POLICY NAME:	**Parenteral Lidocaine for Pain Management**
POLICY NO:	**C.PT.08**
REFERENCE:	**HOSPICE WIDE**
AREA/DEPARTMENT:	**CLINICAL**

Purpose

This protocol provides evidence-based guidelines for the use of parenteral lidocaine in pediatric palliative care patients with difficult-to-manage neuropathic, nociceptive, and/or severe, opioid-resistant pain.

Background

Lidocaine is an analgesic, anti-hyperalgesic, and anti-inflammatory drug that works by blocking the sodium channel so nerve cells cannot depolarize and transmit pain signals to the brain. Lidocaine is also a potent anti-arrhythmic used in cardiac care.

Systemic lidocaine for pain management is administered by two principal methods: intermittent infusion or continuous infusion. The administration method is selected based on the characteristics of the child's pain, underlying disease, anticipated trajectory, and goals of care.

Indications and Patient Criteria

- the child/youth's pain syndrome is considered lidocaine-responsive
- the child/youth's pain is not amenable to the use of topical lidocaine
- the child/youth has a diagnosis of neuropathic pain syndrome or Opioid-Poorly Responsive Pain (OPRP) on the basis of:
    - descriptors of the quality of the pain – burning, stabbing, shooting, electric shock-like
    - the presence of hyperalgesia and/or allodynia
    - inadequate pain control despite trials of appropriate adjuvant therapies
    - presence of intolerable side-effects from high doses of opioids and other analgesics
- the child/youth has no contraindication to the use of systemic lidocaine
- the child/youth is capable of verbally communicating analgesic response and symptoms of potential local anaesthetic toxicity

Contraindications

- Systemic lidocaine is not recommended for infants due to immature liver metabolism, leaving infants at greater risk for toxicity. Ideally, patients should be old enough to describe symptoms and side effects
- Major cardiac dysfunction (including heart failure, second or third degree heart block);
- Liver dysfunction
- Uncontrolled seizures
- Allergy to amide local anesthetics.

Dosing and Methods

1. **Lidocaine Challenge / Intermittent Infusion**

Purpose*:* a lidocaine challenge is given to determine whether a patient can tolerate lidocaine, if it is effective, and at what dose. Intermittent lidocaine doses over 45 – 120 minutes (dose dependent) can be given as a treatment approach whereby doses given on a bi-weekly (sometimes tri-weekly or monthly) basis disrupts pain for sustained periods.

Special Considerations: For initial lidocaine challenge infusions, a high-acuity environment (e.g. BCCH) is often the most appropriate location of care in case access to health care personnel skilled in resuscitation and airway management, and assessment and care of adverse effects is required. In end-of -life-circumstances, transfer to a high acuity setting for challenges or initiating is not required and the medication can be given at Canuck Place.

Dosing:
Infusion: 5 mg/kg delivered over 1 hour
Time between infusions: usually 1 month, but based on patient response

2. **Lidocaine Maintenance Infusion**

Purpose: to provide continuous pain relief in end-of-life situations with escalation and extreme pain not responsive to first-line medications (i.e. opioids). Continuous intravenous infusion (CIVI) or continuous subcutaneous infusion (CSCI) allows titration to the lowest effective dose and can be continued as CIVI/CSCI for days or weeks. Re-evaluation should occur after 1 week of infusion, and consideration needs to be made for risk of metabolite accumulation.

Special Considerations: children/youth receiving continuous IV lidocaine infusions will be cared for as inpatients at Canuck Place. .

Dosing:
Continuous infusion: 0.5-1.5 mg/kg/hr in children as young as 1 year of age, or higher for older children with refractory pain.

Ordering providers - Please see on CST: PED ANES Multi-Modal Pain Management for Age Greater than or Equal to 6 Months --> Ped Anes Lidocaine Infusion

Max Dosing: 1.5mg/kg/hr as per BCCH APS Lidocaine Infusion Order Set.

CAUTION: [prolonged] infusion rates of greater than 2 mg/kg/hr or plasma concentrations greater than 25 micromols/L would produce a substantial risk for seizures.

