MODULE 2:CURRENT EVIDENCE; THE WHY, WHAT, AND HOW

Eliminating/reducing needle pain in children

January 2020

WHY CHANGE ?

What are children most afraid of when coming to the hospital or clinic ?

- Friedrichsdorf S, Eull D, Weidner C, Wilke, C; Children Are Afraid of Needle Pokes. *Journal of Things We Already Knew.* 2018:(1)1:1-518

Current state

- Most children receive a minimum of 18 needle procedures, in their first 15 months.
- **Some parents are concerned primarily about the pain associated with immunizations.**

  http://pediatrics.aappublications.org/content/early/2016/08/25/ peds.2016-2146
- **Needle fear was the primary reason for immunization non-compliance** for 7% and 8% of parents and children, respectively

Taddio A, Ipp M, Thivakaran S, Jamal A, Parikh C, Smart S, Sovran J, Stephens D, Katz J. Survey of the prevalence of immunization non-compliance due to needle fears in children and adults. Vaccine 2012;30(32):4807-4812.

Current state

- Critically ill infant may experience >480 painful procedures during NICU stay

Carbajal, R., Rousset, A.,Danan, C., Coquery, S., Nolent, P., Ducrocq, S., et al. Epidemiology and treatment of painful procedures in neonates in intensive care units. The Journal of the American Medical Association 2008, 157, 1058-64.

- Neonates at 33 weeks gestational age admitted to NICU experienced an average of 11.4 painful procedures/day; 37% performed without any type of analgesia.

Roofthooft DW, Simons SH, Anand KJ, Tibboel D, van Dijk M. Eight years later, are we still hurting newborn infants? Neonatology. 2014;105(3):218-226.

- Undertreated pain in neonates creates changes in the central nervous system including mood regulation and cognitive

Attarian, S., Tran, L., Moore, A., Stanton, G., Meyer, E., and Moore, R. Neurodevelopmental impact of neonatal morphine administration. *Brain Science,* 2014; 4: 321-334. doi:10.3390/brainsci4020321

Current state

- Memory of previous painful experience has great influence on pain experience during subsequent procedures

Versloot J, Veerkamp JSJ, Hoogstraten J: Children's self-reported pain at the dentist. Pain 2008. 137:389-94

- Untreated pain can have long-term consequences including:
  - pre-procedural anxiety
  - hyperalgesia
  - needle fears
  - change in the central nervous system
  - avoidance of health care (including non adherence with vaccination schedules
- 25 % of adults have needle phobia

Taddio A, Chambers CT, Halperin SA, et al. Inadequate pain management during childhood immunizations: the nerve of it. Clin Ther 2009;31(Suppl 2):S152-67.)

Taddio A, Appleton M, Bortolussi R, Chambers C, Dubey V, Halperin S, et al. Reducing the pain of childhood vaccination: an evidence-based clinical practice guideline. CMAJ : Canadian Medical Association journal 2010 Dec 14;182(18):E843-55.

Current state

Patient and family experience

- Parents expect pain to be relieved

Forgeron PA, Finley GA, Arnaout M. Pediatric pain prevalence and parents' attitudes at a cancer hospital in Jordan. J Pain Symptom Manage. 2006; 31(5):440-8.

- Parents' greatest distress: failing to protect their child from pain

Tiedeman, M. (1997). Anxiety responses of parents during and after the hospitalisation of their 5 to 11 year old children. Journal of Pediatric Nursing, 12(2), 110-119.

Melnyk BM. Intervention studies involving parents of hospitalized young children: an analysis of the past and future recommendations. J Pediatr Nurs. 2000 Feb;15(1):4-13.

WHAT DOES EVIDENCE SUPPORT?

Evidence

4 Simple Steps to reduce or eliminate needle pain

- Topical anesthesia
- Sucrose or breast feeding
- Comfort positioning
- Distraction

#1 Numb the skin

Topical anesthetic

- To reduce pain at time of injection (encourage parents to) use topical anesthetics during vaccination of children (*grade A recommendation, based on level I evidence*).

Taddio A, Appleton M, Bortolussi R, Chambers C, Dubey V, Halperin S, et al. Reducing the pain of childhood vaccination: an evidence-based clinical practice guideline. CMAJ : Canadian Medical Association journal 2010 Dec 14;182(18):E843-55.

