

## Local Guideline



**Health**  
Hunter New England  
Local Health District

## Assessment and Management of pain in the Neonate

<b>Sites where Local Guideline applies</b>	Neonatal Intensive Care Unit, JHCH
<b>This Local Guideline applies to:</b>	
1. Adults	No
2. Children up to 16 years	No
3. Neonates – less than 29 days	Yes
<b>Target audience</b>	NICU Clinical staff who provide care to neonatal patients
<b>Description</b>	This guideline provides information to the clinician to assess and manage pain in the newborn

[Hyperlink to Guideline](#)

<b>Keywords</b>	Analgesia, non-pharmacological pain relief, pain, painful stimuli, PIPP score (premature infant pain profile), sucrose
<b>Document registration number</b>	JHCH_NICU_03.04
<b>Replaces existing document?</b>	Yes
<b>Registration number and dates of superseded documents</b>	Pain Assessment in the Newborn 5-5.9.3 Management of pain in the newborn 5-5.9.4
<b>Related Legislation, Australian Standard, NSW Ministry of Health Policy Directive or Guideline, National Safety and Quality Health Service Standard (NSQHSS) and/or other, HNE Health Document, Professional Guideline, Code of Practice or Ethics:</b>	
<ul style="list-style-type: none"> <li>• NSW Health Policy Directive 2014_036 Clinical Procedure Safety</li> <li>• <a href="http://www0.health.nsw.gov.au/policies/pd/2014/pdf/PD2014_036.pdf">http://www0.health.nsw.gov.au/policies/pd/2014/pdf/PD2014_036.pdf</a></li> <li>• NSW Health Policy PD 2005_406 Consent to Medical Treatment</li> <li>• <a href="http://www.health.nsw.gov.au/policies/PD/2005/pdf/PD2005_406.pdf">http://www.health.nsw.gov.au/policies/PD/2005/pdf/PD2005_406.pdf</a></li> <li>• NSW Health. Medication Handling in NSW Public Hospitals PD 2013-043</li> <li>• <a href="http://www0.health.nsw.gov.au/policies/PD/2013/PD2013_043.html">http://www0.health.nsw.gov.au/policies/PD/2013/PD2013_043.html</a></li> <li>• NSW Health Policy Directive PD 2007_036 Infection Control Policy</li> <li>• <a href="http://www.health.nsw.gov.au/policies/pd/2007/pdf/PD2007_036.pdf">http://www.health.nsw.gov.au/policies/pd/2007/pdf/PD2007_036.pdf</a></li> <li>• Australian Medicines Handbook (Access via CIAP)</li> <li>• <a href="https://amhonline.amh.net.au.acs.hcn.com.au/">https://amhonline.amh.net.au.acs.hcn.com.au/</a></li> <li>• ANZCA Guidelines on Acute Pain Management</li> <li>• High—Risk Medicines management Policy PD2015_029</li> </ul>	
<b>Prerequisites (if required)</b>	Successful completion of neonatal drug calculation form
<b>Local Guideline note</b>	This document reflects what is currently regarded as safe and appropriate practice. The guideline section does not replace the need for the application of clinical judgment in respect to each individual patient but the procedure/s <b>require mandatory compliance</b> . If staff believe that the procedure/s should not apply in a particular clinical situation they must seek advice from their unit manager/delegate and document the variance in the patient's health record.
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<b>Date authorised</b>	24/05/2016
<b>This document contains advice on therapeutics</b>	Yes Approval gained from Local Quality Use of Medicines Committee on May 2016

<b>Issue date</b>	24/05/2016
<b>Review date</b>	24/05/2019

Note: Over time links in this document may cease working. Where this occurs please source the document in the PPG Directory at: <http://ppg.hne.health.nsw.gov.au/>

