



Neuroprotective Core Measure 5: Minimizing Stress and Pain—Neonatal Pain Management Practices During Heel Lance and Venipuncture in Ontario, Canada

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ABSTRACT

A provincial-wide online survey was conducted to: 1) ascertain frequency of use of breastfeeding (BF), skin-to-skin care (SSC) and sucrose for pain reduction during heel lance and venipuncture in maternal newborn units and neonatal intensive care units (NICUs), and 2) to identify barriers to using these strategies for pain reduction. An invitation and link to an electronic survey were emailed to nurse managers of 91 maternal newborn units and NICUs in Ontario, Canada, and 40 completed surveys were submitted (44%). Results showed variable but infrequent use of pain reduction strategies. Barriers were coded as health care provider (HCP), infant, parent and organizational factors. Most barriers related to BF and SSC and included: preference to perform blood sampling without parents; parental preference to not be involved during blood sampling; unit cultures; out of date policies; insufficient time, knowledge and education; and staff being uncomfortable performing blood sampling with infants BF or held SSC.

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Newborn infants have blood work for newborn screening in their first days of life, and preterm or sick hospitalized infants need many more needle-related procedures for medical monitoring over the duration of their hospitalization.^{1–4} The procedures of heel lance or venipuncture, used to obtain blood for screening and medical monitoring, are painful for infants at the time of the procedures,⁵ and noxious stimulation causes similar brain activity changes to that of adults.⁶ In addition, repeated painful procedures are a key contributing factor in

long-term adverse outcomes on brain development and developmental and cognitive outcomes in preterm infants.^{7–14}

There are three evidence-based effective, simple and cost effective ways to reduce pain in infants during painful procedures. Rigorously conducted systematic reviews demonstrate that breastfeeding (BF),¹⁵ skin-to-skin care (SSC),¹⁶ or giving infants small amounts of sweet solutions (sucrose or glucose) with or without a pacifier,^{17–19} effectively and safely reduces pain in newborn infants during commonly performed painful procedures. Multiple clinical practice guidelines on acute procedural pain reduction in infants are available and include recommendations to use BF, SSC and sucrose.²⁰ Despite this large and increasing volume of evidence, provincial,²¹ national,^{3,4,22,23} and international,^{1,2,24–31} studies of pain management practices consistently show infrequent use of these strategies, and too many infants receive no pain treatment during commonly performed painful procedures.^{3,21,24,26,31} These studies highlight an important knowledge-to-practice gap which can negatively impact on the health of newborn infants, especially preterm and sick infants.

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The good news is that there has been improvements in the treatment of pain over the years, especially in reducing the number of painful procedures and increasing the use of sucrose for painful procedures,^{3,21,26,31} however pain treatment still consistently falls below recommended guidelines.²⁰ There is a need to establish baseline data on the use of evidence-based pain reduction strategies as well as barriers to their use in local contexts so that appropriate knowledge translation (KT) interventions may be planned, developed, implemented and evaluated to improve procedural pain treatment in neonates.

The aims of this study were to: (1) establish baseline data of frequency of use of BF, SSC and sweet solutions for pain reduction during heel lance and venipuncture in maternal newborn and neonatal intensive care units (NICUs) in one province in Canada; and (2) identify barriers to using the three pain reduction strategies in clinical practice.

Methods

Design

A prospective cross-sectional survey was administered electronically.

Setting and Sample

The settings were maternal newborn units (level 1) and NICUs (levels 2 and 3) in the province of Ontario, Canada. Within Ontario there are 96 maternal newborn units and NICUs which, together, account for 98% of all births within the province. The province mandates that newborn screening should be completed shortly after 24 hours post-birth,³² therefore this sample represents the sites for the vast majority of blood draw procedures conducted in the early newborn period.

The survey sample was identified through the Better Outcomes Registry & Network (BORN) Ontario. BORN Ontario, as a designated registry under Ontario's Personal Health Information Protection Act legislation, collects, discloses, and uses personal health information for the purpose of improving maternal, infant and child care and patient outcomes.³³ The BORN Ontario Information System (BIS), an Internet-based data collection system, is operational in all hospitals in the province of Ontario providing maternal/newborn care. The BIS has historical birth record data for all hospital births since 2004 and combined maternal child data from 2012 onwards.³³

The brief online survey was distributed to the unit leader (i.e., nurse manager) or clinical educator, or their nominees in 91 out of 96 maternal newborn units and NICUs entering data into the BIS at the time. Unit leaders were targeted as the research team considered their knowledge and perception of practices in their unit would be an accurate representation of clinical practices. Five units were excluded from this study as the nurse unit managers of these units had previously participated in piloting the survey. Minor modifications to the survey had been made following the pilot study, to improve clarity of the survey questions as well as adding an open-ended free text section for barriers to using the three recommended pain reduction strategies.

