

Pediatric Procedural Pain Management BMC Medication Guideline #16.55



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Section:	Pharmacy

Procedural Pain Management in Neonates through Adolescents

A. Introduction

PainFree Pediatrics is a program within the Department of Pediatrics whose purpose is to minimize the pain and discomfort associated with the care of pediatric patients at Boston Medical Center. The goal is to make pain management a fundamental component of pediatric care, and to provide education to patients, families, and the medical staff.

Procedural pain is a part of both routine and acute healthcare encounters. The purpose of this document is to assist providers in reducing this discomfort in safe and effective ways.

B. Pharmacologic Interventions

The following pharmacologic interventions are recommended for treatment of procedural pain in pediatric patients. Medications may be used alone or in combination. Non-pharmacological pain management techniques (Section D.) should also be used whenever possible.

1) Sucrose solution

- Sucrose is a carbohydrate, which has been used to reduce procedural pain in infants. Both the sucrose and the act of sucking combine to provide an analgesic effect.
- Sucrose is available as TootSweet™, a 24% solution in 2 ml unit dose vials from Materials Distribution.
- Dosing: Sucrose works best for neonates, but may be tried in infants up to 3 months.
 - Term infants: Slowly give 1.5 to 2 ml PO over 2 minutes, wait 2 minutes before starting the procedure, may give remaining 0.5 ml of sucrose on a pacifier or on gloved finger. Analgesia should persist for up to 8 minutes. The dose may be repeated once.
 - Preterm infants:

Gestational age	Dose
<28 weeks	0.2 ml swabbed into mouth
28-32 weeks	0.2-2 ml depending upon suck/swallow
>32 weeks	2 ml

2) L.M.X.4™

- L.M.X.4 (formerly called ELA-Max) is 4% lidocaine cream. It is an over-the-counter medication. The cream is applied to the skin in a thick layer. Use of an occlusive dressing is not necessary for effect, but will help to hold the cream in place. It is safe for use in all patients, including newborns*.
* See reference – Lehr et al. Use in preterm infants has not been evaluated.
- Onset of anesthesia: 15-45 minutes.
Duration of anesthesia: 1 hour, increases with longer application time.
- L.M.X.4 does not contain prilocaine, so methemoglobinemia is less of a risk than with EMLA™ cream (*EMLA™ cream was removed from the BMC formulary 10/2005, and therefore will not be discussed in this guideline*).

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- L.M.X.4 Dosing:

Age and Weight	Maximum Dose/ Application Area	Maximum Application Time
Less than 1 yr OR less than 10 kg	< 100 cm ² (4x4 in)	1 hour
1 to 6 years AND 10 – 20 kg	< 200 cm ² (5.5 x 5.5 in)	2 hours
7 to 12 years AND greater than 20 kg	< 600 cm ² (9x9 in)	2 hours

May be used with or without an occlusive dressing. Adequate anesthesia may be achieved 10-15 minutes faster with occlusion.

3) Numby Stuff™ (Also see BMC Policy & Procedure manual)

- Numby Stuff is a mechanical device that delivers Iontocaine™ (lidocaine 2% and epinephrine 1:100,000) solution through the skin via iontophoresis (electrical impulses).
- The dose is always 1 ml.
- Onset of anesthetic effect: 10-20 minutes depending upon what voltage of electrical current is used.
Duration of anesthesia: 1 hour after placement.
- The grounding/dispersive electrode often causes transient discomfort to the child. Numby Stuff may be used in patients > 1 year of age, but patients under five years should have an adult to act as ground. The following interventions may be helpful:
 - remove all metal/jewelry
 - place the grounding/dispersive electrode on another adult and maintain skin to skin contact
 - apply pressure to both the grounding/dispersive and medication electrodes,
 - distract the patient
 - run the machine at the lowest setting (2 mA/min)
- Adverse Effects:
 - Numby Stuff should only be applied to intact skin.
 - Due to the vasoconstrictive action of epinephrine, Numby Stuff should not be placed on any body parts that are supplied by end arterioles: fingers, toes, earlobes, penis.
 - Persons with a pacemaker should not have either electrode placed on them.
 - Halt the procedure if persistent discomfort occurs despite the above-mentioned interventions.
 - Discomfort and local irritations may be more common in patients with light colored skin.

4) Vapocoolant spray

- Vapocoolant sprays cause a transient freezing of the skin surface. The anesthetic effect begins immediately after application, but lasts less than 1 minute. Vapocoolant should only be applied to intact skin. All vapocoolants may cause hypopigmentation of the skin, and should not be used in patients with peripheral vascular conditions.
- The formulary agent at BMC is Instant Ice™ Mist spray.
- Other non-formulary products include ethyl chloride, PainEase™, Spray and Stretch™, and Fluro-Ethyl™.
- Application: May be applied by direct spraying or with a saturated cotton ball.
 - Spray technique:
 - 1) Hold the spray can 3 to 9 inches away from the site.
 - 2) Spray to desired area for up to 10 seconds for Instant Ice™, or until a white frost is immediately noted. Avoid getting the spray into the face.
 - 3) Immediately swab with alcohol and perform the procedure.

