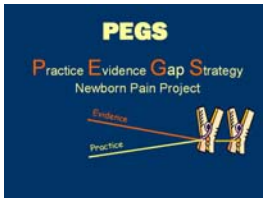
Best Practice
Clinical Guideline

Assessment and Management of Neonatal Pain

September 2007



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Scope and Purpose

The Royal Australian College of Physicians Guidelines for Newborn Pain recommends that clinical units providing health care to neonates should develop written guidelines and protocols for the management of neonatal pain [1]. This document had been produced to assist clinicians in individual clinical units in developing written guidelines for their unit and to enable them to benchmark any existing guidelines on this topic. The document has been developed according to the AGREE domains [2] and a search of the current best available evidence.

Forward

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage, this experience occurs from an early age and pain is defined as an 'inherent quality of life that appears early in development and serves as a signal for tissue damage [3].

Newborn infants may experience pain as a result of undergoing a single or repeated procedure for diagnostic or therapeutic and/or surgical reasons. This is true for neonates of all gestational ages in all hospital settings [4]. Additionally, mechanically ventilated neonates are subjected to multiple invasive and procedural interventions that maybe particularly painful. Sedation alone does not alleviate pain [5]

Key strategies for neonatal pain

- Consideration of the least painful method of undertaking specific procedures is important [6].
- Provide information to parents about strategies they can use to assist their infant in coping with pain, stress and discomfort in the intensive care, special care nursery, post-natal wards and other areas of the hospital where they are cared for [7].
- Provide information to the parents which emphasises that breastfeeding or oral sucrose is effective for short duration procedures and the administration maybe repeated for subsequent procedures [8, 9].
- Comfort measures such as positioning, swaddling, a quiet environment, containment, pacifiers and a familiar odour reduce the effects of extraneous stimuli and are effective strategies for pain management [4, 11, 12].
- Painful or stressful procedures should be minimised and when appropriate, coordinated with other aspects of the neonate's care. Special consideration is required for infants less than 30 weeks gestation as they may not tolerate clustered cares following a stressful intervention [14, 15].
- A sweet tasting solution, such as a breastfeed or sucrose is given prior to painful procedures [10, 6].
- The use of opioid for infants with ongoing pain or post-operative pain is recommended[4] and pain assessments should be undertaken regularly.

Breastfeeds or sucrose for procedural pain

Neonatal responses to short duration, single event procedures indicate that they experience considerable pain and this is often under treated.

Breastfeeds
If the mother is present and breastfeeding is possible, place the infant on the breast to suck for two minutes prior to and if possible during a painful procedure such as a heel lance [13, 16, 17].

Sucrose
When breastfeeding is not possible, oral sucrose has been found to be effective for repeated painful procedures during an infant's hospitalisation in term and preterm neonates [8, 9].

- Small amounts of sweet solutions placed onto the neonate's tongue have been shown to mediate an increase in endogenous opioid release, reduce procedural pain and minimise crying following the procedure [18].
- The oral administration of sucrose is a safe and effective form of analgesia for short duration procedures[12] and may be given for repeated procedures [8, 9].

- It is recommended that sucrose be ordered on the medication chart or as a standing order. This may be as a nurse-initiated medication. Document each dose with a precautionary maximum dose for each 24 hours.
- The recommended sucrose concentration is a 24% solution. Sucrose is available either commercially or can be produced by the hospital pharmacy at this concentration.
- The long term effects of sucrose use for short duration procedures are unknown [27], therefore sucrose should be used with caution for neonates hospitalised for a prolonged period of time, in particular neonates of less than 32 weeks gestation [17].
- Infants of methadone addicted mothers have altered endogenous opiate systems and the analgesic effects of oral sucrose may not be as effective [4]. For these neonates consider alternate strategies such as swaddling, reducing environmental stimuli or other pharmacological interventions.
- The small dose of sucrose or breastmilk is absorbed via the buccal wall, it is not absorbed via the gastro-intestinal tract. Therefore there is no known risk for infant's of diabetic mothers, hyperglycaemic neonates or dental caries (no teeth present)[18].