- Insufficient evidence for use of skin-cooling techniques (vapocoolants, ice, cool/cold packs) to reduce pain at time of injection

#1 Numb the skin

Topical anesthetic

- Use numbing prior to all needle sticks
- 4% lidocaine
  - Apply 30 minutes prior to needle procedure
  - Cover with plastic wrap or tape to avoid getting in mouth or eyes
  - Wipe off prior to injection, prep skin per protocol
  - Can safely be left in place for 2 hours
  - Effect lasts for at least 1 hour after it is removed
  - Warm pack may be applied to speed up numbing process

#2 Sucrose or breast feeding

- Giving sucrose or breast feeding prior to painful procedures has been shown to significantly reduce pain in babies 12 months and younger
- Sucrose reduces pain and cry during painful procedure, such as venipuncture

Stevens B, Yamada J, Ohlsson A, Haliburton S, Shorkey A. Sucrose for analgesia in newborn infants undergoing painful procedures. Cochrane Database Syst Rev. 2016;7:CD001069.

- Breast feeding is effective in term infants (superior to sweetening agents?)

Shah PS, Herbozo C, Aliwalas LL, Shah VS. Breastfeeding or breast milk for procedural pain in neonates. Cochrane Database Syst Rev. 2012;12:CD004950.

#2 Sucrose or breast feeding

Giving sucrose or breast feeding prior to painful procedures has been shown to significantly reduce pain in babies 12 months and younger

- Sucrose (*Does not affect NPO status or Lab Values*)
  - Give solution 2 minutes prior to procedure
    (on pacifier, parents' finger, side of cheek)
  - Just drops are needed (taste triggers the effect)
  - Effect lasts for 4 minutes
  - Re-administer as needed during and after the procedure
- Breast feeding
  - Start 2-5 minutes before the procedure
  - Continue throughout

#3 Comfort Positioning

- For Children <6 months of age
  - Swaddle, warmth
  - Skin to skin (kangaroo care)
  - Facilitated tucking
  - Parent to hold

Johnston C, Campbell-Yeo M, Disher T, Benoit B, Fernandes A, Streiner D, Inglis D, Zee R. (2017). Skin-to-skin care for procedural pain in neonates. Cochrane Database of Systematic Reviews , Issue 2. Art. No.: CD008435. DOI: 10.1002/14651858.CD008435.pub3.

#3 Comfort Positioning

For Children > 6 months **Upright position is best**

- To reduce pain at the time of injection, do not place children in a supine position during vaccination (grade E recommendation, based on level I evidence). Taddio A, Appleton M, Bortolussi R, Chambers C, Dubey V, Halperin S, et al. Reducing the pain of childhood vaccination: an evidence-based clinical practice guideline. CMAJ : Canadian Medical Association journal 2010 Dec 14;182(18):E843-55.
- **Use of Restraint Never Supportive:** Restraining children for procedures makes them feel ashamed, humiliated, powerless

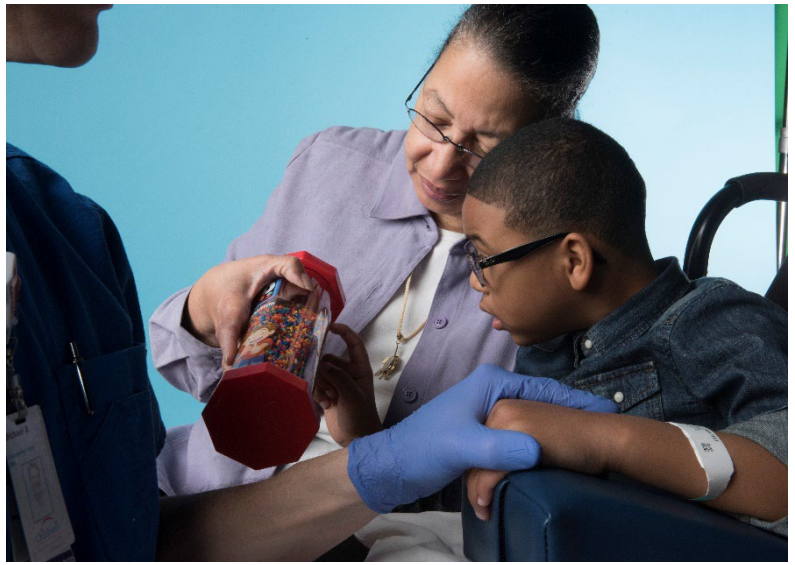
Karlson K, Darcy L, Enskär K: The Use of Restraint is Never Supportive (Poster) Nordic Society of Pediatric Hematology/Oncology (NOPHO) 34th Annual meeting 2016 and 11th Biannual Meeting of Nordic Society of Pediatric Oncology Nurses (NOBOS). May 27 - 31, 2016, Reykjavik, Iceland