Data Collection

Ethics approval to conduct the study was granted from the PI's affiliated hospital (Research Ethics Board protocol number 13/72X). Email contact information for the nurse unit managers was provided to the study team by the BORN Ontario administrator. The email invitation, sent from the study research assistant, contained a direct hyperlink to the survey. To maximize the response rate, a total of four reminders from the study research assistant were emailed over the two month data collection period.³⁴ Study data were collected and managed using REDCap (Research Electronic Data Capture),³⁵ a secure-Web based application, hosted at the Children's Hospital of Eastern Ontario.

The survey contained a demographic question (the units' level of care) and closed-ended questions to identify: frequency of use of pain reduction interventions (BF, SSC, sucrose) during heel lance and venipuncture (never, occasionally, often, always); and details of use of sweet solutions (i.e., type, concentration and volume of solution, ordering and documentation details, contraindications). In addition, there were optional free text open-ended questions to record barriers to using each of the three pain reduction strategies during heel lance and venipuncture in clinical care.

Data Analysis

Data were exported from REDCap to SPSS³⁶ for data analysis. Individual identifying information was removed for data analysis. Descriptive statistics were used to analyze the quantitative survey data. Responses to the open-ended questions were analyzed using qualitative content analysis to identify overarching categories and their sub-categories.³⁷ Coding was completed by a research student and co-author JR. Each coder independently read the qualitative survey responses, highlighting key words and making notes about initial impressions. The two coders used the highlighted key words to develop the coding scheme. Related codes were subsequently grouped into broader categories and their sub-categories. Discrepancies and further modifications were completed with a third coder; the first author (DH).

Results

Between July 22, 2013 and September 23, 2013, invitations to participate in the survey were sent to the BORN Ontario registered email addresses for the 91 nurse unit leaders of maternal newborn units and NICUs across Ontario. Following the four reminder emails, the final number of submitted surveys was 42 (response rate 46%). At the time of analysis, two surveys were found to contain no data aside from the unit type, therefore these were excluded from data analysis, leaving 40 (44%) completed surveys for analysis. Twenty-five (63%) were from maternal newborn units and 15 (37%) were from NICUs (including one level 3 NICU). Fig. 1 presents the participant flow chart.

Use of Any Pain Reduction Strategies

As shown in Table 1, in 20 of the 25 responding maternal newborn units (80%), there was some reported use of one of the three pain reduction strategies during heel lance, while five units (15%) reported "never" for all three strategies. Fourteen of the 15 NICU respondents reported some use of one of the three pain reduction strategies during heel lance, and one NICU reported "never" for all three strategies. Use of any pain reduction strategy during venipuncture was less frequent, with 11 of 22 responding maternal newborn units reporting "never" for all three strategies. Data for the venipuncture question were missing for three units; as some of these units do not perform venipuncture for blood sampling. In two of the 15 NICUs "never" was reported for frequency of three pain reduction strategies during venipuncture.

Frequency of Pain Reduction Interventions Used During Heel Lance

NB: Not all respondents answered each section of the survey. The number (N) of respondents for each strategy are presented in Fig. 2, which presents the frequency of use of BF, SSC and sucrose for pain reduction during heel lance.

Over half the participants reported using BF *occasionally* (n = 21, 54%) and only eight units (21%) reported using breastfeeding *often* during heel lance. Ten units (26%) reported *never* using breastfeeding as a pain reduction strategy during heel lance and no units reported BF being *always* used during heel lance. BF during heel lance was more frequently reported in maternal newborn units, with 20 out of 25 units (80%) reporting using BF *occasionally* or *often*, compared to 9 out of 14