Recommended sucrose dose and administration

- The effect of sucrose on pain is mediated via its gustatory effect (taste), and therefore doses are given onto the tongue (buccal). No benefit has been demonstrated when administered via a gastric tube [12]

Gestational age	*Sucrose Concentration*	*Volume per dose*
Term and preterm	24%	0.05 to 0.5ml

Reference: Stevens et al 2004

- Two minutes prior to the painful procedure administer a small amount of the dose onto the neonate's tongue using a syringe or pacifier [18, 19].
- Repeat every two minutes for the total prescribed dose [18]. A total of less than 10 doses in a 24 hour period were subsequently found to have a lesser risk of poor developmental outcomes in one small study [20].

Pain assessment

- Pain assessments should be carried out by health professionals at least once per shift for all neonates following surgery, those receiving mechanical ventilation and those in intensive or special care nurseries who are subjected to painful procedures [5].
- A baseline assessment using a pain assessment score is useful when comparing trends in assessment scores for neonates in the NICU or SCN.
- To ensure consistency in interpretation of pain assessment and scores both nurses (and or doctors) should each assess and score the neonate at handover from one shift to the next.

- A lack of behavioural responses (including crying and movement) does not necessarily indicate a lack of pain [4]. Infants at risk of neurological impairment also respond to painful stimuli [10].

- Useful indicators of persistent pain in ventilated preterm infants include facial expression, high activity levels, poor response to routine care and poor ventilator synchrony [21].

- Use a pain assessment score to determine the infant's level of discomfort immediately following each potentially painful procedure and to evaluate the efficacy of behavioural, environmental, and pharmacological agents. Repeat observations at least every four hours.

- All neonates who undergo a surgical procedure should have their pain scores measured every four hours for at least 48 hours or until narcotics have been ceased for 48 hours [22, 23]

Analgesia

- Continuous infusions of opioid are used for postoperative or post-procedural pain, and for the treatment of painful medical conditions[4].

- When continuous infusions of morphine are used, the addition of extra morphine is ineffective for the management pain in additional procedures[24]

- Use infusions for administering synthetic opioid such as Fentanyl as bolus doses can cause glottic and chest wall rigidity and are not recommended [22]

- For the duration that the neonate requires treatment for pain, use a validated assessment tool to assess pain in a consistent way and document the assessment [25, 26, 27, 28]

- Opioid infusions are used at the lowest effective dose and minimum duration based on clinical assessment [6]. Neonates aged 7 days or younger may require lower doses of morphine in the post-operative period than neonates who are over a week of age [29]

- When opioid or other sedating medications are administered for a prolonged period, physical dependence and tolerance may develop. This means that higher opioid or sedative doses are required in order to maintain patient comfort [22].

- Opioid infusions administered for greater than 4 days should be weaned over a period of days at the rate of 10% of the prescribed dose per day based on the clinical assessment of the neonate [22]. Close observation is required as withdrawal symptoms may appear after 3 days of weaning [23].

- Opioid antagonists must be used with caution in neonates who have received opioid for greater than 4 days as the antagonist may precipitate acute opioid withdrawal [30, 31].

- Regional anaesthesia techniques (such as epidural) can be used to provide anaesthesia and analgesia for procedures on the trunk or limbs as an adjunct to general anaesthesia and for postoperative analgesia [4].

Key performance indicators

- ☐ Invasive painful procedures are performed only when necessary
- ☐ The use of behavioural modifications and comfort measures* are implemented prior to all painful procedures
- ☐ A sweet tasting solution (breastfeed or sucrose) is used as analgesia before all heel lances and venipuncture for hospitalised neonates
- ☐ Pain assessment scores are recorded at least once per shift for all ventilated neonates

* Comfort measures include repositioning, containment, swaddling, diminishing environmental noise and lighting.

Development of the document

This guideline was developed by the Practice Evidence Gap Strategy (PEGS) Project team with consultation and opportunity for input from the clinicians and consumers of the neonatal units and postnatal wards in the 23 tertiary hospitals in Australia.

This guideline was developed using the evidence provided by the Royal Australasian College of Physicians (Paediatric Division) guideline statement[1] and additional resources covering pain assessment scoring, narcotic withdrawal and family participation.