**RISK STATEMENT**

<p><i>This local guideline has been developed to provide guidance to clinical staff in NICU to assist in assessment and management of pain in the newborn. It ensures that the risks of harm to the infants whilst caring for an infant being assessed and managed for pain are identified and managed.</i></p> <p><i>Any unplanned event resulting in, or with the potential for injury, damage or other loss to infants/staff/family as a result of this management must be reported through the Incident Information management System and managed in accordance with the Ministry of Health Policy Directive: Incident Management Policy PD2014_004. This would include unintended injury that results in disability, death or prolonged hospital stay.</i></p>
<p><b>Risk Category:</b> <i>Clinical Care &amp; Patient Safety</i></p>

**GLOSSARY**

<b>Acronym or Term</b>	<b>Definition</b>
IM	Intramuscular
IV	Intravenous or intravascular
MRI	Magnetic Resonance Imaging
NICU	Neonatal Intensive Care Unit
PICC	Peripherally Inserted Central (venous) Catheter
N-PASS	Neonatal Pain and Sedation Score
RETCAM	Retinal Camera used to detect Retinopathy of Prematurity (ROP)
RCT	Randomised Control Trial

**GUIDELINE**

This Guideline does not replace the need for the application of clinical judgment in respect to each individual patient.

**OUTCOMES**

1	To ensure a reliable assessment of pain in the neonate
2	The provision of treatment for pain in the neonate, either non-pharmacological or pharmacological measures

**Assessment and Management of pain in the Neonate**

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[Definition](#)

[General principles of pain in newborns and its management](#)



- A lack of behavioural responses (e.g. crying and movement) does not necessarily indicate a lack of pain.
- Neonates cannot verbalise their pain experience and so depend on others to assess and manage it.
- Pain in newborns is often unrecognised and under treated. Analgesia should be prescribed when indicated during medical care. If a procedure is painful in adults it should be considered painful in newborns, even if they are preterm.
- Compared with older age groups, newborns may experience a greater sensitivity to painful stimuli and be more susceptible to the long-term effects of painful stimulation.
- Neonates admitted to NICU may experience pain as a result of diagnostic or therapeutic interventions or as a result of a disease process.
- Health care professionals have the responsibility for assessment, prevention and management of pain in neonates.
- By assessing neonates for pain, adequate treatment can be provided. Pain assessment is the 5th vital sign
- Severity of pain and effects of analgesia can be assessed in the neonate by standardised methods with demonstrable validity, reliability and clinical utility. This NICU uses the Neonatal Pain and Sedation Score (N-PASS).
- The appropriate use of environmental, behavioural and pharmacological interventions can prevent, reduce or eliminate neonatal pain in many clinical situations.
- Appropriate non-pharmacological strategies and analgesics should be used for all infants in pain or having painful procedures.
- Adequate treatment of pain may be associated with decreased clinical complications and decreased mortality.
- Sedation alone does not provide pain relief and may mask the neonate's response to pain.

## Principles of management of pain in neonates

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Prevention	<ul style="list-style-type: none"> <li>• Consider whether each test/ intervention is necessary or can be reduced.</li> <li>• Use non-invasive monitoring where possible e.g. oximeter</li> <li>• Use central lines (umbilical) rather than peripheral lines</li> <li>• Consider central or PICC lines rather than repeated IV lines for longer term use</li> <li>• Use arterial line rather than repeated arterial stabs</li> </ul>
Environment	<ul style="list-style-type: none"> <li>• Reduce stresses from noxious stimuli for baby and family                             <ul style="list-style-type: none"> <li>○ Acoustic,</li> <li>○ Visual,</li> <li>○ Tactile</li> <li>○ Vestibular</li> </ul> </li> </ul>
Behavioural methods	<ul style="list-style-type: none"> <li>• Breast feeding</li> <li>• Sucrose</li> <li>• Non-nutritive sucking (dummy)</li> <li>• Swaddling</li> <li>• Multisensory stimulation – this may include the use of massage, speaking with a soothing /familiar voice and providing eye contact</li> </ul>

	<ul style="list-style-type: none"> <li>• Skin to skin contact</li> </ul>
Pharmacological therapy	For severe or ongoing pain <ul style="list-style-type: none"> <li>• Paracetamol</li> <li>• Morphine</li> <li>• Fentanyl</li> <li>• Anaesthetic agents</li> </ul> (RACP,2005,pS31: Jeffery,2004)

## Potentially painful procedures performed in NICU

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Studies have documented that babies born at less than 32 weeks of gestation are exposed to 10–15 painful procedures each day during the first few weeks of life, and in almost 80% no pharmacological treatment for pain relief is offered. (Murki & Subramanian, 2011)

The following table lists diagnostic, therapeutic and surgical procedures that may be required by infants in a NICU or SCN and may cause pain.