Practice Guideline and Procedure

Prior to initiating therapy

Most Responsible Prescriber (MRP - MD or NP) to:

1. Determine if patient appropriate for lidocaine therapy and discuss with patient/family.
2. Determine most appropriate method to administer (intermittent or continuous infusion)
3. Determine appropriate dose. Consider drug-drug interactions (see appendix A) and renal function.
4. Order lidocaine infusion using pre-printed order form. The standard concentration is 4 mg/mL in D5W for IV infusion and 20 mg/mL for subcutaneous infusion.

Nurse (RN) to:

5. Complete baseline assessment including:
   Patient weight
   Vital signs: Respiration rate, Heart rate, Blood pressure, Oxygen saturation (by pulse oximetry)
   Sedation level
   Pain assessment (use developmentally appropriate scale)

6. Obtain prepared lidocaine infusion bag from BCCH pharmacy

7. Set up infusion and program appropriate pump. Lidocaine intermittent/challenge doses are given on an Alaris pump, using the Critical Care profile. Continuous infusions are delivered using a CADD pump. Lidocaine is a high-alert medication. Follow the safety practices as outlined in C.ME.14 – High Alert Medications and C.PT.06 Standards for Infusion Practice

During Infusion

Prescriber (MD or NP) to:

8. Participate in initial hourly assessment and be prepared to intervene to manage adverse effects. Should remain easily accessible to patient and nurse (i.e. on 2nd floor) for duration of lidocaine challenge and at least 1st hour or until infusion safely established, for continuous infusions.

Nurse (RN) to:

9. Regularly assess and monitor patient vital signs and response (**BP, HR, RR, SpO2, pain score and sedation score**) following recommended frequencies:
   - For all infusions: check Q5 min x3, then q15 min x3 for the first hour; then
   - Q1 hour until the intermittent/challenge is completed, or Q1 hour x 1 for continuous and prn thereafter; then
   - Q30 min x 4 after dose change for maintenance continuous infusion lidocaine, then PRN
   - Q30 min x1 after the infusion is discontinued, then PRN

10. Regularly assess for lidocaine toxicity or adverse effects. For continuous infusion lidocaine, assess for toxicity symptoms Q4 hours throughout the duration of the infusion (but not required to wake patient for self-report of subjective symptoms/adverse effects, unless clinically indicated – e.g. managing previously identified toxicity)

Management of toxicity and adverse effects

The side effects of lidocaine are directly related to the serum lidocaine level. There is no specific serum target range for pain relief as each individual's response and requirements are different. Side effects are rare at plasma levels within the 4.3-12.8 mcmol/L (1-3 mcg/mL) range. Side effects are more pronounced in patients with liver dysfunction, pulmonary diseases where the predominant problem is carbon dioxide retention, and congestive heart failure. If early signs of toxicity are detected, decrease infusion and obtain serum lidocaine level. If symptoms do not resolve, the infusion should be discontinued. If more significant toxicity develops, lidocaine should be discontinued and supportive therapy initiated.

- **Mild** (usually seen at plasma levels 12.8-25.6 mcmol/L (3-6 mcg/mL)
    - Numbness and tingling in the fingers and toes
    - Numbness and unusual sensations around the mouth
    - A metallic taste in the mouth
    - Ringing in the ears
    - Lightheadedness and dizziness
        - **NURSING ACTION:** Reassure patient, pause infusion, consult prescriber and continue to monitor. Consider re-starting at lower dose/rate.

- **Moderate** (at plasma levels 25.6-38.4 mcmol/L (6-9 mcg/mL)
    - Visual or auditory disturbances
    - Dissociation
    - Muscle twitching
    - Drowsiness or agitation
    - Nausea/vomiting
    - Severe dizziness
    - Decreased hearing
    - Tremors
    - Changes in blood pressure and pulse. Changes in BP over three consecutive readings of plus or minus 20 mm Hg, or BP > 160 mm Hg systolic, or bradycardia (<50 bpm)
    - Unrest, tremor and facial twitching are signs of impending generalized convulsions
        - **NURSING ACTION:** Stop the infusion. Notify the MRP, reassure patient, and administer oxygen, midazolam or lorazepam if indicated. Consider rehydrating patient, drawing lidocaine levels, if IV access available.

