood pressure, and oxygen saturation (Johnston & Stevens, 1990; Jorgensen, 1999; "Pain in Newborns," 2000). Other physiological responses include palmar sweating and increased intracranial pressure and cortisol levels (Stevens et al., 1995).

Although physiological indicators can aid in the evaluation of pain, nurses must recognize that, on their own, such signs are not always accurate indicators of pain (Keeble & Twaddle, 1995). Stimuli such as hunger, fatigue, and anger may elicit similar changes not necessarily associated with pain (Fuller & Neu, 2000; Stevens & Johnston, 1993). Through an appreciation of these physiologic parameters and behavioral responses, health care professionals have the ability to assess pain in the neonate.

Assessment Tools for Neonatal Pain

Several pain assessment tools are based on the knowledge that infants exhibit physiological and behavioral responses to noxious stimuli. Two criteria were vital for the selection of an appropriate tool by the southern California facility. First, the assessment tool needed to incorporate nurses' existing newborn assessment skills, and second, the tool had to be easy to use. Although an in-depth review of all existing infant pain scales is beyond the scope of this article, a brief discussion will focus on four assessment tools reviewed.

A CINAHL (Cumulative Index to Nursing and Allied Health Literature) search was conducted to explore newborn pain assessment instruments reported in the literature. The tools most frequently cited were the Premature Infant Pain Profile (PIPP) (Stevens, Johnston, & Petryshen, 1996), CRIES: Neonatal Postoperative Pain Assessment Score (CRIES) (Krechel & Bildner, 1995), Neonatal Facial Coding System (NFCS) (Grunau & Craig, 1987, 1990), and the Neonatal Infant Pain Scale (NIPS) (Lawrence et al., 1993). Literature related to all the instruments described the development and testing of the tools. None of the articles described the tools' application in clinical practice.

The first instrument reviewed was the PIPP (Stevens et al., 1996). The PIPP is a behavioral and physiological assessment tool, which provides a measure of the premature infant's response to pain. Scoring indicators include gestational age, behavioral states (i.e., active, awake, asleep, quiet), heart rate, oxygen saturation, brow bulge, eyes squeeze, and nasolabial furrow. The PIPP is the only tool that accounts for the infant's gestational age, thus allowing the distinction between behavioral differences among full-term and preterm infants. The PIPP requires additional equipment and assessment parameters not

often used in the well newborn population (i.e., blood pressure readings and oxygen saturation). Because the tool did not meet the facility's criteria for the well newborn population, it was not chosen.

The second instrument reviewed was the CRIES (Krechel & Bildner, 1995). The CRIES is used to assess infants' postoperative pain and has a 10-point scale that measures several physiological and behavioral indicators. The indicators include oxygen saturation, vital signs, facial grimacing, cry, infant's states (awake or asleep), and the infant's ease of consolability. The instrument was found to be reliable, with an interrater reliability of 0.72. Although the CRIES met the criterion of ease of application, its primary purpose is to assess postoperative pain, and thus it was not appropriate to a well newborn population.

The third instrument reviewed was the NFCS (Grunau & Craig, 1987, 1990). The NFCS uses the newborn's facial actions/expression to assess levels of pain. It was determined that implementation of this tool would be difficult because of its subjectivity. The reliability of the NFCS when used by the bedside nurse was of concern. This tool was eliminated because of the inherent difficulties in its accurate implementation.

On the basis of the literature review and the consideration of multiple tools, it was determined that the NIPS (Lawrence et al., 1993) would suit the hospital's needs for assessing pain in well newborns.

The NIPS (Lawrence et al., 1993) was developed at Children's Hospital of Eastern Ontario. The NIPS assesses six behavioral indicators in response to painful procedures in preterm newborns (gestational age < 37 weeks) and full-term newborns (gestational age > 37 weeks to 6 weeks after delivery). This nonintrusive assessment includes facial expression, cry, breathing patterns, motor activity (arms and legs), and state of arousal. The calculated score measures the infants' response to pain and allows the nurse to intervene accordingly. Scoring ranges from 0 to 1 in each category, with the exception of cry, which ranges from 0 to 2. A total score can range from 0 to 7. During the clinical trials and testing of the tool with an invasive procedure, newborns displayed a score of 1 before the procedure, a 5 during the procedure, and a 2 after the procedure.