Diagnostic	Therapeutic	Surgical
Arterial puncture Heel lancing Lumbar puncture Suprapubic bladder tap Venipuncture Eye examination Cannulation	Urethral catheterisation Central line insertion/removal Chest tube insertion/removal Chest physiotherapy Gavage tube insertion Intramuscular injection Laser therapy for retinopathy Peripheral venous cannulation Mechanical ventilation Removal of adhesive tape Tracheal intubation/extubation Ventricular tap	Other surgical procedures e.g. peritoneal drain, cut-down, silo formation, suture removal

(Anand & International Evidence Based Group for Neonatal pain, 2001 p. 174; RACP, 2005)

## Infant responses to pain

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Infants can demonstrate physiological, behavioural, hormonal and autonomic changes in response to pain, as well as changing body movements (Mathew & Mathew, 2003). The table below summarises these potential changes.

Physiological changes	Behavioural changes	Hormonal changes	Autonomic changes	Body movements
Increase in: <ul style="list-style-type: none"> <li>• Heart rate</li> <li>• Blood pressure</li> <li>• Respiratory rate</li> <li>• Oxygen consumption</li> <li>• Mean airway pressure</li> <li>• Muscle tone</li> <li>• Intracranial pressure</li> </ul>	Change in facial expression: <ul style="list-style-type: none"> <li>• Grimacing</li> <li>• Screwing up of eyes</li> <li>• Nasal flaring</li> <li>• Deep nasolabial groove</li> <li>• Curving of the tongue</li> <li>• Quivering of the chin</li> </ul>	Increased release of: <ul style="list-style-type: none"> <li>• Cortisol</li> <li>• Catecholamines</li> <li>• Glucagon</li> <li>• Growth hormone</li> <li>• Renin</li> <li>• Aldosterone</li> <li>• Antidiuretic hormone</li> </ul> Decreased secretion of: <ul style="list-style-type: none"> <li>• Insulin</li> </ul>	<ul style="list-style-type: none"> <li>• Mydriasis</li> <li>• Sweating</li> <li>• Flushing</li> <li>• Pallor</li> </ul>	<ul style="list-style-type: none"> <li>• Finger clenching</li> <li>• Thrashing of limbs</li> <li>• Writhing</li> <li>• Arching of back</li> <li>• Head hanging</li> </ul>

(Mathew & Mathew, 2003)

## Pain assessment in newborns

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Assessment of pain in the newborn is more difficult because of their inability to verbalise. Indirect measurements such as, hormonal, behavioral and physiological measures are used to assess pain in the newborn. We use the N-PASS scoring system that scores pain and sedation on a continuum and suggests a response to the scores obtained to best manage the clinical situation.

## The Neonatal Pain and Sedation Score (N-PASS)

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Assessment Criterion	Sedation		Normal	Pain / Agitation	
	-2	-1	0	1	2
<b>Crying Irritability</b>	No cry with painful stimuli	Moans or cries minimally with painful stimuli	Appropriate crying Not irritable	Irritable or crying at intervals Consolable	High-pitched or silent-continuous cry Inconsolable
<b>Behavior State</b>	No arousal to any stimuli No spontaneous movement	Arouses minimally to stimuli Little spontaneous movement	Appropriate for gestational age	Restless, squirming Awakens frequently	Arching, kicking Constantly awake or Arouses minimally / no movement (not sedated)
<b>Facial Expression</b>	Mouth is lax No expression	Minimal expression with stimuli	Relaxed Appropriate	Any pain expression intermittent	Any pain expression continual
<b>Extremities Tone</b>	No grasp reflex Flaccid tone	Weak grasp reflex ↓ muscle tone	Relaxed hands and feet Normal tone	Intermittent clenched toes, fists or finger splay Body is not tense	Continual clenched toes, fists, or finger splay Body is tense
<b>Vital Signs HR, RR, BP, SaO<sub>2</sub></b>	No variability with stimuli Hypoventilation or apnoea	< 10% variability from baseline with stimuli	Within baseline or normal for gestational age	↑ 10-20% from baseline SaO <sub>2</sub> 76-85% with stimulation - quick ↑	↑ > 20% from baseline SaO <sub>2</sub> ≤ 75% with stimulation - slow ↑ Out of sync with ventilator