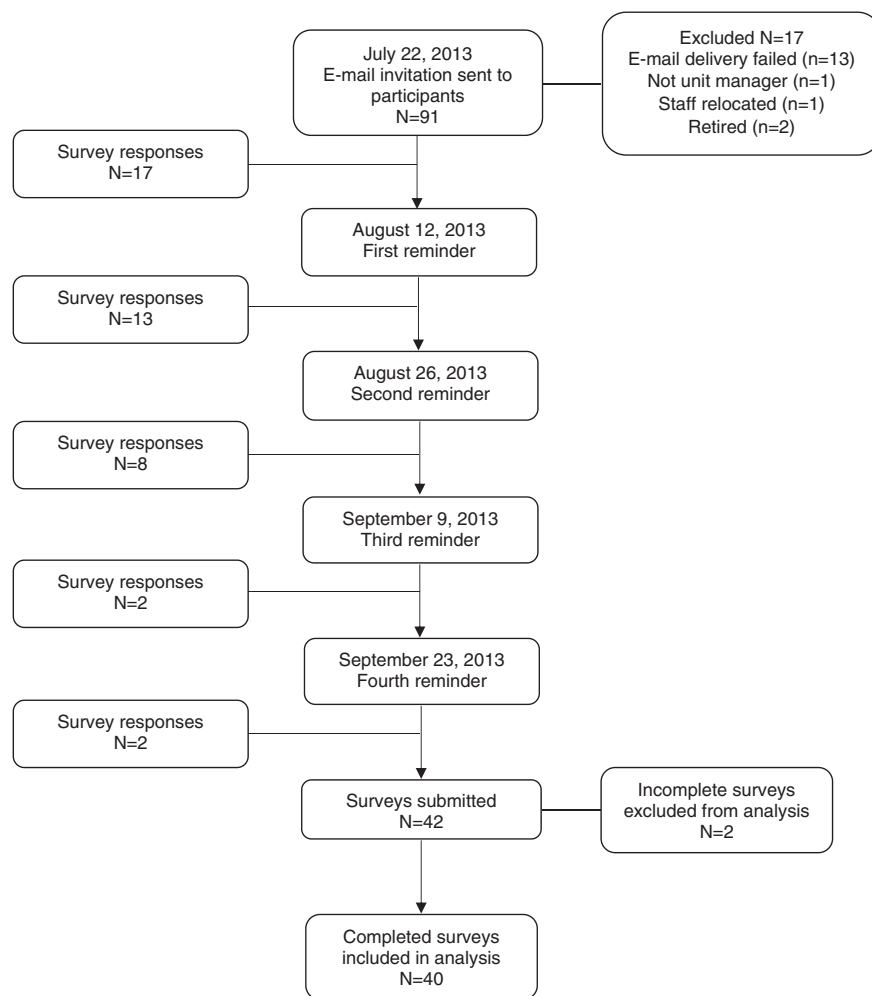


Fig. 1. Participant flow chart.

NICUs (64%). Thirteen (33%) units reported using SSC with the mother *often* for pain reduction during heel lance, while 17 (44%) reported using SSC with the mother *occasionally*. Nine (23%) respondents reported *never* using SSC with mothers and no unit reported *always* using SSC with the mother during heel lance. SSC with the mother was slightly more likely to be used in maternal newborn units, with 20 out of 25 units (80%) reporting using SSC *occasionally* or *often*, compared to 10 out of 14 NICUs (71%).

As presented in Fig. 2, SSC with the father was rarely used in most units, regardless of the type of unit. Only one unit stated SSC with the father was used *often*. Similarly, SSC during heel lance with individuals other than the parents was rarely used; seven units reported using SSC with females other than the mother *often* or *occasionally* and only

three units reported using SSC with males other than the father *occasionally*.

Eight units (21%) reported *always* using sucrose, with or without non-nutritive sucking (NNS), during heel lance procedures, while at the other end of the scale, almost 50% ($n = 19$) responded they *never* used sucrose. Twelve units reported using sucrose *often* ($n = 6$, 15%) or *occasionally* ($n = 6$, 15%) during heel lance. Maternal newborn units were the least likely to report using sucrose, with 18 (75%) of the 24 respondents of this question from these units reporting their unit *never* uses sucrose. Fig. 2 depicts results of pain reduction strategies used during heel lance.

Frequency of Pain Reduction Interventions Used During Venipuncture

NB: Three respondents from maternal newborn units did not complete this section, due to venipuncture not being performed in their units. The number (N) of respondents for each strategy is presented in Fig. 3, which presents the frequency of use of BF, SSC and sucrose for pain reduction during venipuncture.

The majority of units reported *never* using breastfeeding ($n = 28$, 76%) during venipuncture. Only two units reported using breastfeeding *often* ($n = 2$, 5%) and seven units (19%) reported using BF *occasionally* during venipuncture. No units reported *always* using BF during venipuncture. BF during venipuncture was more frequently reported in maternal newborn units, with 7 out of 22 units (32%) reporting using BF *occasionally* or *often*, compared to 2 out of 15 NICUs (13%). Almost the

Table 1

Any use of BF, SSC or sucrose for pain reduction.