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- Cotton ball technique (less effective, and not recommended with Instant Ice™ spray):
 - 1) Place a cotton ball in a medicine cup and spray into the cup for 10 seconds.
 - 2) Apply the cotton ball to the desired area using forceps and hold for 15 seconds.
 - 3) Immediately swab with alcohol and perform the procedure.

5) Local Infiltration with Lidocaine

- Alkalinizing (buffering) lidocaine before infiltration will reduce pain.
- Mix one part of sodium bicarbonate with nine parts lidocaine 2% (1:10 ratio). Inject the solution with a small (27 or 30 gauge) needle.
- Buffered lidocaine may be better tolerated when the superficial tissues have been previously anesthetized using LMX4, Numbly Stuff, or vapocoolant. When injecting multiple times, inject through previously anesthetized areas.

6) LET Solution (Replaces P&T Medication Guideline: LET Solution for Pediatrics)

- LET solution is a topical gel mixture consisting of lidocaine 4%, epinephrine 0.1% and tetracaine 0.5%. It may be applied to simple lacerations in children over 6 months of age. LET is prepared by the Pharmacy Department and must be stored in the refrigerator.
- Onset of action is 15 to 30 minutes, duration of anesthesia is 45-60 minutes.
- Application:
 - 1) Apply LET within the margins of the wound using a cotton swab, or a syringe without a needle.
 - 2) Place a cotton ball saturated with LET into the wound and secure this with tape. If necessary, have the parent/guardian hold it in place while wearing a glove.
 - 3) Assess anesthesia within 15-30 minutes after application. If wound is still not anesthetized, LET may be reapplied as above.
 - 4) Proceed with wound care (irrigation) and laceration repair as per wound care management policy after wound is anesthetized.
- Contraindicated in children < 6 months, and for use on fingers, toes, earlobes, wings of nostrils, and the glans of the penis due to the vasoconstrictive action of epinephrine.

7) Hurricaine™ spray

- Hurricaine spray is benzocaine 20%, a topical anesthetic used on mucous membranes.
- Application: Hold can 1-2 inches away from area to be anesthetized. Spray for no longer than 0.5 - 1 second. May repeat every 6 hours as needed.
- Onset of anesthesia: 30-60 seconds.
Duration of anesthesia: 12-15 minutes
- Adverse effects:
 - Suppresses gag reflex if swallowed.
 - Methemoglobinemia is a potential risk, especially with frequent use and use in children < 2 years of age. As with all medications, Hurricaine spray should not be left at a patient's bedside.

8) Conscious sedation

Refer to the BMC Pediatric Conscious Sedation Policy.

9) Anesthesia

General anesthetics may be appropriate for some patients depending upon the amount of anticipated pain and the anxiety level. These agents may only be given by anesthesiologists in controlled settings.

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10) Oral and parenteral medications (opiates, benzodiazepines, etc.)

This guideline does not go into detail for dosing these medications. When pre-medicating a patient, it is essential to consider that medication's time to onset. The Pediatric Dosage Handbook and Harriet Lane are two good references for medication dosing, contraindications, and timing.

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C. Guidelines for Choosing Appropriate Agents for Management of Painful Procedures.

Unless specified in the **Nurse-Driven Protocol** (Section E), all medications require a specific MD order.

Procedure	Age*	Pharmacologic Interventions
Abscess I&D	All ages	<ul style="list-style-type: none"> • Vapocoolant • Local infiltration with buffered lidocaine • Opiate IV • For further management BMC Pediatric Conscious Sedation Guidelines
Arterial, Non-Tunneled Central and PICC line placements	Preterm Infants	<ul style="list-style-type: none"> • Sucrose protocol • LMX4 • Consider opiate IV when there is IV access • For further management BMC Pediatric Conscious Sedation Guidelines
	Term Infants to Adolescents	<ul style="list-style-type: none"> • Sucrose Protocol (if under 3 months of age) • LMX4 • Local infiltration of buffered lidocaine • Opiate or anxiolytic IV • For further management see BMC Pediatric Conscious Sedation Guidelines
Arterial Puncture or Catheter	Preterm Infants	<ul style="list-style-type: none"> • Sucrose protocol • LMX4 • For further management see BMC Pediatric Conscious Sedation Guidelines
	Term Infants	<ul style="list-style-type: none"> • Sucrose Protocol (if under 3 months of age) • LMX4 • Local infiltration of buffered lidocaine
	Children and Adolescents	<ul style="list-style-type: none"> • LMX4 or Numby Stuff • Local injection of buffered lidocaine
Bone Marrow Aspirate	All ages	<ul style="list-style-type: none"> • LMX4 or Numby Stuff • Local infiltration of buffered lidocaine • For further management see BMC Conscious Sedation Guidelines
Bone Marrow Biopsy	All ages	<ul style="list-style-type: none"> • LMX4 or Numby Stuff • Local infiltration of buffered lidocaine • For further management see BMC Conscious Sedation Guidelines • Consider general anesthesia
Burn Dressings-Minor	All ages	<ul style="list-style-type: none"> • Pre-medicate with oral opiate • Consider PO anxiolytic • Option of single dose of opiate IV for analgesia
Burn Dressings-Major	All ages	<ul style="list-style-type: none"> • For further management BMC Pediatric Conscious Sedation Guidelines • General anesthesia when appropriate