Extensive testing of the NIPS in clinical settings has demonstrated high interrater reliability (Pearson correlations ranging from .92 to .97) and internal consistency (Cronbach's alphas of .95, .87, and .88). In addition, construct and concurrent validity (Pearson correlations ranging from .53 to .84) were established (Lawrence et al., 1993). Transition from the development of the instrument to widespread clinical implementation has not been noted in the literature.

The advantage of using the NIPS to assess the newborn was that it did not require additional assessment skills or equipment. The labor and delivery nurses in the unit already possessed the skills required and were able to assess the six behavioral indicators addressed by the NIPS.

By adding a skill in using a pain assessment scale, nurses increased the comprehensiveness of newborn care.

The Neonatal Infant Pain Scale in Clinical Practice

Introduction to a Clinical Setting

The NIPS was implemented for newborn pain assessment in the southern California hospital. This large freestanding women's facility has approximately 7,000 deliveries per year. The hospital consists of 22 labor, delivery, and recovery suites; 72 postpartum beds; 18 antepartum beds; and 26 beds for women's acute care. In addition, the hospital has a 61-bed Level III neonatal intensive care unit and 8 surgical operating suites.

The NIPS was introduced throughout the hospital, with the exception of the neonatal intensive-care unit. Although use of the NIPS tool was taught to all nurses who cared for well newborns, this article focuses on the implementation process with the labor and delivery staff, which included 125 labor and delivery nurses responsible for newborn care.

Parameters of the Infant Pain Scale

The NIPS was created and tested for use with preterm and full-term neonates. The tool was to be used in the well newborn, defined as an infant born with a gestational age of 34 weeks or greater and asymptomatic for medical complications. Newborns within these parameters would be assessed using the NIPS tool. Assessment begins shortly after delivery and continues through the average hospital stay of 2 to 3 days. To comply with the current mandates of both state law and regulatory agencies (Joint Commission on Accreditation of Healthcare Organizations, 2001; Legislative Counsel State of California, 2000), pain assessments are completed during each infant assessment in which a full set of vital signs are recorded. In addition, pain assessments are required each time a painful procedure is performed on an infant. A pain assessment score must be obtained before and after each such procedure. To facilitate the nurse's understanding of the assessment and scoring process, a pain assessment algorithm was created (see Figure 1). Documentation of the scores and any applicable intervention is recorded in the medical record after each pain assessment.