	Heel lance		Venipuncture	
	Use of any strategy	Use of no strategy	Use of any strategy	Use of no strategy
NICU ($n = 15$) ^a	14/15	1/15	13/15	2/15
Maternal newborn ($n = 27$) ^b	20/25	5/25	11/22	11/22

NB: Three maternal newborn units did not answer the venipuncture section.

^a One NICU used no strategy during both heel lance and venipuncture.

^b Five maternal newborn units used no strategy during heel lance and venipuncture.

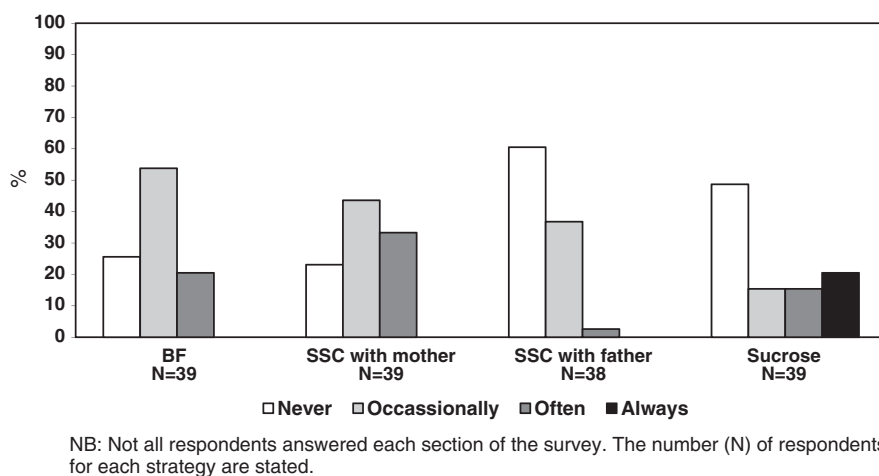


Fig. 2. Pain reduction strategies used during heel lance.

same results were reported for use of SSC during venipuncture with mothers. Most units reported *never* using SSC with the mother ($n = 28$, 76%) during venipuncture. Only one unit (3%) stated that they *often* used SSC with the infant's mother during venipuncture, while eight units (22%) reported *occasional* use. Reported frequency of SSC with the mother during venipuncture was similar for both types of units: 5 out of 22 maternal newborn units (24%) reported using SSC *occasionally*, compared to 3 out of 15 NICUs (20%).

Nearly all respondents reported that they *never* used SSC with the father ($n = 32$, 89%) during venipuncture. Reported frequency of SSC with the father during venipuncture was low in both types of units: 2 of the 21 maternal newborn units reported using SSC *occasionally*; only one respondent reported *often*, while only 1 of the 15 NICUs (7%) reported occasional SSC with the father. SSC during venipuncture with individuals other than the parents was rarely used; only three units reported using SSC with females other than the mother *often* ($n = 1$) or *occasionally* ($n = 2$) and only two units reported using SSC with males other than the father *often* ($n = 1$) or *occasionally* ($n = 1$).

Sucrose with or without NNS was more commonly used during venipuncture than BF or SSC. Yet, just over half the units ($n = 19$, 51%) stated that they *never* used sucrose. Nineteen of the 25 (77%) maternal newborn units *never* used sucrose during venipuncture. Six units in total (16%) reported *always* using sucrose during venipuncture. Fig. 3 depicts the frequency of use of BF, SSC and sucrose during venipuncture.

Details of Use of Sweet Solutions

Thirty-eight of the 40 respondents completed this section of the survey. Nearly two-thirds of the units ($n = 24$, 63%) reported that sweet solutions were available for use on their unit. Twenty-four respondents reported contraindications to using sucrose. Confirmed necrotizing enterocolitis and parental refusal were the most commonly selected contraindications. No units selected the following three contraindications listed on the survey: "infant of diabetic mother"; "infants of mothers taking methadone"; and "infants on opioid infusions." Results of sweet solution availability, use and contraindications are summarized in Table 2.

Barriers to Using Pain Reduction Strategies

Thirty-five (88%) respondents completed the qualitative section of the electronic survey. Four overarching categories to using pain reduction strategies were identified from the responses: health care provider (HCP), infant, parent and organizational. Specific barriers occurring at these four levels were further categorized into 11 sub-categories as presented in Fig. 4.