+ 3 if < 28 weeks gestation / corrected age  
 + 2 if 28-31 weeks gestation / corrected age  
 + 1 if 32-35 weeks gestation / corrected age

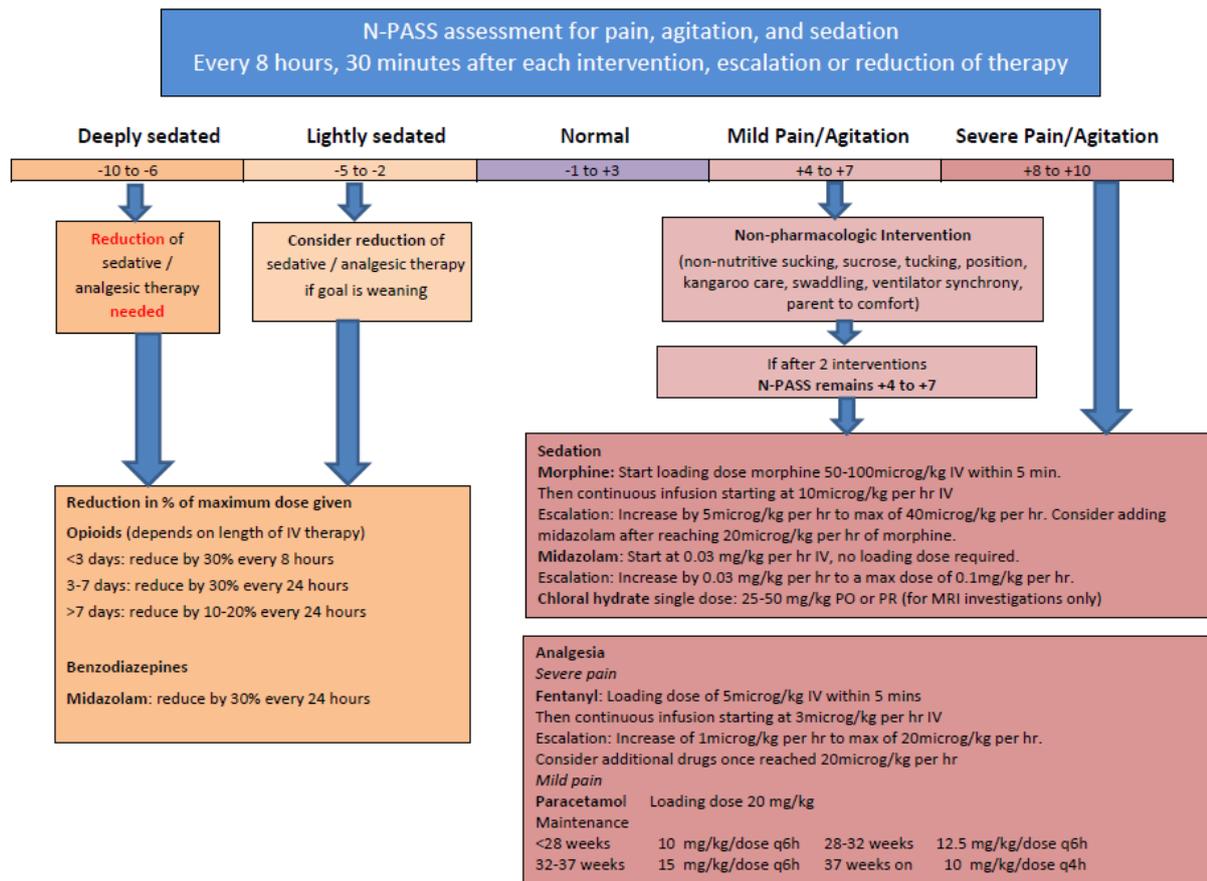
## Using the pain assessment tool

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- Pain and sedation are to be assessed at least once per shift.
- Indications for more frequent pain assessment include :
  - Indwelling tubes or lines which may cause pain, especially with movement, at least every 2-4 hours
  - Receiving analgesics and/or sedatives - at least every 2-4 hours
  - 30 minutes after an analgesic is given to assess response to medication
  - Post-operative- at least every 2 hours for 24 hours, then every 4 hours until off medications
- Sedation is scored from 0 to -2 for each behavioural and physiological criterion and then the scores added together.
- Desired levels of sedation vary according to the situation
  - “Deep sedation” = score of -10 to -5 as goal (e.g. – immediately post-operative)
  - “Light sedation” = score of -5 to -2 as goal (e.g. – to prevent ‘fighting’ the ventilator)
  - A negative score without the administration of opioids/ sedatives may indicate the premature infant’s response to prolonged or persistent pain/stress or may indicate neurologic depression, sepsis, or other pathology
- Pain is scored from 0 to +2 for each behavioral and physiological criteria, and then the scores added together.
- Treatment/interventions are indicated for scores > 3, although interventions for known pain/painful stimuli are indicated before the score reaches 3.
- The goal of pain treatment/intervention is a score < 3.
- Points are added to the premature infant’s pain score based on their gestational age to compensate for their limited ability to behaviourally or physiologically communicate pain.
- Sedation alone may mask the neonate’s response to painful stimuli and does not provide *pain relief*.
- All procedures should be explained to parents and information given on pain and pain management.
- Parents should be taught to recognise and understand their infant’s response to stress / discomfort or pain.

