Systemic Lidocaine for the Treatment of Pain - Adult/Pediatric - Inpatient/Ambulatory/Emergency Department Clinical Practice Guideline

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Introduction

Lidocaine is a sodium channel blocker classified as a type Ib antiarrhythmic and is an amide local anesthetic[1]. It is FDA approved for local and regional anesthesia as well as for the treatment of ventricular arrhythmia. Systemic lidocaine is used off label for the treatment of various pain conditions. In adults, lidocaine has been used to treat both acute and chronic pain conditions including, but not limited to, neuropathic pain[2], headache[3] and renal colic[4-8] and postoperative pain[9].

A Cochrane review of neuropathic pain conditions summarized the evidence of 16 randomized, double-blind, controlled trials, with doses ranging from 1-5 mg/kg. The authors concluded that systemic lidocaine is superior to placebo for controlling neuropathic pain. The included trials were small, and many were underpowered to detect significance. Studies enrolled patients with various types of neuropathic pain syndromes making it unclear if lidocaine is more effective for certain types of neuropathic pain compared to others. Evidence is not as strong when lidocaine is compared to other medications (ketamine, morphine and amantadine) used to treat neuropathic pain[2].

Lidocaine has used for cancer related pain control with varying results. Eleven patients with cancer related neuropathic pain received a 5mg/kg lidocaine infusion with no significant improvement in pain intensity[10]. Conversely, a case series detailed the use of continuous infusion lidocaine for the treatment of intractable pain in six hospice patients in the home setting with an average dose 44mg/hr (range 10-80mg/hr)[11]. A randomized, double blind, placebo-controlled crossover study was conducted in 50 patients with opioid refractory cancer pain and showed pain control was significantly improved with lidocaine (4mg/kg total dose) [12]. Subcutaneous lidocaine infusions (median dose 0.67 mg/kg/hr) were studied in twenty patients with cancer related pain and were deemed effective in 45% of patients[13].

Parenteral lidocaine has been studied in various headache subtypes, including chronic daily headache and acute migraine management, with variable results. Two retrospective reviews describe the successful use of continuous infusion lidocaine (dose range 1-4 mg/min for 2-15 days) for treatment of chronic headache in adults[14,15]. One study specifically describes its successful use in treating chronic daily headache associated with medication overuse (decreased average headache days per month = 29 to 15 after lidocaine infusion)[15]. Case studies describing IV lidocaine (dose range 1.3 mg/kg/hour to 3.3 mg/kg/hour) for short-lasting unilateral neuralgiform headache with conjunctival injection and tearing (SUNCT syndrome) have shown variable efficacy with some patients seeing minimal benefit, and most seeing benefit only during the lidocaine infusion[16,17]. Lidocaine for treatment of acute migraine or headache in the emergency room was shown to be no more efficacious than placebo when dosed at 1 mg/kg and given over 2 minutes[18]. A small randomized, single blinded study showed chlorpromazine to be significantly more effective than lidocaine (50mg boluses up to a max of 150mg) for the treatment of acute headache, and that lidocaine and dihydroergotamine have a similar effect on pain scores in patients with acute headache[19].

In patients with renal colic, lidocaine has been investigated as both monotherapy and adjuvant therapy to opioids. A randomized, double-blind trial compared IV lidocaine (1.5 mg/kg) to IV

morphine (0.1 mg/kg) for renal colic. Results indicate that lidocaine produced a greater reduction in pain score than morphine at 30 minutes (P = 0.0001)[5]. Another study compared lidocaine (1.5 mg/kg) and morphine (0.1 mg/kg) with morphine (0.1 mg/kg) alone for the treatment of renal colic. Pain scores were reduced in both groups but the between group reduction differences were not statistically significant. However, the combination of lidocaine and morphine produced a more rapid pain resolution. Additionally, the authors noted that the lidocaine/morphine group had a significant reduction in nausea-free time when compared to morphine alone[6].