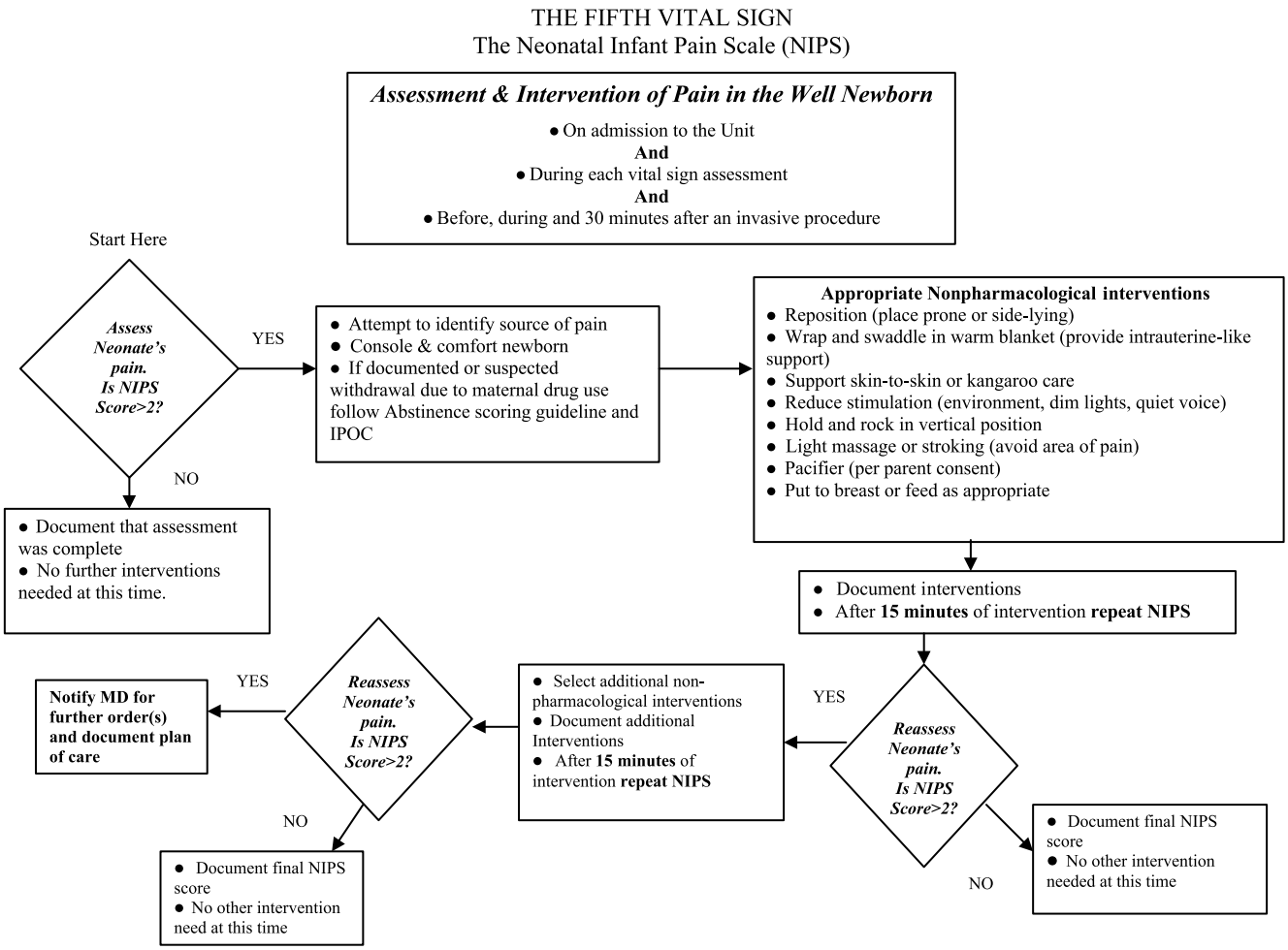

FIGURE 1
Pain Assessment Algorithm.

The hospital's electronic medical record facilitates the ease of documenting the assessment (see Figure 2). A table was created to include each of the behaviors, and the computer program calculates the score at the completion of the assessment. For ease of immediate documentation, a computerized pick-list was developed that included all nonpharmacologic interventions.

Implementation of Assessment Using the NIPS

To implement assessment using the NIPS, the nursing staff received education regarding the tool. The education included the physiological aspects of newborns' pain, assessment of pain in the infant, nonpharmacologic interventions, and documentation. The education program was accomplished in three phases. In the initial phase, the advanced clinicians received the education. The subsequent phase involved educating the staff nurses. The final phase focused on assuring the nursing staff's adherence with the hospital's assessment and documentation program using the NIPS.

Initial Phase: Educating the Advanced Clinicians

It was important to have a core group of nurses who would serve as resource persons for the rest of the nursing staff. At this institution, a creative nursing role of advanced clinician had been developed. Advanced clinicians are staff nurses who, in addition to their clinical bedside duties, are responsible for mentoring and educating their colleagues. During the initial phase of implementation, the advanced clinicians were educated in the use of the NIPS.

A 30-minute presentation created specifically for this project focused on the myths and facts about infant pain, physiological aspects of infant pain, the NIPS tool, and documentation of nonpharmacologic interventions. In addition, a videotaped presentation on the NIPS was created. The video depicted three newborns at different states during the first 24 hours after delivery. The purpose of the video was to test the nurses' accuracy in assessing infant pain. The nurses' confidence in their assessment skills increased when they consistently scored the new-