## Management of pain and sedation using the Vienna Protocol [Top](#)

- Once an N-PASS assessment has been completed, the following flowchart should be used to guide treatment options according to the score that was obtained.
- Once treatment has been initiated, the N-PASS should be performed 30 mins later.
- If treatment is escalated or reduced, the N-PASS should be performed again 30 mins later.



### Suggested management approaches for specific causes of neonatal pain [Top](#)

The use of sucrose ([Sucrose Solution 24% NICU Drug Guideline JHCH NICU 19.023](#)) is supported in the literature with a reduction in pain that varied between 16% and 28% on pain assessment scales. (Holsti & Grunau, 2010) According to the Vienna Protocol, sucrose and non-pharmacological methods of pain relief should be used where the pain level is mild to moderate.

#### **Blood sampling**

*Venipuncture* is the preferred method for blood sampling in term infants, as it is less painful, more efficient and requires less resampling. This approach may not apply to the care of extremely preterm infants.

- Use oral sucrose two minutes prior to procedure; additional use of a pacifier (with parental consent) may further reduce behavioural responses to painful stimuli.
- Encourage the mother to breastfeed the infant if appropriate

- Parent or carer can hold the infant during the procedure and use multisensory stimulation
- Use swaddling, containment by flexing and holding the infant, and employ multisensory stimulation. Multisensory stimulation may include the use of massage, speaking with a soothing voice and providing eye contact, or providing something with the mother's familiar odour near the infant, for example a breast pad.

*If heel lance is used:*

- Use oral sucrose; use of a pacifier (with parental consent) may further reduce behavioural responses to painful stimuli.
- Encourage the mother to breastfeed the infant if appropriate
- Use an automated lancet, preferably fully retractable
- Parent or carer can hold the infant during the procedure and use multisensory stimulation.