HCP Factors

Responses categorized as HCP factors predominantly related to technique of blood sampling and HCP attitudes, especially pertaining to

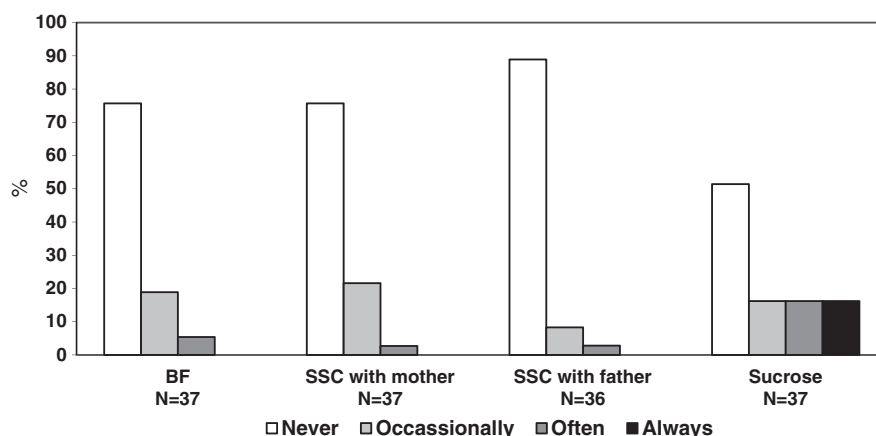


Fig. 3. Pain reduction strategies used during venipuncture.

Table 2
Details of use of sweet solutions.

	n (%)
Type of sweet solution (n = 24)	
Sucrose	23 (96)
Glucose	1 (4)
Sucrose concentration (n = 18)	
24%	17 (94)
25%	1 (6)
Sweet solution administration (n = 23)	
Before procedure	5 (22)
During procedure	4 (17)
Both – before and during procedure	14 (61)
Any contraindications for sweet solution use (n = 23)	
Yes	11 (48)
No	12 (52)
Types of contraindications ^a (n = 24)	
Confirmed NEC	7 (29)
Parental refusal	6 (25)
Altered conscious state	5 (21)
Nil by mouth	4 (17)
Suspected Necrotizing Enterocolitis (NEC)	4 (17)
Below specified gestational age	1 (4)
Person responsible for ordering sweet solutions ^a (n = 24)	
Physician	22 (92)
Neonatal nurse practitioner	3 (13)
Nursing staff	4 (17)
Medical directive	4 (17)
No written order required	3 (13)
Not applicable	8 (33)
Use of sweet solutions to soothe and comfort infants (i.e. not for pain) ^b (n = 36)	
Never	20 (56)
Occasionally	13 (36)
Often	1 (3)
Always	2 (6)
Do you document when you administer sweet tasting solutions? ^b (n = 33)	
Never	10 (30)
Occasionally	4 (12)
Often	4 (12)
Always	15 (45)

^a Respondents could select more than one answer.

^b All respondents could answer this question, regardless of whether they stated that sweet solutions were used on their unit.

supporting parents to BF and hold the infants SSC for pain reduction. Most respondents identified the *technique* of the nurses and lab technicians and their comfort drawing blood from the infant while they were BF or held SSC as a barrier. Many participants stated that the routine practice is completing the blood draw while the infant is lying on a flat surface and the use of BF or SSC during painful procedures requires a change in location and position. Respondents reported that this increased the risk that the blood sample could not be obtained successfully. A respondent from an NICU wrote: “For venipuncture, the baby has to be in a stable position (surface), to be able to pull the blood slowly with the syringe. When the mother is breastfeeding, [staff] may not have the proper access to the required limb which may not be preferable for success.” *Attitudes* of HCP and a lack of buy-in about the importance of reducing infants’ pain were commonly identified as a barrier with some “nurses prefer[ring] to complete bloodwork without the presence of parents” (NICU respondent) and that “staff think of it [SSC] as inconvenient” (maternal newborn unit respondent).

Infant Factors

The most prevalent comments categorized as infant factors that were barriers to BF during painful procedures related to infant’s *feeding status*. Specifically, the barriers concerned the infants’ ability to latch on to the breast and the coordination of the time of feeding with the bloodwork. For example, one respondent from a maternal newborn unit explained that often “babe is sleeping and not wanting to suckle.” The *health status* of the infant was also identified as being important

in determining whether the infant was eligible to be BF, held in SSC or receive sucrose. For example, some units identified that any venous blood sampling is considered urgent and thus would preclude the use of BF or SSC which requires time to initiate.

Parent Factors

Many respondents identified the *availability* of the infant’s parent/s as a key barrier to implementing BF and SSC during bloodwork. For example, the timing of routine blood sampling was identified as being done early in the morning and parents were rarely present. The perceived *stress* levels of parents were also identified as a barrier by respondents, especially in NICUs. There was a perception by the nurses that parents find it stressful to be present during the bloodwork and seeing their infant undergo a painful procedure, as highlighted by these quotes: “increases mother’s anxiety” and “parents request not to be present when bloodwork is completed” (NICU respondents).