For use of an IV or PO opiate, anxiolytic, or anesthetic agent, please consult a medication dosing reference and the appropriate BMC policy.

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Procedure	Age*	Pharmacologic Interventions
CVL removal-tunneled	Term infants to adolescents	<ul style="list-style-type: none"> • LMX4 to exit site • Local infiltration with buffered lidocaine • Consider oral midazolam • Consider conscious sedation or general anesthesia if very anxious or if established line with cuffs firmly adhered
Circumcision	Less than 6 months*	<ul style="list-style-type: none"> • LMX4 • Mogen clamp • Ring block or dorsal penile nerve block • Sucrose Protocol • Post-op acetaminophen x 24 hours <p>* may defer 2-6 months old until old enough for surgery under anesthesia</p>
	Over 6 months	<ul style="list-style-type: none"> • General anesthesia
Closed Reduction-Post Fracture	All ages	<ul style="list-style-type: none"> • See BMC Pediatric Conscious Sedation Guidelines • LMX4 to fracture site if using hematoma block •
Chest Tube Placement	Preterm Infants	<ul style="list-style-type: none"> • Sucrose protocol • Local infiltration with buffered lidocaine • Opiate IV
	Term Infants	<ul style="list-style-type: none"> • Vapocoolant • LMX4 • Local infiltration with buffered lidocaine • Sucrose protocol (if under 3 months of age) • Opiate IV • For further management BMC Pediatric Conscious Sedation Guidelines
	Children and Adolescents	<ul style="list-style-type: none"> • Vapocoolant • LMX4 or Numby Stuff • Local infiltration with buffered lidocaine • Opiate IV • For further management BMC Pediatric Conscious Sedation Guidelines
Chest Tube Removal	Preterm Infants	<ul style="list-style-type: none"> • Sucrose Protocol • Opiate IV
	Term Infants	<ul style="list-style-type: none"> • Sucrose Protocol (if under 2-3 months of age) • Opiate IV
	Children and Adolescents	<ul style="list-style-type: none"> • Opiate IV

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Procedure	Age*	Pharmacologic Interventions
Heelsticks	Preterm Infants	<ul style="list-style-type: none"> Sucrose Protocol
	Term Infants	<ul style="list-style-type: none"> Sucrose Protocol (if under 2-3 months of age)
Implanted Port	All ages	<ul style="list-style-type: none"> LMX4 or Numby Stuff before access
Injections	Preterm Infants	<ul style="list-style-type: none"> Sucrose Protocol LMX4
	Term Infants	<ul style="list-style-type: none"> Sucrose Protocol (if under 2-3 months of age) LMX4 Vapocoolant Lidocaine 1% mixed with ceftriaxone IM
	Children and Adolescents	<ul style="list-style-type: none"> Vapocoolant Consider LMX4 Consider Numby Stuff Lidocaine 1% mixed with ceftriaxone IM
IV Placement	Preterm Infants	<ul style="list-style-type: none"> Sucrose Protocol
	Term Infants	<ul style="list-style-type: none"> Sucrose Protocol (if under 2-3 months of age) Vapocoolant LMX4
	Children and Adolescents	<ul style="list-style-type: none"> Vapocoolant LMX4 or Numby Stuff Local injection of buffered lidocaine
Lumbar Puncture	Preterm Infants	<ul style="list-style-type: none"> Sucrose Protocol LMX4 Consider local infiltration of buffered lidocaine
	Term Infants	<ul style="list-style-type: none"> Vapocoolant LMX4 Sucrose Protocol (if under 2-3 months of age) Local infiltration of buffered lidocaine
	Children and Adolescents	<ul style="list-style-type: none"> Vapocoolant LMX4 or Numby Stuff Local infiltration of buffered lidocaine Midazolam PO or IV