### ***Intramuscular (IM) injections***

*The birth process produces high levels of endogenous endorphins and most centres would not use oral sucrose when administering IM injections such as Vitamin K following birth.*

- Avoid subcutaneous and IM injections, give drugs intravenously whenever possible;
- Use swaddling, containment by flexing or holding the infant, and employ multisensory stimulation.
- Use oral sucrose as above.

### ***Nasogastric or orogastric tube insertion***

- Use a gentle technique with appropriate lubrication ensuring the head is in the neutral or 'sniffing' position and inserting the tube in a vertical direction at right angles to the face.
- Use swaddling, containment by flexing or holding the infant, and employ multisensory stimulation.
- Use oral sucrose as previously described.

### ***Lumbar puncture***

- Use oral sucrose as previously described.
- Subcutaneous infiltration of lignocaine.

### ***Screening for Retinopathy via RETCAM***

Randomised trials show minimal or no effects of topical anaesthetic (amethocaine), oral sucrose, or comfort care in reducing the pain and distress associated with retinopathy of prematurity screening via RETCAM. Therefore, consideration should be given to providing deep sedation with short-acting drugs like midazolam for this procedure. (Olsson & Eriksson, 2011)

***Insertion of PICC, peripheral venous or arterial line, arterial puncture, or cut-down***

- Use swaddling or containment by holding the infant
- Use oral sucrose as previously described
- Consider opioid dose if IV access is available;
- Consider subcutaneous infiltration of lignocaine for arterial catheter insertion or cut-down.

***Endotracheal intubation***

*Endotracheal intubation without the use of analgesia or sedation should be performed for resuscitation or other life threatening situations associated with the unavailability of IV access.*

There are many variations in the clinical approach to pain management during endotracheal intubation; each usually consists of a combination of atropine, an opioid, and a muscle relaxant.

Currently recommended for use in infants being intubated for on-going ventilation:

- Atropine and morphine, or fentanyl

***Endotracheal suction***

- Use swaddling or containment by holding the infant
- Use oral sucrose as previously described
- Consider continuous IV infusion of opioids (morphine) or slow injection of intermittent opioid doses (morphine).

***Intercostal catheter insertion***

- Anticipate the need for intubation and ventilation in infants breathing spontaneously;
- Use oral sucrose as previously described
- Consider subcutaneous infiltration of lignocaine
- Consider slow IV opioid (morphine) infusion. IV midazolam is not recommended.
- Other approaches may include the use of short-acting anaesthetic agents.

***Post-operative pain relief***

- Use IV opioid infusion (morphine);
- Opioid infusions should be used at the lowest effective dose and minimum duration based on clinical assessment and according to the Vienna Protocol.
- On occasion infants will return from the Operating Theatre with regional anaesthesia such as epidural and peripheral nerve blocks. These will generally be ordered and placed by anaesthetic staff.

***Routine nursery care and procedures***

- Use swaddling, containment by flexing and holding the infant, and employ multisensory stimulation;
- Use a pacifier (with consent) and if safe to do so, give with sucrose
- Consider low-dose continuous infusion of morphine if infant is ventilated.

## Weaning analgesia and sedation

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- According to the Vienna Protocol (2013), weaning of the sedative or analgesic therapy should take place slowly and methodically.
- The procedure for the weaning of opioids is dependent upon the duration of the therapy and is designed to prevent opioid withdrawal syndrome –
  - <3 days of opioid therapy requires a reduction of 30% of the maximum dose achieved every 8 hours
  - 3-7 days of opioid therapy requires a reduction of 30% of the maximum dose every 24 hours
  - >7 days of opioid therapy requires a reduction of 10-20% of the maximum dose achieved every 24 hours
  - Weaning from benzodiazepines should be by 30% of the maximum dose achieved every 24 hours.

## Consequences of newborn pain

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Newborn pain, generally as a result of an intervention, may have short (physiological & behavioral) and/or long-term consequences (increased or decreased behavioral responses to pain) (Anand & Hickey, 1987).

