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Citation: Hills, E., Rosenberg, J., Banfield, N. and Harding, C. ORCID: 0000-0002-5192-2027 (2020). A multidisciplinary approach to the implementation of non-pharmacological strategies to manage infant pain. *Infant*, 16(2), pp. 78-81.

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A multidisciplinary approach to the implementation of non-pharmacological strategies to manage infant pain

Newborn infants, both term and preterm, endure many painful procedures when receiving treatment on a neonatal intensive care unit. Unmanaged neonatal pain can have a negative influence on short- and long-term neurodevelopmental outcomes and can also impact on parental wellbeing. While clinicians are aware of the efficacy of non-pharmacological strategies to reduce pain, these are not always implemented into neonatal care. This article summarises efforts made by a multidisciplinary team to improve the use of non-pharmacological approaches in the management of infant pain during procedures on a level 2 neonatal unit.

Emily Hills

Clinical Specialist Neonatal Occupational Therapist, Imperial College Healthcare NHS Trust

James Rosenberg

Neonatal Consultant, Starlight Neonatal Unit, Royal Free Hospitals NHS Foundation Trust

Natalie Banfield

Neonatal Staff Nurse, Starlight Neonatal Unit, Royal Free Hospitals NHS Foundation Trust

Celia Harding

Honorary Professor, City University of London and Neonatal SLT, Royal Free Hospitals NHS Foundation Trust

Keywords

NICU; pain management; preterm; non-pharmacological; quality improvement

Key points

- Hills E., Rosenberg J., Banfield N., Harding C.** A multidisciplinary approach to the implementation of non-pharmacological strategies to manage infant pain. *Infant* 2020; 16(2): 78-81.
1. Newborn infants are capable of experiencing pain.
 2. Infants requiring specialist hospital care are likely to experience painful medical procedures.
 3. Unmanaged pain has a long-lasting impact on an infant's behaviour and physiological status.

It is estimated that around 90,000 infants born each year in the UK require specialist hospital care.¹ While receiving hospital care, term and preterm infants may experience medical procedures, many of which are painful. Coughlin² suggests that all healthcare practitioners who work with neonates have an ethical obligation to prevent pain. There are some neonatal pain management guidelines identifying the use of non-pharmacological strategies to reduce pain (eg American Academy of Pediatrics³). Recent evidence in the literature promotes the use of breastfeeding, skin-to-skin contact and sucrose to minimise pain, however while clinicians are aware of the efficacy of non-pharmacological strategies to reduce pain, it has been shown that these strategies are not always implemented into neonatal care.

Pain in neonatal care

Historically it was thought that newborn infants were incapable of experiencing pain, although it is now known that this is not the case.⁴ Unmanaged pain has an immediate impact on a neonate's behavioural and physiological development.⁵ In hospital, preterm infants can experience up to 12 painful procedures each day and less than half of these interventions use pain management.⁶ Often pain is untreated in neonatal units⁷ despite electrophysiological evidence suggesting that acute pain results in diffuse brain

activation for preterm infants, with region specific alterations in the lateral thalamus and thalamocortical pathways in extremely preterm infants.^{8,9} Managing neonatal pain is important as repeated pain and stress can have a life-long impact on the infants themselves and on parental wellbeing.^{4,10} The best pain management strategy is to try and prevent pain if possible, or minimise the intensity of the pain when carrying out a procedure.

There are pharmacological and non-pharmacological interventions available to enable practitioners to manage infant pain. Non-pharmacological interventions are cost effective and can be easily integrated into neonatal care by a range of neonatal practitioners.¹¹

Thematic analysis of the literature

Reviews of the literature have identified the following non-pharmacological strategies as being effective in pain management:

- skin-to-skin opportunities¹²
- use of sucrose¹³
- experiencing breastfeeding or having breast milk¹⁴
- use of non-nutritive sucking, swaddling, tucking, rocking and holding.¹⁵

Further investigations of the literature highlight five key themes that are important in relation to infant pain management:

1. *Involving parents.* Parents need to be directly involved as they are aware of their infant's pain¹⁶ and they also have a

desire to alleviate pain.¹⁷ Parent participation and involvement in developing pain management strategies is best achieved through a collaborative approach.¹⁸ Parents need to be valued as advocates for their infants, rather than a disruptive influence.¹⁹

2. *Improving awareness of pain management by discussing it.* For clinical practice to change in the management of infant pain, communication within the team is essential.^{18,20} Projects that involve healthcare practitioners and parents working together have the most effective outcomes.¹⁸ Limitations in the communication used between healthcare practitioners and parents can produce a sense of unease, leading to limited implementation of important pain management approaches.¹⁹
3. *Educating staff and parents.* To implement non-pharmacological strategies into neonatal care there need to be key dedicated individuals on the unit who can promote these and encourage others to use them.²¹ To ensure all practitioners are aware of the rationales underpinning the approaches, an appreciation of the diversity of staff and parent learning styles is essential.²² Practical education sessions can support linking theory to practice.²³
4. *Providing resources to enable practice of pain management strategies.* Visual resources such as posters and brochures that are readily available can help enhance education.¹⁶ Pain champions can ensure strategies are taking place in practice.²⁴ Despite these positive elements in promoting pain management there are barriers to overcome, such as reduced nurse-to-infant ratios.²¹
5. *Involving and informing the whole organisation.* A whole unit approach with active collaboration from all levels of practice, including management, is necessary to implement non-pharmacological strategies to minimise infant pain.^{16,23} It is stated that implementation of changes in practice can take between three and five years to allow for neonatal culture and practice alterations.²⁵

Exploration of practice on a level 2 neonatal unit: methods

This project took place in a level 2 neonatal unit in north London – Starlight neonatal unit, Barnet Hospital. This unit has 30 cots,

of which six are intensive care, 10 are high dependency, four are special care cots, and 10 are individual care rooms. The hospital the unit is in has approximately 5,800 deliveries per year. It is the third busiest neonatal unit in NHS England. Staff from the unit met in December 2017 and agreed to review pain management on the unit.

The literature was discussed as a team, with general agreement that good pain management was necessary to ensure the best possible long- and short-term outcomes for infants. A four-phase quality improvement project was implemented that:

- supported staff and parents to understand neurobehavioural infant cues and non-pharmacological strategies
- used a pain assessment tool
- provided pain management guidelines regarding non-pharmacological methods when working with infants.

The pain project was scheduled to take place from January 2018 to January 2019. Two observation audits were undertaken at the beginning of the project to observe what staff did to minimise infant pain during immunisations, lumbar punctures, blood tests, nasal prong adjustments, nasogastric tube re-insertion, cannulation and eye testing. Observation findings were discussed during training sessions.

Staff received education about pain management throughout the 12-month period and filled in the same questionnaire twice to test their knowledge and to

identify changes in views about using non-pharmacological approaches at two time points during 2018 (February and December). Specifically, staff answered questions about neurobehavioural cues and support for parents; practice knowledge and beliefs, and confidence with non-pharmacological pain management strategies (ie skin-to-skin, non-nutritive sucking, breastfeeding/breast milk, use of sucrose, etc).

Parents were informed that a pain audit and training were taking place on the neonatal unit. They were invited to participate in education sessions during ‘supper club’ including a video about minimising infant pain while their infants were on the unit. Parents also had cotside information sharing and training. They were asked for feedback about how their infant’s pain was managed after discharge from the unit.

Outcomes

The two early observation audits highlighted that seven non-pharmacological strategies were used by staff; these are outlined in **TABLE 1**. It is interesting to note that during the second observation, no skin-to-skin, breastfeeding or use of expressed breast milk strategies were used. In addition, parents were not always present when painful procedures were undertaken.

At time point 1 (TP1, February 2018),

		Observation period 1 n=20	Observation period 2 n=11
Parent involvement	Parent present	50%	45%
Strategies used	Skin-to-skin	✓	-
	Breastfeeding	✓	-
	Sucrose	✓	✓
	Expressed breast milk	✓	-
	Non-nutritive sucking	✓	✓
	Swaddling	✓	✓
	Facilitated tucking	✓	✓
Professionals observed	Nurse	n=6	n=2
	Nursery nurse	n=4	n=1
	Doctor	n=9	n=8
	Allied health professional	n=1	n=0

TABLE 1 Procedures used during initial observation periods.