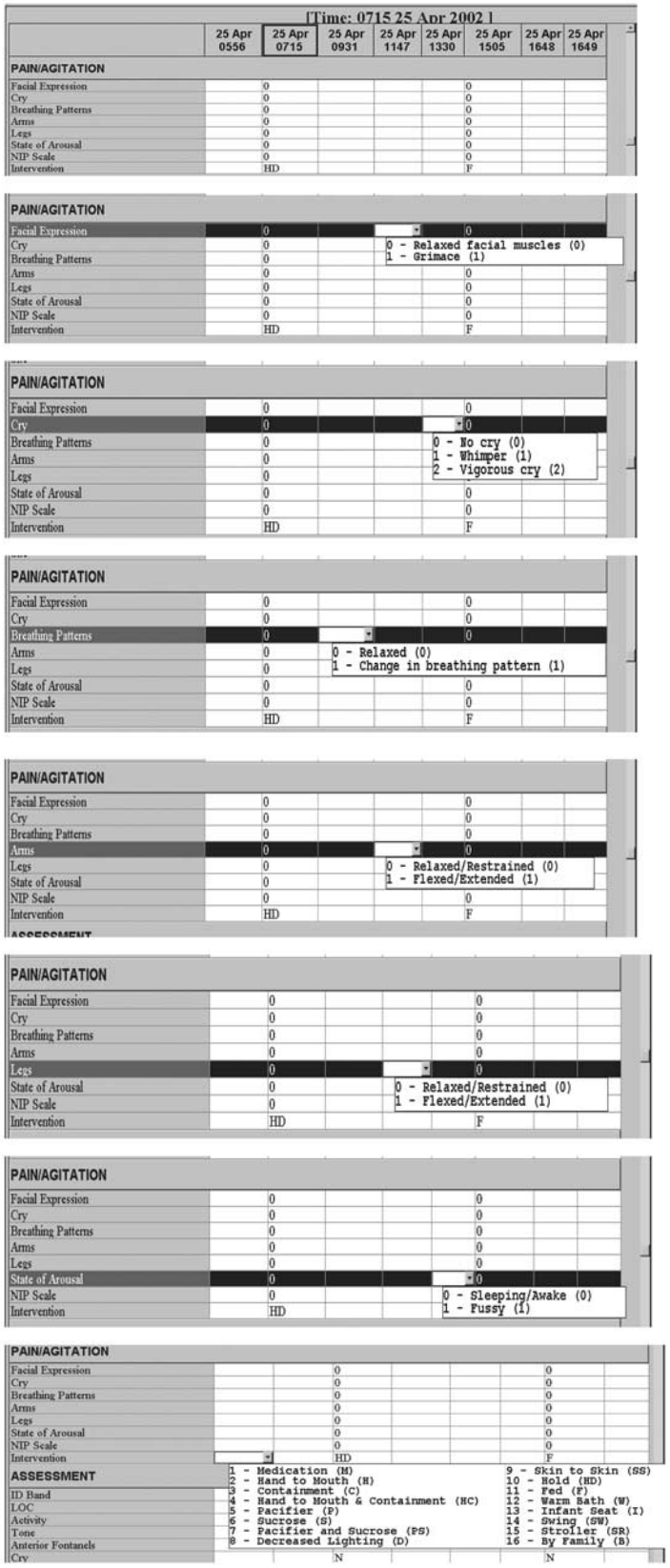

FIGURE 2
Electronic Medical Record Documentation.

Reprinted with permission of Sharp Mary Birch Hospital for Women, San Diego, CA.

borns correctly. Once instruction on the NIPS was completed, education efforts focused on interventions for pain and the documentation of pain management.

The nurses were already providing comfort measures to the newborns. As caring professionals, nurses were applying many nonpharmacologic interventions as part of their daily care. A newborn crying from a recent heel stick would be promptly picked up by the nurse and swaddled or taken to the mother. It is recommended that nonpharmacologic measures or simple comfort measures be used for minor procedures before progressing to pharmacologic agents (National Association of Neonatal Nurses, 1995; "Pain in Newborns," 2000; Vessey & Carlson, 1996). With this in mind, nonpharmacologic comfort measures were reintroduced, with an emphasis on documenting their use. Nonpharmacologic interventions included repositioning, wrapping and swaddling the newborn in a warm blanket, skin-to-skin or kangaroo care, holding and rocking the infant in a vertical position, light massage or stroking, use of a pacifier (as the parent permits), and breast- or bottle-feeding, as appropriate.

Proficiency in pain assessment is the foundation for pain management programs for well newborns.

Subsequent Phase: Educating the Clinical Staff

While the core group of nurses honed their skills, the staff nurses were made aware of the implementation project through staff meetings, department newsletters, and other forums. Extensive staff education occurred during the second phase of implementation, over a 30-day period. Education was provided by the advanced clinicians through in-service programs, bedside teaching, and viewing of the NIPS video recording. Competency validation followed the education, which consisted of the nurse correctly demonstrating the NIPS to an advanced clinician or lead nurses when assessing three different infants. Apprehension on the part of the nurses decreased with the realization of their effectiveness in assessing the well newborn and the ease of using the NIPS. Such ease in the use of the tool came from the nurses' confidence in their newborn assessment skills.