Accumulating data suggest that untreated or poorly treated neonatal pain may have long-term deleterious effects. These may include -

- Altered pain sensitivity and reactivity
- Neuro-anatomical changes and effects on neuro-development (Attarian et al, 2014)
- Metabolic changes

## References and further reading

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American Academy of Pediatrics Committee on Fetus and Newborn, American Academy of Pediatrics Section on Surgery, Canadian Paediatric Society Fetus and Newborn Committee, Batton DG, Barrington KJ, Wallman C. (2006) Prevention and management of pain in the neonate: an update. *Pediatrics*.118(5):2231.

Anand, K & Phil, D. (2016) Prevention and treatment of neonatal pain.

<[http://www.uptodate.com/contents/prevention-and-treatment-of-neonatal-pain?source=search\\_result&search=Prevention+and+treatment+of+neonatal+pain&selectedTitle=1%7E15](http://www.uptodate.com/contents/prevention-and-treatment-of-neonatal-pain?source=search_result&search=Prevention+and+treatment+of+neonatal+pain&selectedTitle=1%7E15)>Accessed Uptodate18/04/2016

Anand KJ, & International Evidence-Based Group for Neonatal Pain. (2001).

Consensus statement for the prevention and management of pain in the newborn. *Archives of Pediatrics & Adolescent Medicine*. Vol 155(2):173-80.

Attarian S, Tran L, Moore A, Stanton G, Meyer E and Moore R ; (2014) The Neurodevelopmental Impact of Neonatal Morphine Administration in Brain Science. Vol 4, 321- 334

Australian Medicines Handbook <https://amhonline.amh.net.au.acs.hcn.com.au/>

Carbajal R, Rousset A, Danan C, Coquery S, Nolent P, Ducrocq S, Saizou C, Lapillonne A, Granier M, Durand P, Lenclen R, Coursol A, Hubert P, de Saint Blanquat L, Boëlle PY, Annequin D, Cimerman P, Anand KJ, Bréart G. (2008)

Epidemiology and treatment of painful procedures in neonates in intensive care units. *JAMA*. 300(1):60

De Graaf, J.; van Lingen, R.A.; Valkenburg, A.J.; Weisglas-Kuperus, N.; Groot Jebbink, L.; Wijnberg-Williams, B.; Anand, K.J.; Tibboel, D.; van Dijk, M. (2013) Does neonatal morphine use affect neuropsychological outcomes at 8 to 9 years of age? *Pain* 154, 449–458.

Duhn, L & Medves, J. (2004). A systematic integrative review of infant pain assessment tools. *Advances in Neonatal Care*, 4(3):126-140.

Harrison, D. (2006) ACNN Position statement 2003/2 Management of pain in sick hospitalized infants. *Neonatal, Paediatric & Child Health Nursing*, 9(1),:27-29.

Holsti L and Grunau R. (2010) Considerations for using sucrose to reduce procedural pain in preterm infants. *Pediatrics*; 125:1042-1047.

Mathew PJ, Mathew JL. Assessment and management of pain in infants. *Postgraduate Medical Journal* 2003; 79(934):438-43.

Murki S and Subramanian S. Sucrose for analgesia in newborn infants undergoing painful procedures: RHL commentary June 2011. *The WHO Reproductive Health Library*; Geneva: World Health Organization.

NH&MRC Acute Pain Management: Scientific Evidence – 2<sup>nd</sup> Edition

Olsson E, Eriksson M. (2011) Oral glucose for pain relief during eye examinations for retinopathy of prematurity. *J Clin Nurs*. 20(7-8):1054

Royal Australasian College of Physicians, Paediatrics & Child Health Division (2006) Guideline statement Management of procedure-related pain in neonates. *Journal of Paediatrics & Child Health*, 42: S31-S39.

Royal Prince Alfred Hospital (RPA) Newborn Care Protocol Book- Neonatal Pain Policy

Young, T. & Mangum, B. (2006). *Neofax 2006 19<sup>th</sup> Edition*. Acorn Publishing:Raleigh, NC.

Zempsky WT, Schechter NL. What's new in the Management of Pain in Children? *Pediatrics in Review* 2003; 24(10):337-47

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23/05/2016

Clinical Quality & Patient Care Committee

24/05/2016