#3 Comfort Positioning

- For Children > 6 months
  - **Upright position is best**
  - Preference is for parents to hold (cuddle)
  - Give children school age and older a choice

#4 Distraction

- Strong evidence that **distraction and hypnosis** effective in reducing pain and distress that children and adolescents experience during needle procedures
- Promising but limited/no evidence for preparation and information or both, combined CBT, parent coaching plus distraction, suggestion, or virtual reality



Uman LS, Birnie KA, Noel M, Parker JA, Chambers CT, McGrath PJ, Kisely SR. Psychological interventions for needle-related procedural pain and distress in children and adolescents. Cochrane Database of Systematic Reviews 2013, Issue 10

#4 Distraction

Encourage parents to actively distract their child with age appropriate options

- Favorite toy, comfort item
- Music, singing
- Breathing exercises, i.e., bubbles, pinwheels, tissues
- Books, find it sheets, stories

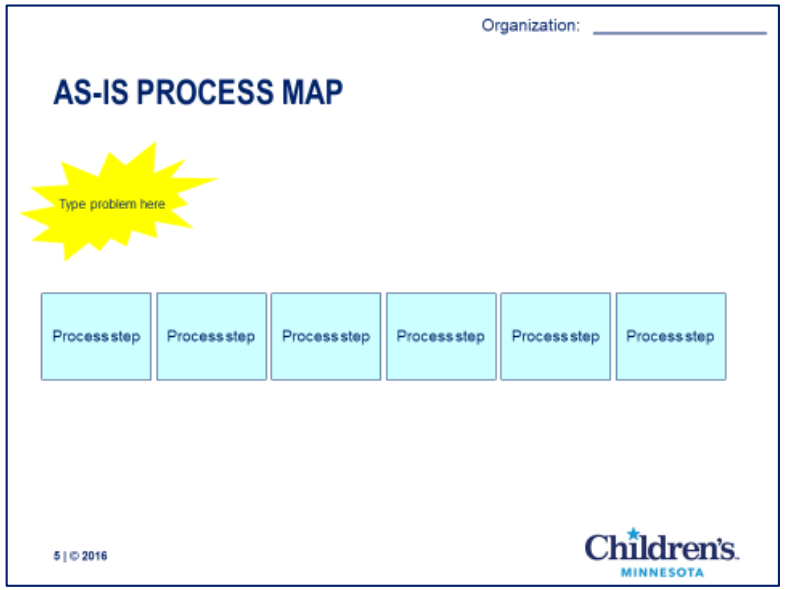
* Note this will look different in neonates

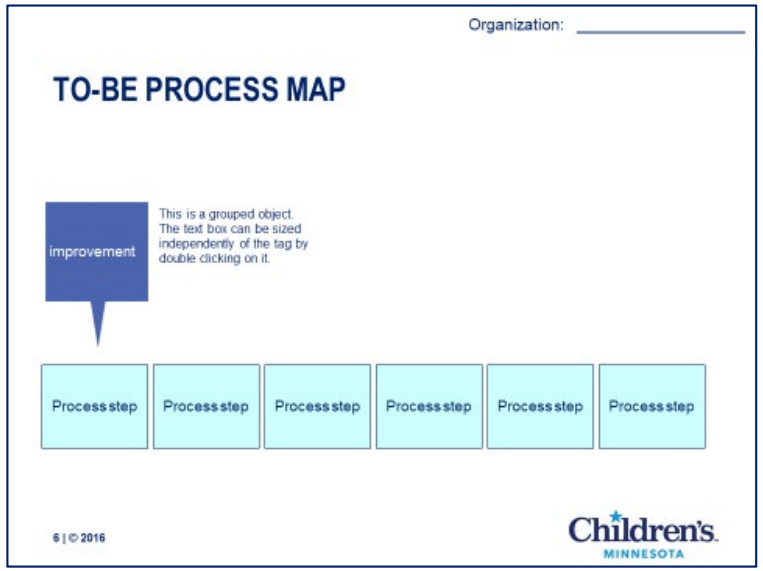
HOW TO IMPLEMENT

Map the process

- Current state vs desired state
- Identify opportunities (tasks)