The guideline has been endorsed by:

- Australian College of Neonatal Nurses
- Australian College of Midwives Inc
- Australian and New Zealand Neonatal Network

Developed by Kaye Spence AM, David Henderson Smart OA, Karen New, Jan Whitelaw on behalf of the PEGS Newborn Pain Project. Further information maybe obtained from: Kaye Spence on kaye@chw.edu.au

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Search strategy

The search strategy to identify additional sources covering pain assessment scoring, narcotic withdrawal and family participation included searches of electronic databases for both published and unpublished studies, including but not limited to Systematic Reviews, randomised control trials, clinical trials, policy statements and clinical guidelines: CINAHL (1982 - 2007), Health Source: Nursing/Academic Edition (1968 – 2007), MEDLINE (1966 - 2007), EMBASE (1966 – 2007) and databases of systematic reviews and randomised controlled trials: The Cochrane Library Issue 2, 2007, including the Central Register of Controlled Trials (CENTRAL, DARE). Language restrictions were not applied.

In addition, searches of the electronic databases were based on the following search terms: The MeSH terms 'Infant, Newborn' OR 'Neonate*' OR 'Nurser*, Hospital' OR 'Intensive Care Units, Neonatal'
AND
The MeSH terms 'Pain' OR 'pain measurement' OR 'pain management' OR the text word 'diagnostic pain' OR 'therapeutic pain' OR 'post-operative pain' OR 'procedur* pain' OR 'pain assessment'
AND
The MeSH terms 'Guideline Statement' OR 'Analgesia' OR the text word 'Opioid' OR 'Sucrose' OR 'Glucose' OR 'Breastfeeding' OR 'Breast milk' OR 'Expressed Breast milk' OR 'EBM' OR 'Comfort Measures' OR 'Swaddling' OR 'Non-nutritive sucking' OR 'Positioning'

It is recommended that this guideline be reviewed every 3 years due to the current research that is in progress.

References

1. Paediatrics & Child Health Division, The Royal Australasian College of Physicians. Guideline Statement - Management of procedure-related pain in neonates, *Journal of Paediatrics and Child Health.* 2006, 42: S31–S39.
2. The AGREE Collaboration. Appraisal of Guidelines for Research & Evaluation (AGREE) Instrument. www.agreecollaboration.org
3. Zempsky WT, Schechter NL. What's new in the management of pain in children? *Pediatric Review.* 2003; 24 (10): 337–47.
4. Anand KJ, International Evidence-Based Group for Neonatal Pain. Consensus statement for the prevention and management of pain in the newborn. *Archives of Pediatric and Adolescent Medicine.* 2001; 155 (2):173–80.
5. Anand KJ, Aranda J, Berde C, Buckman S, Capparelli E, Carlo W, et al. Summary proceedings from the neonatal pain-control group. *Pediatrics.* 2006;117 (3):S9-S22.
6. Pritchard D. Reducing pain during blood sampling in infants. *Clinical Evidence* 2006
7. Franck LS, Allen A, Cox S, Winter I, Parents' views about infant pain in neonatal intensive care. *Clinical Journal of Pain* 21(2):133-9, 2005
8. Harrison D, Loughnan P, Manias E, Johnston L. The effectiveness of repeated doses of oral sucrose in reducing procedural pain during the course of an infant's prolonged hospitalisation. *Journal of Paediatrics & Child Health,* 2007, *43* (Supplement 1), A20.
9. Stevens B, Yamada J, Beyene J, Gibbins S, Petryshen P, Stinson J, et al. Consistent management of repeated procedural pain with sucrose in preterm neonates: Is it effective and safe for repeated use over time? *Clinical Journal of Pain.* 2005, *21*(6), 543-548.
10. Stevens B, McGrath P, Gibbins S, Beyene J, Breau L, Camfield C, Finley A, Franck L, Howlett A, Johnston C, McKeever P, O'Brien K, Ohlsson A, Yamada J. Determining behavioural and physiological responses to pain in infants at risk of neurological impairment. *Pain* 2007; 127: 94-102.
11. Johnston CC, Stevens B, Pinelli J, Gibbins S, Filion F, Jack A et al., Kangaroo care is effective in diminishing pain response in preterm neonates. *Archives of Pediatrics & Adolescent Medicine* 2003,157(11):1084-8.
12. Rattaz C, Goubet N, Bullinger A. The calming effect of a familiar odor on full-term newborns. *Developmental and Behavioral Pediatrics* 2005, 26 (2):86-92.
13. Shah PS, Aliwalas LL, Shah V. Breastfeeding or breast milk for procedural pain in neonates. *Cochrane Database of Systematic Reviews* 2006, Issue 3. Art. No.: CD004950. DOI: 10.1002/14651858. CD004950. pub 2.
14. Stevens B, Johnston C, Franck L, Petryshen P, Jack A, Foster G, The efficacy of developmentally sensitive interventions and sucrose for relieving procedural pain in very low birth weight neonates. *Nursing Research*, 1999, 48(1):35-43.
15. Holsti L, Grunau R, Oberlander T, Whitfield M. Prior pain induces heightened motor responses during clustered care in preterm infants in the NICU. *Early Human Development* 2005, 81:293-302.
16. Carbajal R, Veerapen S, Couderc S, Jugie M, Ville Y. Analgesic effect of breast feeding in term neonates: randomised controlled trial. *BMJ,* 2003, 326):13-17.