Intravenous lidocaine infusions have shown to have an opioid sparing effect during the post-operative period when administered during abdominal surgery[20]. Additionally, lidocaine infusions have reduced the duration of postoperative ileus[21] and decreased length of stay by 8-24 hours[22]. Secondary to limited quality evidence, a 2018 Cochrane review, however, concluded that it is uncertain if lidocaine has a beneficial impact, when compared to placebo, for pain control, bowel recovery and on opioid consumption.[23]

In pediatric populations, lidocaine has been studied for use in neuropathic pain, refractory cancer pain, postoperative pain and headache. However, the evidence to support lidocaine for use in these pain conditions is mainly derived from case series and expert opinion.
A case series details the effectiveness of continuous IV lidocaine for dinutuximab-induced neuropathic pain in neuroblastoma patients[24]. There are also a case series[25-27]and expert opinion articles[28] that describe the successful use of continuous IV lidocaine for refractory cancer pain. Doses used for these indications range from 0.5-2 mg/kg/hour continuous infusion with or without a 1-2 mg/kg loading dose over 30 minutes[28]. One case study reports dose escalation up to 3.8 mg/kg/hour after more than 2 months of IV lidocaine therapy for severe neuropathic pain due to terminal cancer[27]. However, doses this high should only be considered in extreme circumstances where the benefit outweighs the risk of toxicity, and the patient still receives pain relief with an increase in dose.[28]

Continuous lidocaine has been used to successfully treat postoperative pain in children in a small randomized controlled trial.[29] The trial included 12 pediatric patients (age 1-6) who received lidocaine perioperatively at 1.5 mg/kg/hour. This infusion was initiated with a 1.5 mg/kg bolus 20 minutes before incision and continued for up to 6 hours post-procedure. Lidocaine levels were monitored, and no patient achieved a level >5 micrograms/ml. Patients receiving IV lidocaine had significantly shorter length of stay and significantly lower opioid consumption compared to the placebo group. Expert opinions support lidocaine for postoperative pain control as well.[30,31]

Additionally, a retrospective review in of adolescents demonstrates the effectiveness of intermittent IV lidocaine for the treatment of various kinds of chronic pain including headache, neuropathy, sickle cell disease, and skeletal pain[3]. In this study 15 patients underwent a total of 58 infusions and a decrease in pain score was reported after 41/58 infusions.

A 2018 retrospective review described the use of continuous lidocaine for refractory status migraine in 26 pediatric patients. After initiating a lidocaine 3 mg/kg loading dose over 90 min and then starting a continuous infusion at 1 mg/kg/hour (range 1.125-2.25 mg/kg/hour with titration), it took an average of 16 (+/- 12) hours to reduce patients' pain scores by 50% & 19 (+/- 19) hours to achieve complete resolution for the 28/31 patients who did achieve complete resolution. Unfortunately, 16/31 patients had relapse of pain at the time of discharge but were reported at significantly lower intensities than on admission[32].

Scope

Intended User(s): Physicians, Advanced Practice Providers, Nurses, Pharmacists

Objective(s): To provide evidence-based recommendations for the dosing, administration and monitoring of parenteral lidocaine for the treatment of pain at University Hospital inpatient units, infusion center, and emergency departments and at UW Health pain clinics.

Target Population: Adult and pediatric patients with acute, chronic (cancer and non-cancer) and postoperative pain conditions.

Clinical Questions Considered:

- *What indications and contraindications should be considered when using intravenous or subcutaneous lidocaine infusions for pain?*
- *Do patients need an ECG and baseline labs prior to initiation of lidocaine treatment?*
- *How is lidocaine dosed, how frequently should it be administered, and how should it be administered for pain?*
- *What are the monitoring parameters for lidocaine infusions?*
- *Should lidocaine levels be routinely ordered for patients receiving lidocaine for pain?*
- *What interventions should be used to treat adverse reactions to lidocaine?*

Definitions

- Adult – any patient > 18 years of age
- Pediatric – any patient > 1 month of age to 18 years of age
- Chronic pain – pain that persists beyond normal tissue healing time, which is assumed to be three months[33]
- Central pain syndrome (CPS) - a neurological condition caused by damage to or dysfunction of the central nervous system (CNS), which includes the brain, brainstem, and spinal cord. This syndrome can be caused by stroke, multiple sclerosis, tumors, epilepsy, brain or spinal cord trauma, or Parkinson's disease[34]
- Complex regional pain syndrome (CRPS) is an array of painful conditions that are characterized by a continuing (spontaneous and/or evoked) regional pain that is seemingly disproportionate in time or degree to the usual course of any known trauma or other lesion. The pain is regional (not in a specific nerve territory or dermatome) and usually has a distal predominance of abnormal sensory, motor, pseudo motor, vasomotor, and/or trophic findings. The syndrome shows variable progression over time. See Appendix A for Budapest Criteria for diagnosis of CRPS[35,36].
- Peripheral neuropathy - damage to the peripheral nervous system, which transmits information to and from the brain and spinal cord to every other part of the body. More than 100 types of peripheral neuropathy have been identified, each with its own characteristic set of symptoms, pattern of development, and prognosis. Impaired function and symptoms depend on the type of nerves -- motor, sensory, or autonomic -- that are damaged[37].
- Status Migraine – prolonged migraine attack ($\geq$ 72 hr) of unremitting headache[38]
- Chronic Daily Headache - headache occurs greater than 15 days per month for at least 3 months[39]
- Actual body weight (Actual BW) – actual total mass of the patient in kilograms
- Ideal body weight (IBW):
  - Males IBW = 50 kg + 2.3 kg for each inch over 5 feet in height
  - Females IBW = 45.5 kg + 2.3 kg for each inch over 5 feet in height
- Adjusted body weight (Adj BW)[40]
  - Adj BW = IBW + 0.4 x (Actual BW – IBW)