Type Opportunity (gap) here





#1 Numb the skin

Tasks for topical anesthetic

- Who applies
  - For labs
  - For IV starts
  - For injections
- Process for families and staff for each
  - Where to obtain
  - How, when, and where to place
  - How to keep in place
  - Educational resources

#2 Sucrose or breast feeding

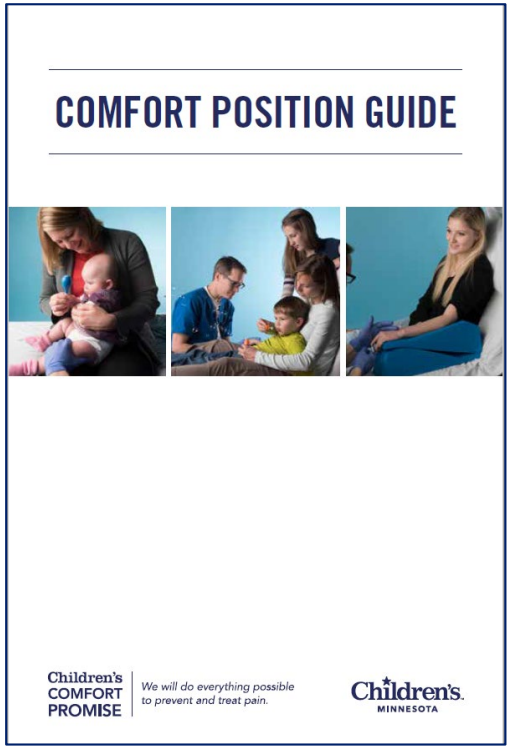
Tasks for sucrose and breast feeding

- Sucrose
  - How to stock and replenish
  - Where to keep
  - How to give (educational resources)
- Breast feeding
  - Look at ergonomics for staff
  - Provide education to staff
  - Education for parents

#3 Comfort Positioning

Tasks for comfort positioning

- Education/training for staff
- Education for families
- Quick resources for rooms



#4 Distraction

Tasks for distraction

- Select options
- Set up plan for ordering and restocking
- Set up cleaning and cues
- Staff education/training

Summary

- Parents and children expect we will do everything possible to reduce or prevent pain
- There is strong evidence for 4 simple steps to reduce needle pain
  - Numb the skin
  - Breast feeding or Sucrose
  - Comfort Positioning
  - Distraction
- Map the process
- Each step presents opportunities (gaps) which requires logistics

Homework

- Know the literature and research
- Assess current state for each of the 4 simple steps
- Where are the gaps?
- What are the solutions?
- Ask why?....and why not? (…and keep asking and listening)

References

Birnie KA, Chambers CT, Fernandez CV, Forgeron PA, Latimer MA, McGrath PJ, et al. Hospitalized children continue to report undertreated and preventable pain. *Pain Res Manag*. 2014;19(4):198-20

Birnie KA, Noel M, Chambers CT, Uman LS, Parker JA. (2018). Psychological interventions for needle-related procedural pain and distress in children and adolescents. Cochrane Database of Systematic Reviews, 10. Art. No.: CD005179. DOI: 10.1002/14651858.CD005179.pub4.

Bovier PA, Charvet A, Cleopas A, Vogt N, Perneger TV. (2004). Self-reported management of pain in hospitalized patients: link between process and outcome. *The American Journal of Medicine*, *117*(8):569-574.

Carbajal R, Rousset A, Danan C, Coquery S, Nolent P, Ducrocq S, et al. Epidemiology and treatment of painful procedures in neonates in intensive care units. *JAMA*. 2008;300(1):60-70.

Committee On F, Newborn, Section On A, Pain M. Prevention and Management of Procedural Pain in the Neonate: An Update. *Pediatrics*. 2016;137(2):e20154271.