33 staff completed the questionnaire, and at time point 2 (TP2, December 2018), 21 staff completed it. Age of participants at both time points ranged from 25–64 years of age. A wide range of neonatal practitioners completed the questionnaires at both time points. At TP1, 47% were nurses, 41% were doctors, 9% were allied health professionals, and 3% were classified as 'other'. A similar profile of staff was noted at TP2, with 47.5% nurses, 42.5% doctors and 10% allied health professionals. The experience of participants was recorded, so at TP1, 48% had five years or less experience with neonates, with 32% having over 15 years neonatal experience. At TP2 30% had five years or less neonatal experience, and 33% with over 10 years' experience.

Participants were asked about neuro-behavioural cues and working with parents and the relevance of this to working to minimise pain within infant care. A five-point rating scale was used, from 'strongly agree' to 'strongly disagree'. At TP1 64% strongly agreed that infants were able to communicate non-verbally in contrast with TP2 where 75% strongly agreed that infants were able to communicate non-verbally. In relation to involving parents in infant pain management, at TP1 42% strongly agreed that parents should be involved in pain management procedures, in contrast with TP2 where 50% strongly agreed that parents should be involved in pain management procedures.

Participants were asked to rate statements related to their knowledge and beliefs about infant pain management. At TP1 88% strongly agreed that neonates could experience pain compared with TP2 where 79% strongly agreed. Regarding minor procedures 82% strongly agreed that even minor procedures could cause pain at TP1, and this view was similar at TP2 with 83% stating that they strongly agreed. There was an increase in the strongly agreed category between the two time points that poor pain management could increase the risk of neuro-developmental problems (a change from 70% to 80%).

Participant knowledge about pharmacological and non-pharmacological interventions to manage infant pain was considered with 30% strongly agreeing that non-pharmacological interventions were effective at TP1, increasing to 54% at TP2. Overall, participants identified a range of non-pharmacological approaches for

Examples of parent comments and feedback after discharge from the neonatal unit

"I found the video incredibly helpful in explaining pain management"

"The video was helpful in knowing how I can best support my baby"

"I always found the Starlight team super helpful and really easy to understand"

TABLE 2 Parent feedback.

infant pain management as listed in **TABLE 1**. At TP1, 9% strongly agreed that skin-to-skin was an effective non-pharmacological strategy in contrast with 36% who strongly agreed that sucrose was effective. At TP2, 4% strongly agreed that skin-to-skin was an effective strategy in contrast with 63% who strongly agreed that sucrose was effective.

Before training, most staff reported on the questionnaire that they used breast comfort to manage pain before training, but interestingly, after training, at TP2, most reported that they used sucrose. This was not reflected in the unit observations of pain management practice where skin-to-skin, breastfeeding and use of expressed breast milk were not used on both occasions in contrast with non-nutritive sucking, sucrose, swaddling and facilitated sucking.

Parents were invited to give feedback about infant pain management once they had been discharged from the unit. Comments made by parents were favourable, as outlined in **TABLE 2**.

Conclusions

This neonatal pain management project implemented in a level 2 neonatal unit to improve practice highlighted that although non-pharmacological interventions are often recommended, and even though staff are aware of them, they are used variably as reported by staff.²⁶ In addition, parents were not always present for painful procedures at the beginning of the project. Further consideration needs to be given to the use of sucrose. Interestingly, the observation audits revealed sucrose use both times, with a high reporting of use of sucrose in the questionnaires, especially at TP2. Research suggests that sucrose use in infancy, when a significant amount of neuroplastic change is occurring, can be detrimental to both white and grey matter development in the brain.²⁷ The unit has a commitment to exploring non-pharmacological approaches to minimise infant pain, and use of sucrose will be a major discussion point within the team. As

the pain management project demonstrated, there remains diversity in clinical practice in methods used.²⁸

Acknowledgements

Dr C. Cane, Dr S. Shanmugalingham, Dr T. Wickham, Dr K. Job, L. Collier, P. Chong, K. Eglinton, A. Hollings.