The major challenge for the nurses was differentiating whether an elevated score was a result of normal newborn communication (i.e., hunger or a soiled diaper) or a result of pain. Unless the infant had recently undergone an invasive procedure, the nurse was to first address the infant's basic care needs. According to Fuller's (1998, 1999) principle of consolability, the nurse must determine whether the infant is in distress and then act accordingly. If uncertain, the nurse should intervene, using one or more comfort measures before moving to more complicated measures. The belief is that if the infant responds to comfort measures, the distress was not due to pain. Because minimal comfort measures will not provide a lasting calm for infants who are experiencing pain, further interventions are promoted (Fuller, 1998; Fuller, Neu, & Smith, 1999). Interventions and their effectiveness were documented accordingly.

Final Phase: Assuring Adherence

During the final phase of the project, the staff nurses' adherence to assessment with the NIPS was audited through review of medical records. A chart audit tool was created for this evaluation (see Figure 3). The audit consisted of reviewing the chart for the assessment and its documentation, in which the NIPS score was recorded during routine assessment of vital signs and at the completion of a painful procedure. An evaluation of the documentation of nursing interventions also was included in the audit.

Sixty days after the original educational session, an informal review was conducted. Results indicated that nurses' use of the NIPS was minimal at first (27%), especially when assessing pain after a procedure and documenting interventions. The advanced clinicians continued to serve as resources and re-educated the staff for several weeks. A formal chart audit 1 year after implementation revealed improved adherence. The nurses' assessment of pain when assessing routine vital signs indicated a 65% adherence rate. The documentation of a pain score after a procedure and of nursing interventions showed 60% and 55% rates, respectively. Although not at 100%, the results showed that most nurses were aware of the need for pain assessment and were beginning to incorporate it in their daily newborn assessment. To comply with the mandates in state law and by regulatory agencies, 100% adherence will be required; thus, education by the advanced clinicians has resumed to improve adherence.

Nursing Implications

It is often challenging to implement new ideas into clinical practice. Frequently, change is the result of a new or revised policy and procedure, technological improvements, or mandated regulations. In this instance, implementing the use of an infant pain scale provided an opportunity to review different assessment tools. Efforts were made to choose a tool that focused on the nurses' existing assessment skills and would be easy to use. The NIPS was chosen for these reasons. Adding the use of a pain assessment scale to the nurses' existing newborn assessment skills increased the comprehensiveness of new-

Neonatal Infant Pain Scale Chart Audit Tool

Demographics
Infants MR #_____ Gestational age:_____

Type of delivery: Vaginal Birth Cesarean Section
Low Forceps Vacuum Assist

Routine Vitals
Was the NIPS performed during each vital sign? Yes No

Procedure
Was a procedure performed? Yes No

What procedure was performed?
Intramuscular injection Heel stick
Venipuncture Circumcision
Other

Criteria			**NIPS Score**
Was the NIPS performed prior to procedure?	Yes	No	
Was the NIPS performed 15 minutes after procedure was completed?	Yes	No	

Nonpharmacological Nursing Interventions

Reposition	Reduce stimulation
Wrap and swaddle in a warm blanket	Hold and rock in vertical position
Light massage (avoid area of pain)	Pacifier
Breastfeed or bottle-feed as appropriate	Support skin to skin or Kangaroo Care

RN performing audit_____ Date_____

FIGURE 3
Chart Audit Tool.

born care. When an accurate pain assessment was completed, appropriate pain management interventions could follow. Pain management interventions focused on the compassionate comfort measures, which were already being provided.

Pharmacologic interventions require an interdisciplinary approach and often cause increased levels of stress for both physicians and nurses. This was one of the reasons that the program placed an emphasis on education regarding assessment skills and nonpharmacologic interventions before introducing any pharmacologic measures. Once proficiency in use of the NIPS was demonstrated and use of nonpharmacologic comfort measures documented, a pharmacologic intervention program could begin.