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Procedure	Age*	Pharmacologic Interventions
NG/OG Tube Placement	Preterm Infants	<ul style="list-style-type: none"> • Sucrose Protocol • Scant amount of lidocaine jelly
	Infants, Children and Adolescents	<ul style="list-style-type: none"> • Sucrose Protocol (if under 2-3 months of age) • Hurricane Spray • Lidocaine jelly to tube tip
Penile Adhesions	All ages	<ul style="list-style-type: none"> • LMX4 • For extensive adhesions general anesthesia
Skin Testing	All ages	<ul style="list-style-type: none"> • No method of topical anesthesia has been shown to be effective without interfering with test results
Suturing		<ul style="list-style-type: none"> • LET • Midazolam PO or IV • Local infiltration of buffered lidocaine
Tympanocentesis	All ages	<ul style="list-style-type: none"> • Ibuprofen PO • Midazolam PO
Umbilical Line	Preterm Infants	<ul style="list-style-type: none"> • Sucrose Protocol • Avoid suturing or clamping the skin around the umbilicus
Urinary Catheterization	Preterm Infants	<ul style="list-style-type: none"> • Sucrose Protocol • Scant amount of lidocaine jelly
	Term Infants to Adolescents	<ul style="list-style-type: none"> • Sucrose Protocol (if under 2-3 months of age) • Lidocaine jelly to catheter tip
Venipuncture	Preterm Infants	<ul style="list-style-type: none"> • Sucrose Protocol
	Term Infants	<ul style="list-style-type: none"> • Sucrose Protocol (if under 2-3 months of age) • LMX4 • Vapocoolant
	Children and Adolescents	<ul style="list-style-type: none"> • LMX4 or Numby Stuff • Vapocoolant

For use of an IV or PO opiate, anxiolytic, or anesthetic agent, please consult a medication dosing reference and the appropriate BMC policy.

* **Preterm infants are defined as those infants less than 36 weeks gestation**

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D. Non-pharmacological Interventions for Managing Pain

Non-pharmacological interventions include approaches to pain management that do not involve medications. They are non-invasive strategies that increase comfort, improve coping and give children a sense of control. Either alone or in conjunction with pain medication, these strategies are proven successful for the reduction of pain and the associated anxiety. In an attempt to offer Family Centered Care, these techniques promote parental involvement and satisfaction. Non-pharmacological techniques are very safe and easily accessible by all members of the health care team.

Method

Developmental Stages

	<i>Infants</i>	Toddler	Preschool	School-age	Adolescent
Art, Play, & Music	X	X	X	X	X
Breastfeeding	X				
Choices & Control		X	X	X	X
Deep Breathing			X	X	X
Deep Pressure and Massage			X	X	X
Distraction	X	X	X	X	X
Environment	X	X	X	X	X
Guided Imagery				X	X
Medical Play		X	X	X	X
Non-nutritive Sucking	X				
Positioning	X	X	X	X	X
Post Procedural Comforting	X	X	X	X	X
Parental Involvement	X	X	X	X	X*
Preparation	X**	X***	X	X	X
Relaxation	X**	X***	X	X	X
Skin to Skin Contact	X				
Swaddling	X	X			
Warm Packs	X	X	X	X	X

*Involve parents with permission from child

**Provide information for parents

***Provide information for parents and appropriate interventions for child

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E. Nurse-Driven Protocol for Procedural Pain Management

When an MD or NP writes for pain control medications “per PainFree Protocol” the following orders may be carried out. Protocol management means that the nurse will choose and administer pharmacologic and non-pharmacologic measures according to this guideline considering age, developmental level, type of procedure and medication characteristics. Documentation of the method chosen and the outcome should be written in the medical record.

- 1) Sucrose: 0.2-2 ml (depending upon gestational age) PO x 1 dose given 2 minutes prior to procedure for patients up to 3 months of age

Gestational age	Dose
<28 weeks	0.2 ml swabbed into mouth
28-32 weeks	0.2-2 ml depending upon suck/swallow
>32 weeks	2 ml

- 2) L.M.X.4 Cream (formerly called Ela-Max): apply to skin at least 15-45 minutes prior to needlestick
May use with or without an occlusive dressing.
Not for use in Preterm Infants.

Age and Weight	Maximum Dose/ Application Area	Maximum Application Time
Full term, Less than 1 yr AND less than 10 kg	< 100 cm ² (4x4 in)	1 hour
1 to 6 years AND 10 – 20 kg	< 200 cm ² (5.5 x 5.5 in)	2 hours
7 to 12 years AND greater than 20 kg	< 600 cm ² (9x9 in)	2 hours

- 3) Numby Stuff: 1 ml of Iontocaine™ or lidocaine 2% with epinephrine 1:100,000 by iontophoresis prior to procedure for children over 1 year of age
- 4) Vapocoolant spray: Spray on skin up to 10 seconds (Instant Ice™) immediately prior to needlestick.

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References:

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