17. Johnston C, Filion F, Snider L, Majnemer A, Limperopoulos C, Walker C, Veilleux A et al. Routine sucrose analgesia during the first week of life in neonates younger than 31 weeks post conceptual age. *Pediatrics*, 2002, 110 (3): 523-528.
18. Stevens B, Yamada J, Ohlsson A. Sucrose for analgesia in newborn infants undergoing painful procedures. *Cochrane Database of Systematic Reviews* 2004, Issue 3. Art. No: CD001069. DOI: 10.1002/14651858. CD001069. pub 2.
19. Ramenghi LA, Evans DJ, Levene MI, "Sucrose analgesia": absorptive mechanism or taste perception? *Archives of Disease in Childhood Fetal & Neonatal Edition*, 1999, 80(2):F146-7.
20. Johnston C., Filion F, Snider L, Limperopoulos C, Majnemer A, Pelausa E, Cake H, Stone S, Sherrard A. How much sucrose is too much? *Pediatrics.* 2007;119;226.
21. Boyle EM, Freer Y, Wong CM, McIntosh N, Anand KJ. Assessment of persistent pain or distress and adequacy of analgesia in preterm ventilated infants. *Pain* 2006; 124: 87-91.
22. Suresh S, Anand KJ, Opioid tolerance in neonates: a state-of-the-art review. *Pediatric Anesthesia*. 2001, 11(5):511-21.
23. Franck LS, Naughton I, Winter I. Opioid and benzodiazepine withdrawal symptoms in paediatric intensive care patients. *Intensive and Critical Care Nursing* 2004; 20, 344 -351.
24. Carbajal R, Lenclen R, Jugie M, Paupe A, Barton B, Anand K. Morphine does not provide adequate analgesia for acute procedural pain among preterm infants. *Pediatrics* 2005;115(6):1494-500
25. Spence K, Gillies D, Harrison D, Johnston L, Nagy S, A reliable pain assessment tool for clinical assessment in the neonatal intensive care unit. *JOGNN - Journal of Obstetric, Gynecologic, & Neonatal Nursing* 2005, 34(1):80-6.
26. Pasero C. Pain assessment in infants and young children: premature infant pain profile. *American Journal of Nursing* 2002, 02(9):105-6.
27. van Dijk M, Peters J, van Deventer P, Tibboel D. The COMFORT behaviour scale - a tool for assessing pain and sedation in infants. *American Journal of Nursing* 2005;105(1):33-6.
28. Duhn L, Medves JM. A systematic integrative review of Infant pain assessment tools *Advances in Neonatal Care,* 2004; 4 (3):126-140
29. Bouwmeester NJ, Hop WC, van Dijk M, Anand KJ, van den Anker JN, Tibboel D, Postoperative pain in the neonate: age-related differences in morphine requirements and metabolism. *Intensive Care Medicine* 2003, 29(11):2009-15.
30. R Bellù, KA de Waal, R Zanini. Opioids for neonates receiving mechanical ventilation. *Cochrane Database of Systematic Reviews* 2005, Issue 1. Art. No.: CD004212. DOI: 10.1002/14651858.CD004212.pub2.
31. American Academy of Pediatrics. Committee on Fetus and Newborn. Committee on Drugs. Section on Anesthesiology. Section on Surgery. Canadian Paediatric Society. Fetus and Newborn Committee. Prevention and management of pain and stress in the neonate*, Pediatrics.* 2000, 105(2):454-61.