Cowie, J., Nicoll, A., Dimova, E. D., Campbell, P., & Duncan, E. A. (2020). The barriers and facilitators influencing the sustainability of hospital-based interventions: a systematic review. BMC Health Services Research, 20(1), 1–28. https://doi.org/10.1186/s12913-020-05434-9

References

Curtis, S., Wingert, A. & Ali, S.(2012). The Cochrane Library and procedural pain in children: An overview of reviews. Evidence.-Based Child Health 7: 1363–1399. Published online in Wiley Online Library (http://www.evidence-basedchildhealth.com). DOI: 10.1002/ebch.1864

Eccleston C., Fisher E., Howard R.F., Slater R., Forgeron P., Palermo T.M., Birnie K.A., (...), Wood C. (2021). Delivering transformative action in paediatric pain: A Lancet Child & Adolescent Health Commission. *The Lancet Child and Adolescent Health, 5* (1) , pp. 47-87.

Edwards KM, Hackell JM, Committee On Infectious Diseases TCOP, Ambulatory M. Countering Vaccine Hesitancy. *Pediatrics*. 2016;138(3).

Foster JP, Taylor C, Spence K. (2017). Topical anaesthesia for needle-related pain in newborn infants.Cochrane Database of Systematic Reviews, Issue 2. Art. No.: CD010331. DOI: 10.1002/14651858.CD010331.pub2.

Friedrichsdorf SJ, Eull D, Weidner CA. Children's Comfort Promise: how can we do everything possible to prevent and treat pain in children using quality improvement strategies? (Commentary). *Pediatric Pain Letter*. 2016;18(3):26-30

Friedrichsdorf, S. J., Eull, D., Weidner, C., & Postier, A. (2018). A hospital-wide initiative to eliminate or reduce needle pain in children using lean methodology. Pain Reports, 3(7), 1–11. https://doi.org/10.1097/PR9.0000000000000671

References

Friedrichsdorf SJ, Postier A, Eull D, Weidner C, Foster L, Gilbert M, et al. (2015). Pain Outcomes in a US Children's Hospital: A Prospective Cross-Sectional Survey. *Hospital pediatrics*, *5* (1):18-26.

Gao H, Gao H, Xu G, Li M, Du S, Li F, et al. (2016). Efficacy and safety of repeated oral sucrose for repeated procedural pain in neonates: A systematic review. *International Journal of Nursing Studies*, *62*, 118-125.

Grunau RE, Whitfield MF, Petrie-Thomas J, Synnes AR, Cepeda IL, Keidar A, et al. (2009). Neonatal pain, parenting stress and interaction, in relation to cognitive and motor development at 8 and 18 months in preterm infants. *Pain, 143* (12), 138-146.

Guideline statement:(2006). Management of procedure-related pain in children and adolescents. Journal of Paediatric *Child Health, 42,* Suppl 1:S1-29.

Hamilton JG. (1995). Needle phobia: a neglected diagnosis. *Journal of Family Practice, 41*(2), 169-175.

Johnston CC, Collinge JM, Henderson SJ, Anand KJ. A cross-sectional survey of pain and pharmacological analgesia in Canadian neonatal intensive care units. Clin J Pain. 1997;13(4):308-312.

Lunoe MM, Drendel AL, Levas MN, Weisman SJ, Dasgupta M, Hoffmann RG, et al. A Randomized Clinical Trial of Jet-Injected Lidocaine to Reduce Venipuncture Pain for Young Children. Ann Emerg Med. 2015;66(5):466-474.

.

References

Lunoe MM, Drendel AL, Brousseau DC. The use of the needle-free jet injection system with buffered lidocaine device does not change intravenous placement success in children in the emergency department. Acad Emerg Med. 2015;22(4):447-451

Roofthooft DW, Simons SH, Anand KJ, Tibboel D, van Dijk M. Eight years later, are we still hurting newborn infants? *Neonatology*. 2014;105(3):218-226.

Schreiber S, Ronfani L, Chiaffoni GP, Matarazzo L, Minute M, Panontin E, et al. Does EMLA cream application interfere with the success of venipuncture or venous cannulation? A prospective multicenter observational study. Eur J Pediatr. 2013;172(2):265-268.

Shah PS, Herbozo C, Aliwalas LL, Shah VS. Breastfeeding or breast milk for procedural pain in neonates. Cochrane Database Syst Rev. 2012;12:CD004950.