- **Severe** (at plasma levels greater than 38.4 mcmol/L (9 mcg/mL)
    - Loss of consciousness
    - Confusion
    - Respiratory depression, dyspnea, perspiration, and short periods of apnea are signs of impending respiratory arrest
    - Convulsions
    - Cardiac arrhythmias
    - Cardiac arrest
        - **NURSING ACTION**: Stop the infusion. Notify the MRP. Administer oxygen, midazolam, diazepam, lorazepam or phenobarbital as ordered. Complete Incident Report. Consider rehydrating patient, drawing lidocaine level

In the event of a critical event and/or malfunction of the pump, secure the pump on the 2nd floor and notify the MRP. Do not clear information on the pump.

For Providers – See CST - Please refer to separate module for local anesthetic systemic toxicity: PED ANES Local Anesthetic Toxicity (Module)

Documentation

- Document lidocaine infusion on the Lidocaine Infusion Monitoring Log.

Related Policies

- C.ME.14 High-Alert Medications
- C.ME.02 Medication Administration
- C.ME.06 Communicating Medication Orders
- C.PT.03 Minimal Infusion Rates
- C.PT.06 Standards for Infusion Practice
- C.SAF.04 Child (Patient Identification)

References

Berde, C., Koka, A., & Donado-Rincon, C. (2016). Lidocaine infusions and other options for opioid-resistant pain due to pediatric advanced cancer. *Pediatric blood & cancer, 63*(7), 1141-1143.

Buck, M.L. (2013). Use of lidocaine for analgesia in children and adolescents. *Pediatric Pharmacotherapy, 19*(12).

College of Physicians and Surgeons of British Columbia (2014). *Pain infusion clinic standard.* Vancouver, BC. Author, Downloaded from https://www.cpsbc.ca/files/pdf/NHMSFAP-AS-Pain-Infusion-Clinic.pdf

Lauder, G. R. (2017). A review of intravenous lidocaine infusion therapy for paediatric acute and chronic pain management. In C. Maldonado (Ed). *Pain relief – From analgesics to alternative therapies* (63-109). Croatia, InTech Open. DOI: 10.5772/66771

Muir, J. (2016). *NCS6470 – Lidocaine IV low dose: neuropathic / post-op pain.* Vancouver, B.C., Providence Health Care.

Peixoto, R. D., & Hawley, P. (2015). Intravenous lidocaine for cancer pain without electrocardiographic monitoring: a retrospective review. *Journal of Palliative Medicine, 18*(4), 373-377. doi:10.1089/jpm.2014.0279

Taylor, L. Macpherson, N. & Kennedy, B. (2012). *Clinical protocol: administration of lidocaine infusions for opioid poorly responsive pain in adult hospice palliative care patients*. Vancouver, B.C., Fraser Health.

Thomas, J., Kronenberg, R., Cox, M. C., Naco, G. C., Wallace, M., & von Gunten, C.F. (2004). Intravenous lidocaine relieves severe pain: results of an inpatient hospice chart review. *Journal of Palliative Medicine, 7*(5). P 660-667.

Drugs that can increase levels of lidocaine, or increase its cardiac effects.

(Consider LOWER lidocaine dosing)