Organizational Factors

The most frequently reported barriers to using pain reduction strategies were coded as “organizational factors.” Many respondents highlighted issues related to the overall *culture* in their unit, and “challenges to practice changes” (NICU respondent). Some units identified a lack of specific policies or outdated policies on pain reduction strategies as a barrier to implementing BF, SSC or sucrose. Respondents reported a lack of *education* on using BF, SSC and sucrose, resulting in a “knowledge deficit of lab staff and some nursing staff” (maternal newborn unit respondent) regarding both the pain reducing effects, and when and how to use these strategies. The *time* required for supporting the mother to initiate BF, or support either parent to organize the infant to be held SSC, or to obtain sucrose from the medication cabinet was also identified as a barrier to implementing these strategies. This was especially the case when HCPs other than the bedside nurse were responsible for obtaining blood samples. The physical *environment* was also perceived as a barrier with some participants identifying that their unit did not have the physical space to accommodate use of BF and SSC, including poor lighting, lack of privacy, and limited space.

Discussion

This survey of newborn infant pain reduction practices conducted in one province in Canada highlighted variable provision of effective pain reduction strategies during the commonly performed needle-related painful procedures of heel lance and venipuncture. Infrequent use of BF, SSC or sucrose in most units was found despite abundant high quality synthesized evidence of analgesic benefits of these three pain reduction strategies for short lasting painful procedures.^{15–17,19} The good news, however, is that the findings, similar to other more recently conducted studies, do show some improvement in use of pain reduction strategies for newborn infants during painful procedures.^{3,21,26,31} For example, a comparison of Australian newborn infant pain management studies over a six-year period showed an increase from less than 50% of units using BF for procedural pain, up to 78%, and an increase in use of sucrose from 10% of units up to 53% of units.²⁶ Similar to this current study, the Australian survey showed wide variation in use of pain reduction strategies. A comparison of practices in Canadian NICUs over a 12-year period showed a reduction in the number of painful procedures performed and an increase in use of sucrose.^{3,38} However, BF and SSC for painful procedures, although not reported in the original study,³⁸ were rarely used in Canadian NICUs.³ This current study, showing that SSC with the mother was used *often* for pain reduction during heel lance in one-third of units, therefore shows some improvement compared to the most recent study of Canadian NICUs.³ Despite some improvements in practices over time, this current provincial-wide survey shows that use of pain reduction for painful procedures still falls short of recommendations in guidelines or standards of care produced by national and international professional associations calling for consistent