Shah, V., Taddio, A., McMurtry, C. M., Halperin, S. A., Noel, M., Riddell, R. P., & Chambers, C. T. (2015). Pharmacological and combined interventions to reduce vaccine injection pain in children and adults systematic review and meta-analysis. Clinical Journal of Pain,

Shomaker K, Dutton S, Mark M. Pain Prevalence and Treatment Patterns in a US Children's Hospital. Hospital pediatrics. 2015;5(7):363-370Stevens B, Yamada J, Ohlsson A, Haliburton S, Shorkey A. (2016). Sucrose for analgesia in newborn infants undergoing painful procedures.Cochrane Database of Systematic Reviews, 7, Art. No.: CD001069.DOI: 10.1002/14651858.CD001069.pub5

References

Stevens BJ, Harrison D, Rashotte J, Yamada J, Abbott LK, Coburn G, et al.(2012). Pain assessment and intensity in hospitalized children in Canada. The journal of pain : official journal of the American Pain Society, 13 (9):857-865.

Stevens B, Yamada J, Ohlsson A, Haliburton S, Shorkey A. Sucrose for analgesia in newborn infants undergoing painful procedures. Cochrane Database Syst Rev. 2016;7:CD001069.

Taddio A, Appleton M, Bortolussi R, Chambers C, Dubey V, Halperin S, et al. Reducing the pain of childhood vaccination: an evidence-based clinical practice guideline. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne. 2010;182(18):E843-855

Taddio A, Chambers CT, Halperin SA, Ipp M, Lockett D, Rieder MJ, et al. Inadequate pain management during routine childhood immunizations: the nerve of it. Clin Ther. 2009;31 Suppl 2:S152-167.

Taddio A, Katz J, Ilersich AL, Koren G. Effect of neonatal circumcision on pain response during subsequent routine vaccination. *Lancet*. 1997;349(9052):599-603.

Taddio A, Parikh C, Yoon EW, Sgro M, Singh H, Habtom E, et al. Impact of parent-directed education on parental use of pain treatments during routine infant vaccinations: a cluster randomized trial. Pain. 2015;156(1):185-191.

References

Taddio A, Shah V, McMurtry CM, MacDonald NE, Ipp M, Riddell RP, et al. Procedural and Physical Interventions for Vaccine Injections: Systematic Review of Randomized Controlled Trials and Quasi-Randomized Controlled Trials. Clin J Pain. 2015;31(10 Suppl):S20-37.

Taddio A, Pillai Riddell R, Ipp M, Moss S, Baker S, Tolkin J, et al. Relative effectiveness of additive pain interventions during vaccination in infants. CMAJ. 2016.

Taylor EM, Boyer K, Campbell FA. (2008)Pain in hospitalized children: a prospective cross-sectional survey of pain prevalence, intensity, assessment and management in a Canadian pediatric teaching hospital. Pain Res Manag. 13(1):25-32 Twycross A, Collis S. How well is acute pain in children managed? A snapshot in one English hospital. Pain Manag Nurs. 2013;14(4):e204-215.

Uman LS, Birnie KA, Noel M, Parker JA, Chambers CT, McGrath PJ, et al. Psychological interventions for needle-related procedural pain and distress in children and adolescents. Cochrane Database Syst Rev. 2013(10):CD005179.

Valeri BO, Ranger M, Chau CM, Cepeda IL, Synnes A, Linhares MB, et al. Neonatal Invasive Procedures Predict Pain Intensity at School Age in Children Born Very Preterm. Clin J Pain. 2015.

Walther-Larsen S, Pedersen MT, Friis SM, Aagaard GB, Romsing J, Jeppesen EM, et al. Pain prevalence in hospitalized children: a prospective cross-sectional survey in four Danish university hospitals. Acta Anaesthesiol Scand. 2016

References

Videos

Canada I. Reduce the Pain of Vaccination in Kids and Teens. http://www.immunize.ca/uploads/pain/3p_kidsandteens_e.pdf Published 2014.

Minnesota CsHaCo. Children's Comfort Promise. http://www.childrensMN.org/comfortpromise Published 2016. Accessed 04/04/2016, 2016.

Nursing CsBStBrtatUoOsSo. Be Sweet to Babies. http://www.cheo.on.ca/en/BeSweet2Babies. Published 2014.

Research CfPP. It Doesn't Have to Hurt. http://itdoesnthavetohurt.ca. Published 2016.

Society CP. Reduce the Pain of Vaccination in Babies. http://www.caringforkids.cps.ca/uploads/handout_images/3p_babiesto1yr_e.pdf Published 2014.