References

1. **Bliss**. Statistics and facts. 2017 Online at: www.bliss.org.uk/media-centre/facts-and-figures-2
2. **Coughlin ME**. Trauma-informed care in the NICU: evidenced-based practice guidelines for neonatal clinicians. 2016: Springer Publishing Company.
3. **Committee on Fetus and Newborn, and Section on Anesthesiology and Pain Medicine**. Prevention and management of procedural pain in the neonate: an update. *Pediatrics* 2016;137:e20154271
4. **Valeri BO, Holsti L, Linhares MB**. Neonatal pain and developmental outcomes in children born preterm: a systematic review. *Clin J Pain* 2015;31:355–62.
5. **Grunau RE**. Neonatal pain in very preterm infants: long-term effects on brain, neurodevelopment and pain reactivity. *Rambam Maimonides Med J* 2013;4:e0025.
6. **Cruz MD, Fernandes AM, Oliveira CR**. Epidemiology of painful procedures performed in neonates: a systematic review of observational studies. *Euro J Pain* 2016;20:489–98.
7. **Johnston C, Campbell-Yeo M, Disher T, et al**. Skin-to-skin care for procedural pain in neonates. *Cochrane Database Syst Rev* 2017;2: CD008435.
8. **Duerden EG, Grunau RE, Guo T et al**. Early procedural pain is associated with regionally-specific alterations in thalamic development in preterm neonates. *J Neurosci* 2018;38:878–86.
9. **Fabrizi L, Slater R, Worley A, et al**. A shift in sensory processing that enables the developing human brain to discriminate touch from pain. *Curr Biol* 2011;21:1552–58.
10. **Franck LS, Oulton K, Nderitu S, et al**. Parent involvement in pain management for NICU infants: a randomized controlled trial. *Pediatrics* 2011;128:510–18.
11. **Cignacco E, Hamers JP, Stoffel L, et al**. The efficacy of non-pharmacological interventions in the management of procedural pain in preterm and term neonates: a systematic literature review. *Euro J Pain* 2007;11:139–52.
12. **Johnson C, Campbell-Yeo M, Fernandes A, et al**. Skin to skin care for procedural pain in neonates. *Cochrane Database Syst Rev* 2014;23: CD008435.
13. **Stevens B, Yamada J, Ohlsson A, et al**. Sucrose for analgesia in newborn infants undergoing painful procedures. *Cochrane Database Syst Rev* 2016;16: CD001069.
14. **Shah P, Hebozo C, Aliwala L, Shah V**. Breastfeeding or breast milk for procedural pain in neonates.

- Cochrane Database Syst Rev 2012;12: CD004950.
15. **Pillai Riddell RR, Racine N, Gennis H, et al.** Non-pharmacological management of infant and young child procedural pain. *Cochrane Database Syst Rev* 2015;2:CD006275.
 16. **Spence K, Henderson-Smart D, New K, et al.** Evidenced-based clinical practice guideline for management of newborn pain. *J Paediatr Child Health* 2010;46:184-92.
 17. **Palomaa AK, Korhonen A, Polkki T.** Factors influencing parental participation in neonatal pain alleviation. *J Pediatr Nurs* 2016;31:519-27.
 18. **Axelin A, Anderzen-Carlsson A, Eriksson M, et al.** Neonatal intensive care nurses' perceptions of parental participation in infant pain management. *J Perinatal Neonatal Nurs* 2015;29:363-74.
 19. **Marfurt-Russenberger K, Axelin A, Kesselring A, et al.** The experiences of professionals regarding involvement of parents in neonatal pain management. *J Obstet Gynecol Neonatal Nurs* 2016;45:671-83.
 20. **Cong X, McGrath JM, Delaney C, et al.** Neonatal nurses' perceptions of pain management: survey of the United States and China. *Pain Manag Nurs* 2014;15:834-44.
 21. **Benoit B, Campbell-Yeo M, Johnston C, et al.** Staff nurse utilization of kangaroo care as an intervention for procedural pain in preterm infants. *Adv Neonatal Care* 2016;16:229-38.
 22. **Lefrak L, Burch K, Caravantes R, et al.** Sucrose analgesia: identifying potentially better practices. *Pediatrics* 2006;118(Suppl2):S197-202.
 23. **Harrison D, Bueno M, Reszel J.** Prevention and management of pain and stress in the neonate. *Res Rep Neonatol* 2015;5:9-16.
 24. **Nurse S.** Implementing change in the neonatal unit:

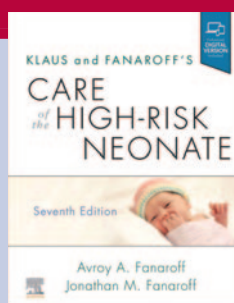
part 2 – the change process. *J Neonatal Nurs* 2014;20:207-13.

25. **Carrier CT.** Individualized family-centered developmental care: reflections on implementation. *Newborn Infant Nurs Rev* 2002;2:27-34.
26. **Campbell-Yeo M, Fernandes A, Johnston C.** Procedural pain management for neonates using nonpharmacological strategies: part 2 – mother-driven interventions. *Adv Neonatal Care* 2011;11:312-18.
27. **Tremblay S, Ranger M, Chau CMY, et al.** Repeated exposure to sucrose for procedural pain in mouse pups leads to long-term widespread brain alterations. *Pain* 2017;158:1586-98.
28. **Carbajal R, Rousset A, Danan C, et al.** Epidemiology and treatment of painful procedures in neonates in intensive care units. *JAMA* 2008;300:60-70.

Book review

Klaus and Fanaroff's care of the high-risk neonate, seventh edition

Avroy Fanaroff and Jonathan Fanaroff
Elsevier, 2019
ISBN: 9780323608541
£66.99, hardcover, 544 pages



First published 45 years ago, this seventh edition reference text now comes as an 'enhanced digital version'. The publisher, Elsevier, provides the option to access the book via a personalised digital bookshelf and this is an excellent asset. The platform is relatively easy to navigate, the additional materials fairly easy to find, and it provides an excellent option for referring to the textbook away from the hard copy.

The edition preface describes the ongoing mission of the publication as a call to arms, supporting the best possible outcomes for our most vulnerable infants by advocating for a triad of humane care, promoting human milk, and supporting the family. Towards these admirable goals for 21st century care, new chapters have been added for this edition. These novel chapters include:

- Quality and evidence-based medicine
- Genetics and inborn errors of metabolism
- Family-centred and developmental care.

The chapter on quality and evidence-based medicine offers some very practical and helpful background to the topic, tips and tools on quality improvement (QI). Examples of QI projects and their approaches, such as reducing unplanned extubations, provide tangible stories and motivation for the reader. One or two areas here are unexpectedly advanced for anyone who may be new to QI literature and some figures may not be very accessible to the beginner. At times the digital enhancement can be a hindrance as references and resources are absent from the print version and only available electronically.

Neonatal infections are covered in a readable and well summarised way, describing evidence as well as discussions around concepts and controversies. The US origins of the book are noticeable in the differences from UK practice, such as protocols related to group B Streptococcus screening and treatment, and the US

vaccination schedule. The Infections in the Neonate chapter is a little text heavy and could benefit from some relief by way of figures or charts but has a very good level of content and breadth.

A chapter on assisted ventilation reads extremely well, offered as 'an introduction' to the field. The basic text is complemented by additional editorial comments, often bringing helpful practical tips on ventilation strategies or principles. Novel as well as traditional approaches are covered, including NAVA ventilation (neurally adjusted ventilatory assist). Good graphics and several clinical cases make this chapter a great asset to the overall volume.

Despite the US/UK discrepancies and lack of visuals in places, the book provides a strong and comprehensive reference text. The clinical cases and related questions lean the book towards an audience of paediatric/neonatal trainees or advanced neonatal practitioners. It would be a strong addition to departmental bookshelves, in paper or digital form.

Chantelle Tomlinson Lead for Education and Guidelines, East Midlands ODN and Locum Consultant Neonatologist, Nottingham University Hospitals NHS Trust

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