Acebutolol (Sectral®, Rhotral®)	Ketoconazole (Nizoral®)
ACIDOSIS	Labetalol (Trandate®, Normodyne®)
Amiodarone (Cordarone®, Pacerone®)	Lapatinib (Tykerb®)
Aprepitant (Emend®)	Levofloxacin (Levaquin®, Iquix®, Quixin®
Aprindine	Lopinavir (in Kaletra®)
Atazanavir (Reyataz®)	Lumefantrine (in Coartem®)
Atenolol (Tenormin®)	Macrolides (Not otherwise listed here)
Beta Blockers (Not otherwise listed here)	Methadone (Metadol™, Dolophine®)
Bicalutamide (Casodex®)	Methotrimeprazine (Nozinan®)
Bisoprolol (Zebeta®)	Metoprolol (Lopressor®, Toprol XL®)
Carvedilol (Coreg®)	Metronidazole (Flagyl®, Florazole® ER)
Celecoxib (Celebrex®)	Mexiletine
Chloroquine (Aralen®)	Mibefradil (Posicor®)
Chlorpromazine (Largactil®)	Mifepristone (Korlym™; Mifeprex®)
Cibenzoline	Moxifloxacin (Avelox®, Vigamox®)
Cimetidine (Tagamet®)	Nadolol (Corgard®)
Cinacalcet (Sensipar®)	Nefazodone (removed from market in Canada)
Ciprofloxacin (Cipro®, Cetraxal®,Proquin®),	Nebivolol (Bystolic®)
Clarithromycin (Biaxin®),	Nelfinavir (Viracept®)
Clomipramine (Anafranil®)	Nicardipine (Cardene®)
Clotrimazole (Canesten®)	Nilotinib (Tasigna®)
Clozapine (Clozaril®, FazaClo®)	Norfloxacin (Noroxin®)
Cocaine	Norfluoxetine (Seproxetine®)
Conivaptan (Vaprisol®)	Paroxetine (Paxil®, Pexeva®)
Cyclosporine (Sandimmune®)	Penbutolol (Levatol®)
Darifenacin (Enablex®)	Phenytoin (Dilantin®)
Darunavir (Prezista®)	Pindolol (Visken®)
Delavirdine (Rescriptor®	Posaconazole (Noxafil®, Posanol™)
Desipramine (Norpramin®)	Propafenone (Rythmol®)
Diltiazem (Cardizem®, Tiazac®)	Propranolol (Inderal®, InnoPran XL®)
Diphenhydramine (Allerdryl®, Benadryl®, Nytol®)	Pyrimethamine (Daraprim®)
Disopyramide	Quinidine
Dronedarone (Multaq®)	Quinine (Qualaquin®)
Duloxetine (Cymbalta®)	Quinolones (Not otherwise listed here)
Efavirenz (Sustiva®)	Ranolazine (Ranexa®)
Erythromycin	Ritonavir (Norvir®)
Esmolol (Brevibloc®)	Saquinavir (Invirase®)
Flecainide	Sertraline (Zoloft®)
Fluconazole (Diflucan®)	Sitaxsentan (Thelin™)
Fuoroquinolones (Not otherwise listed here)	Sotalol (Betapace®, Rylosol®, Sorine®)
Fluoxetine (Prozac®)	Telithromycin (Ketek®)
Fluvoxamine (Luvox®)	Terbinafine (Lamisil®)
Fosamprenavir (Telzir®, Lexiva®)	Tetracycline
Fosaprepitant (Emend® for Injection)	Thioridazine (Melleril®)
Haloperidol	Ticlopidine (Ticlid®)
Imatinib (Gleevec®)	Timolol (Blocadren®)
Imipramine (Tofranil®)	Tipranavir (Aptivus®)
Indinavir (Crixivan®)	Tranylcypromine (Parnate®)
Interferon	Verapamil (Calan®, Chronovera®, Covera, Isoptin® SR, Verelan®)
Isoniazid (Isotamine®)	
Itraconazole (Sporanox®)	Voriconazole (VFEND®)

Taylor, Macpherson, & Kennedy, 2012, pg. 20

Drugs that can decrease levels of lidocaine, or reduce its analgesic effects.

(Consider HIGHER lidocaine dosing):

Aminoglutethimide	Omeprazole
Barbiturates	Oxcarbazepine
Bosentan (Tracleer®)	Pentobarbital (Nembutal®) Long term
Carbamazepine (Tegretol®)	Phenobarbital (Luminal®) Long term
Dexamethasone	Phenytoin (Dilantin®) Long term
Efavirenz (Sustiva®)	Pioglitazone
Etravirine	Primidone (Mysoline®)
Fosphenytoin (Cerebyx®)	Rifabutin (Mycobutin®)
Glucocorticoids	Rifampin (Rifadin®, Rofact™)
Hypokalemia	Rifapentine (Priftin®)
Modafinil	St. Johns Wort
Nafcillin (Nallpen®, Unipen®)	Tobacco
Nevirapine	Troglitazone

Taylor, Macpherson, & Kennedy, 2012, pg. 21