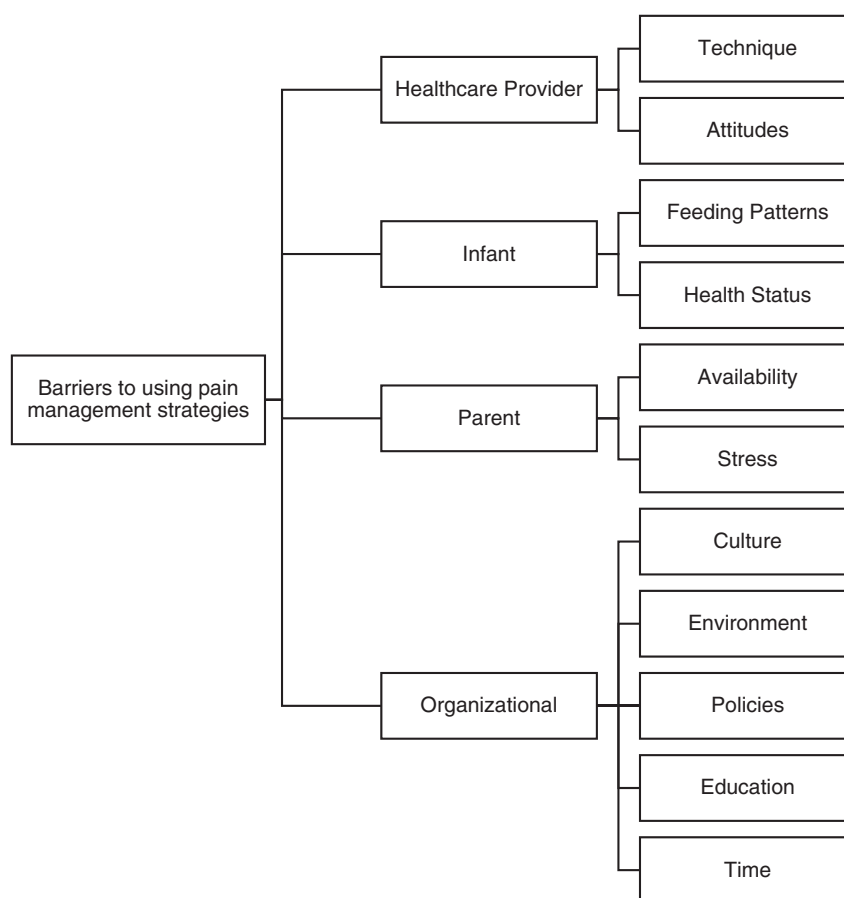


Fig. 4. Barriers to using BF, SSC, and sweet solutions during heel lance and venipuncture.

use of pain reduction strategies for newborn infants during painful procedures.^{20,23,39–42}

Such variable and ongoing low utilization of the three effective, simple, natural, easy to use and cost effective strategies of BF, SSC or sucrose,⁴³ is frustrating. Parental refusal to use sucrose was cited by six of the 24 respondents who answered this section. The question needs to be asked why, and how, this refusal was established, and if parents in these units were fully informed of the risks of untreated pain and the effectiveness and safety of small volumes of sucrose in the context of short lasting painful procedures. Similarly, in a Canadian-wide study of protocols concerning sucrose for procedural pain in neonatal units, parental refusal was cited as a contraindication in 12 (21%) neonatal units.²³ It must be questioned if parents in these units are asked permission to use other analgesics, or indeed any treatments, or if this option of treatment refusal is limited to sucrose alone.

The exploration of barriers to supporting mothers to BF, or family members to use SSC during painful procedures, or the use of sweet solutions contributes important information to the understanding of sub-optimal pain reduction practices for newborn infants. Interventions tailored to prospectively identified barriers are more likely to improve practices than simply disseminating guidelines.⁴⁴ Barriers to using pain reduction interventions during procedural pain for newborn infants were also explored in two other surveys, targeted at members of the National Association of Neonatal Nurses (NANN).^{45,46} Both surveys included questions relating to knowledge, education, evidence, and guidelines and, similar to results of this current survey, the two NANN member surveys reported a lack of staff knowledge and education concerning effective pain reduction strategies for newborn infants during painful procedures. This highlights the need for education, especially

relating to the optimal positioning of the mother and infant during BF, or the person holding the infant SSC and the HCP performing the blood sampling. HCPs need to ensure their positioning and blood sampling techniques are safe for themselves, the infants, and the parents/other caregivers.

The more recent survey of NANN nurses included questions specifically relating to the role of parents in newborn pain care.⁴⁶ Only 28% of nurses *strongly agreed* and 33% of nurses *agreed* with the statement that parents should be involved with the comfort of their infants during painful procedures. The response category *neutral* for this question was selected by 22% of respondents and 7% *disagreed* or *strongly disagreed* with the statement. These responses resonate with the results of this current survey, relating to the poorly acknowledged role of parents, and the perceived barriers to using parental comforting during heel lance and venipuncture. Specific barriers to supporting mothers to BF and mothers or other family members to using SSC during painful procedures, as perceived by the unit manager respondents in this current study included: mothers were too stressed to be involved in supporting their infants during painful procedures; hospital routines of drawing blood early in the morning did not support parents being present; and concerns about skill, technique and ergonomics of drawing blood while the infants were being held. Importantly, there was a perception concerning HCP attitude that some staff simply preferred to complete bloodwork without the presence of parents. Similarly, Levin et al, the investigator of the landmark study of 24-hour care by mothers in an NICU conducted over three decades ago in Estonia,⁴⁷ recently commented that HCPs “resisted being observed by parents, and having to explain the procedures undertaken” (page 300). This preference to perform painful procedures without the attendance of parents is at odds with the values of family centered care in the NICU,^{48,49}

or the more recently coined, family integrated care,^{47,50,51} and with parents' needs. Neonatal care should essentially be a true partnership between the family and HCPs.^{48–50} The fact that parents report that they wish to know more about effective ways to reduce pain, and how to participate in comforting their infants during painful procedures^{52,53} further highlights the need for HCPs to embrace the culture and practices of family centered/family integrated care. In addition, studies indicate that hospitalized infants whose mothers are present during painful procedures are more likely to receive pain reduction strategies compared to infants whose mothers are not present,³ highlighting a positive influence of parents. Despite the espoused benefits of parent participation in care for the infants as well as the parents, this recent quote from a study conducted in a NICU encapsulates a key aspect of newborn care in our current "Westernized society": "Some parents have described themselves as 'voyeurs' who are 'allowed' to visit and hold their infants" (page 1).⁵⁰