Conclusion

Accurate assessment is essential for managing infant pain. Tools have been developed specifically for the purpose of facilitating assessment, which results in appropriate interventions. Although many assessment tools have been developed, most have limited application in clinical practice. The Neonatal Infant Pain Scale was introduced to provide comprehensive newborn care in the clinical setting. Several educational methods led to successful implementation of use of the NIPS and to its ease of application in clinical practice. Accuracy in identifying and assessing pain in the newborn sets the stage for the development of a pain management regimen to include pharmacologic interventions if they are needed.

REFERENCES

Anand, K. J. S., & International Evidence-Based Group. (2001). Consensus statement for the prevention and management of pain in the newborn. *Archives of Pediatrics and Adolescent Medicine*, *155*(2), 173-180.

Buchholz, M., Karl, H., Pomietto, M., & Lynn, A. (1998). Pain scores in infants: A modified infant pain scale versus visual analogue. *Journal of Pain and Symptom Management*, *15*(2), 117-124.

Franck, L. (1998). The ethical imperative to treat pain in infants: Are we doing the best we can? *Neonatal Intensive Care*, *11*(5), 28-34.

Fuller, B. (1998). The process of infant pain assessment. *Applied Nursing Research*, *11*(2), 62-68.

Fuller, B. (1999). Testing a model of the nursing assessment of infant pain. *Clinical Nursing Research*, *8*(1), 69-84.

Fuller, B., & Neu, M. (2000). Validity and reliability of a practice-based infant pain assessment instrument. *Clinical Nursing Research*, *9*(2), 124-143.

Fuller, B., Neu, M., & Smith, M. (1999). The influence of background clinical data on infant pain assessments. *Clinical Nursing Research*, *8*(2), 179-188.

Grunau, R., & Craig, K. (1987). Pain expression in neonates: Facial action and cry. *Pain*, *28*, 395-410.

Grunau, R., & Craig, K. (1990). Facial activity as a measure of neonatal pain expression. In D. Tyler & E. Krane (Eds.), *Advances in pain, research, and therapy* (Vol. 15, pp. 147-156). New York: Raven.

Johnston, C., & Stevens, B. (1990). Pain assessment in newborns. *Journal of Perinatal and Neonatal Nursing*, *4*(1), 41-52.

Joint Commission on Accreditation of Healthcare Organizations. (2001). *Pain management standards effective January 1, 2001* [Online]. Retrieved from www.jcaho.org

Jorgensen, K. (1999). Pain assessment and management in the newborn infant. *Journal of Perianesthesia Nursing*, *14*(6), 349-356.

Keeble, S., & Twaddle, R. (1995). Assessing neonatal pain. *Nursing Standard*, *10*(1), 16-18.

Krechel, S., & Bildner, J. (1995). CRIES: A new neonatal postoperative pain measurement score. Initial testing of validity and reliability. *Pediatric Anaesthesia*, *5*, 53-61.

Lawrence, J. Alcock, D., McGrath, P., Kay, J., MacMurray, B., & Dulberg, C. (1993). The development of a tool to assess neonatal pain. *Neonatal Network*, *12*, 59-66.

Legislative Counsel State of California. (2000). *Healing arts: Pain management, Health and Safety Code Section 1254.7* (1999-2000 ed., Vol. 2001). Sacramento: Author.

National Association of Neonatal Nurses. (1995). Pain management in infants [Position statement]. *Neonatal Network*, *14*(5), 54-55.

Pain in newborns. (2000, May). *Brown University Child & Adolescent Behavior Letter*, *16*(5), 3.

Stevens, B., & Johnston, C. (1993). Pain in the infant: Theoretical and conceptual issues. *Maternal-Child Nursing Journal*, *21*(1), 3-13.

Stevens, B., Johnston, C., & Grunau, R. (1995). Issues of assessment of pain and discomfort in neonates. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, *24*, 849-855.

Stevens, B., Johnston, C., & Petryshen, P. (1996). Premature infant pain profile: Development and initial validation. *Clinical Journal of Pain*, *12*, 13-22.

Vessey, J., & Carlson, K. (1996). Nonpharmacological interventions to use with children in pain. *Comprehensive Pediatric Nursing*, *19*, 169-182.

Ana-Maria Gallo, MSN, CNS, RNC, is a perinatal clinical nurse specialist at Sharp Mary Birch Hospital for Women, San Diego, CA.

Address for correspondence: Ana-Maria Gallo, Sharp Mary Birch Hospital for Women, 3003 Health Center Drive, San Diego, CA 92123. E-mail: ana-maria.gallo@sharp.com.