Appendix 1: Painful procedures for neonates

Painful procedures for neonates [1]

Diagnostic	Therapeutic	Surgical
Arterial puncture Heel lancing Lumbar puncture Eye examination Suprapubic bladder tap Venipuncture	Bladder catheterization Central line insertion/removal Chest tube insertion/removal Chest physiotherapy Dressing change Gavage tube insertion Intramuscular injection Laser therapy for retinopathy Mechanical ventilation Peripheral venous catheterization Postural drainage Removal of adhesive tape Suture removal Tracheal intubation/extubation Ventricular tap	Other surgical procedures, for example, peritoneal drain, venous cut-down

Appendix 2: How to use a pain assessment tool

- Familiarise yourself with the components of the assessment tool and the recommended actions from the score obtained
- Stand where you can clearly see neonate's face and all of body.
- Note the gestational age of the neonate
- Observe the neonate's behavioural state for 15 – 30 seconds
- At conclusion of the observation, gently touch neonate's limb to determine muscle tone/tension
- Complete the physiological and behavioural parameters.

During the score consider

- Physiological conditions that may influence the score. For example neonates with cyanotic heart disease would score their colour as normal unless there is a change in the intensity of the cyanosis or duskiness in response to pain.
- Medications the neonate is receiving or has recently received that may affect behaviour or physiological responses.
- Other environmental issues that may contribute to an elicited response from the neonate. For example, sudden bright lights, noise, activity around the bedspace.
- Document these potential distracters on the chart or in the notes at the time of the score.

When to do the assessment and score

- At the commencement of your shift – think of pain assessment as a vital sign and a priority in assessment.
- Prior to and at the completion of a painful intervention
- At least once per nursing shift (every 4-6 hours) and continue as long as analgesia is being used for pain relief.
- When analgesia is being weaned continue to score when the analgesia has been completed for a further 48 hours.

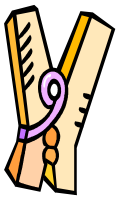
Action to be taken on the results of the pain assessment score

- Depending on the assessment tool being used and the recommended thresholds, institute comfort measures or analgesia when the score is above baseline
- Re-assess after 1-2 hours after administering analgesia or comfort measures
- If the score continues to rise then consider increasing dose of analgesia
- Re-assess after 1-2 hours
- If score constantly at 0 and analgesia maintained, consider reducing the analgesia according to the guidelines.

Ensuring the reliability of staff in using a pain assessment score

- Each clinician needs to be able to demonstrate their reliability in their assessment of a neonate's pain using a pain score
- To assess the reliability of all staff and to teach new staff the following criteria for pain assessment skill is recommended:
    - Clinicians in groups of 2 or 3 observe the neonate as described above and each clinician scores the neonate's pain separately.
    - Compare scores and see where differences occur.
    - Re-observe neonate or a different neonate until consensus is reached for each parameter of the assessment tool
    - This test and retest should occur on a regular basis for all staff

Adapted from CHW Practice Guideline 2006 and Pasero 2002



Appendix 3: Sample Newborn Pain Audit Tool

Audit Tool

This tool can be used as an audit to be undertaken in each clinical area (NICU, SCN, post natal ward). The charts of all the infants discharged over a one month period maybe part of the audit.
The results are collated and the percentage of the responses fed back to the clinical staff. Strategies to improve or sustain the assessment and management of newborn pain can be developed for each context.

1. What is the baby's main food source?
   - ❒ Breast
   - ❒ Artificial formula
   - ❒ Other - please state ……..

2 What painful procedures has baby experienced during hospitalisation?
   - ❒ Heel stab
   - ❒ Intramuscular injection
   - ❒ Venepuncture
   - ❒ Other (refer to list in Appendix 1 of this document)– please state ……..

3. Were comfort measures instituted prior to, during or after the painful procedure?
   ❒ yes ❒ no

4 Which comfort measures were used?
   - ❒ swaddling (wrapping in bunny rug/sheet/muslin wrap)
   - ❒ containment (holding/cuddling)
   - ❒ non-nutritive sucking (dummy/pacifier)
   - ❒ other …….
   - ❒ None used

5. Was breastfeeding offered as analgesia for painful procedures?
   ❒ Always ❒ Mostly ❒ No ❒ unsure

   Comments:……

Sucrose Use

6. Is sucrose available for use? ❒ yes ❒ no
7. Was sucrose administered as an analgesic? ❒ yes ❒ no
8. Does sucrose order appear on the medication chart? ❒ yes ❒ no
9 Is sucrose available as a standing order? ❒ yes ❒ no

Clinical Practice Guidelines (or Policy)
These questions need to be asked of the staff caring for the infant during the audit period.