Increasing use of pain reduction strategies during the commonly occurring painful procedures of heel lance and venipuncture requires further effective KT efforts at all levels of organizations as well as a philosophy of true partnership with families. An important factor in improving use of pain reduction strategies will be to go beyond the individual infant, parent and HCP to ensure sustainable changes to system delivery and the organizational culture of newborn care. In the past, nurses have been described as "gatekeepers" to hospitalized infants.⁴⁸ Despite the growth of the family centered care movement in neonatal care since the 1990's,⁵⁴ based on the reported barriers to reducing infants' pain during painful procedures in this current study as well as the two studies of NANN nurses, it seems as if nurses are still too often acting as "gatekeepers",^{45,46} and HCPs have not fully embraced supporting parents to comfort their infants during painful procedures.⁴⁸ Organizational support to support mothers to BF or provide SSC, or fathers or family members/friends to provide SSC during non-urgent painful procedures,^{43,55} involves HCPs embracing a cultural shift, to seeing the parents as the key caregiver, with the HCP role as supporting the parents in this role. To this end, in partnership with parents of infants, two parent-targeted social-media delivered videos have been developed and disseminated to support parents to advocate for their infants and use BF, SSC or sucrose as appropriate during painful procedures (<http://tinyurl.com/BSweet2newborns> and <https://www.youtube.com/watch?v=3nqN9c3FWn8>). The effectiveness of social-media delivered interventions in changing practices is not yet known; however, these videos are early examples of interventions developed in partnership with parents of infants, to empower parents to partner with HCPs in their infants' pain care.

Systems level approaches to KT in the province where this survey was conducted are underway. In partnership with BORN Ontario,⁵⁶ pain reduction data elements during newborn screening were added to the BIS in April 2014. All sites have access to their own data for audit and feedback and BORN Ontario regularly reports on aggregated outcomes.⁵⁶ Ongoing data validation processes, quality checks and training sessions for data collectors assure high levels of data quality,⁵⁷ and data are routinely used to identify gaps and variability in practices to facilitate practice change.^{58,59} Building on this current baseline survey, the use of these data centrally and by individual units will enable monitoring of trends and will inform the development of KT interventions to improve uptake of pain reduction strategies.

Strengths and Limitations

A major strength of this study is that the research went beyond describing the nature and frequency of pain treatment strategies by including an exploration of barriers to using evidence-based recommended procedural pain reduction interventions for newborn infants in clinical care. These data provide some explanation for the quantitative data, and set the scene for further in-depth exploration of facilitators and barriers to using the three recommended pain reduction interventions. A key limitation is that the targeted respondents were

unit managers or their nominees. Although it was felt that the data that they provided would be considered representative of the broader practices of nurses in maternal newborn and NICUs, there is also the risk that these personnel may not be fully aware of the actual clinical practices in their unit.

The sample was also limited to one province in Canada, and the sample size was relatively small—less than 50% of the targeted units. This was despite four email reminders, considered effective in maximizing response rate yet without participant harassment.^{34,60} The reminders resulted in 25 additional surveys being completed after the first mail out invitation. However, in 17 instances, the email invitation never reached the target personnel, highlighting the challenges in ensuring that email mailing lists used in such studies are updated when personnel change roles or leave their positions. Finally, only one level 3 NICU participated in this study, yet these high acuity units are where repeated pain exposure is the highest. However, previously conducted studies have examined procedural pain exposure and treatment in level 3 NICUs in detail.^{1,3,61–63} Therefore, the findings of this study of low frequency of use of BF and SSC in primarily low acuity units where infants are healthy and born at or near term and can therefore usually be BF or held SSC during non-urgent blood work, are of concern.

Conclusion

Nearly two decades ago, the question was asked "The ethical imperative to treat pain in infants: are we doing the best we can?"⁶⁴ Based on the findings of this current survey, and other similar findings of studies conducted around the world in the recent past,^{3,21,26,31} the answer is unfortunately still, "No". Although only nursing unit leaders participated in this current survey, as a community of parents of infants, clinicians, health care researchers, organizational leaders and funders of research, we need to do more to ensure no newborn infant unnecessarily undergoes a painful procedure without provision of effective pain reduction. We have the evidence on the effectiveness of feasible, simple, cost effective options. We now need all key stakeholders to become involved in the sustained implementation of pain treatment strategies; we need to embrace a culture which views parents as the primary carers of their newborns, even in the NICU; and we need to be committed to providing the best pain care to our youngest members of society.

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