10. Is there a clinical practice guideline available for the management of procedural pain available in your service? ❒ yes ❒ no

11. Is the clinical midwife/nurse (who was caring for the infant being audited) aware of the specific components of the guideline? ❒ yes ❒ no

12. Is the registrar (that was caring for the infant being audited) aware of the specific components of the guideline? ❒ yes ❒ no

13. Was the family (of the infant being audited) aware of the use of breastfeeding or sucrose for procedural pain? ❒ yes ❒ no

14. Did the parent/s receive a brochure informing them of the use of breastfeeding/sucrose for procedural pain? ❒ yes ❒ no

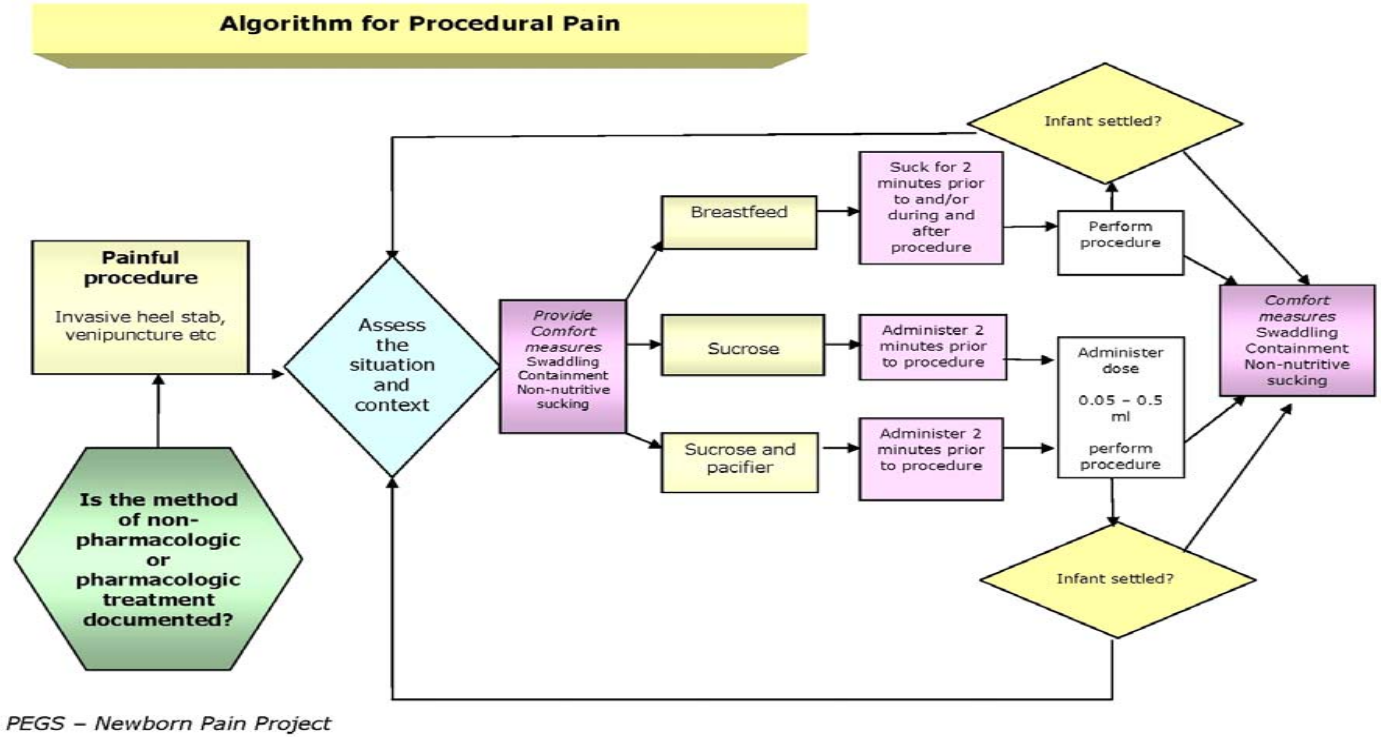
NICU – Ventilated infants

15. Was analgesia used during mechanical ventilation ❒ yes ❒ no

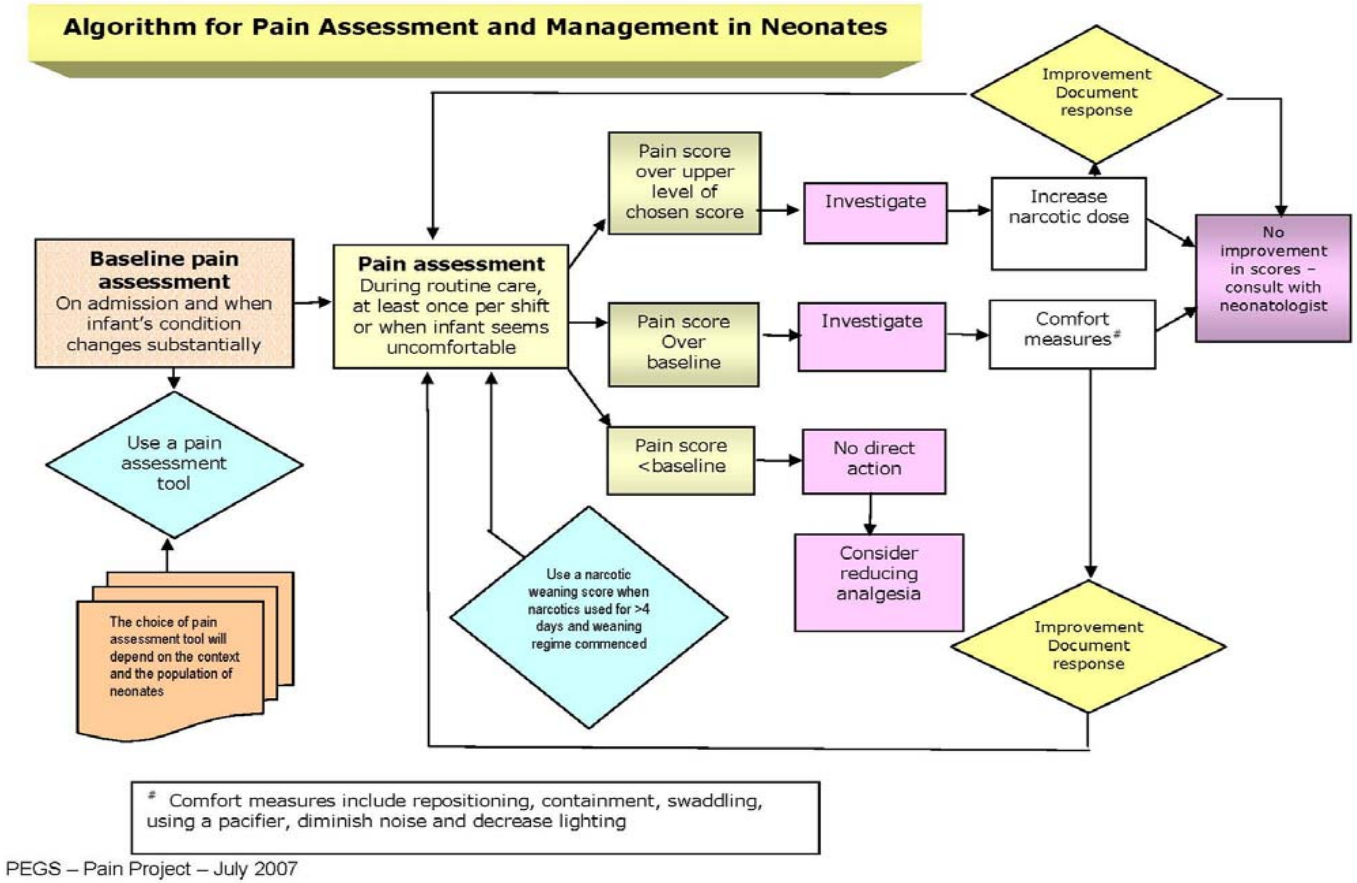
16. Was a pain assessment tool/score used ❒ yes ❒ no

17. Was the pain assessment score documented every 4 hours ❒ yes ❒ no

Appendix 4: Algorithms for procedural pain and assessment



PEGS – Newborn Pain Project



Based on Van Dijk 2002