Recommendations

1. **Indications for lidocaine infusions:** Lidocaine has been studied a variety of pain conditions. See Table 1.

Table 1: Lidocaine Indications

Patient Population	Indications for Lidocaine	UW Health Evidence rating

Adult acute and chronic pain	• Neuropathic pain[2]
	  ○ Spinal cord injury/stroke[41,42]
	  ○ Diabetic neuropathy[43]
	  ○ Postherpetic neuralgia[44,45]
	  ○ Radiculopathy/radicular/nerve injuries[46-48]
	  ○ Fibromyalgia[49]
	  ○ Central pain syndrome[41]
	  ○ Complex regional pain syndrome[50]
	  ○ Multiple sclerosis[51]
		(*UW Health moderate quality evidence, S recommendation*)

	• Opioid refractory cancer pain[10-12]	(*UW Health moderate quality evidence, S recommendation*)
	• Post-operative pain[9,15,20,52-54]	(*UW Health high quality evidence, C recommendation*)

	• Headache[14,15]
	  ○ Chronic daily headache
	  ○ Chronic cluster headache
		(*UW Health low quality evidence, C recommendation*)

	• Renal colic[4-8]	(*UW Health moderate quality evidence, S recommendation*)

Pediatric acute and chronic pain	• Post-operative pain[29,31]
	• Chemotherapy induced neuropathic pain[24]
	• Opioid refractory cancer pain[25-27]
	• Headache[3]
	• Neuropathic pain[3,31]
	  ○ Erythromyalgia[55]
	  ○ CRPS[56]
	  ○ Avascular necrosis[3]
	  ○ Diabetic peripheral nephropathy[3]
		(*UW Health low quality evidence, C recommendation*)

2. **Inappropriate indications[53]**
   2.1. Lidocaine has not been shown to be beneficial for the treatment of certain pain conditions such as (but not limited to) mastectomy[57,58], hysterectomy[59,60], total hip arthroplasty[53], coronary artery bypass surgery[53], tonsillectomy[53]. A list of evidence-based indications is contained in Table 1 (*UW Health moderate quality evidence, S recommendation*)

2.2. Systemic lidocaine is not typically the first line agent for any pain condition (*UW Health moderate quality evidence, S recommendation*).
2.3. For the treatment of neuropathic pain, systemic lidocaine is not recommended unless patients have tried and failed or have contraindications to first or second line agents such as tricyclic antidepressants (TCA), serotonin reuptake inhibitors (SNRI), gabapentin/pregabalin, opioids/tramadol, topical agents and anticonvulsants[61,62] (*UW Health high quality evidence, S recommendation*)

3. **Contraindications for lidocaine infusions:** Lidocaine can affect cardiac conduction, therefore care should be taken to evaluate patient's cardiac history and concurrent medications prior to infusion[21,63]. An ECG should be obtained prior to initiation of lidocaine. The ECG should be reviewed by the ordering provider and if concerns over appropriateness of lidocaine therapy arise, the ECG should be escalated to a qualified clinician for review. Additionally, renal and hepatic dysfunction may lead to the accumulation of lidocaine metabolites.[1] Therefore, an assessment of serum creatinine and ALT should be completed prior to initiation of all lidocaine infusions, periodically during prolonged therapy and/or if clinical status changes *(UW Health low quality of evidence, S recommendation*).

Table 2: Contraindications for Lidocaine

Contraindications for Lidocaine	Evidence rating

Absolute Contraindications
• Conduction block[21,63] with the following findings:
  • Adam-Stokes syndrome;
  • Wolff-Parkinson-White syndrome;
  • Severe degrees of SA, AV, or intraventricular heart block (e.g. 2nd degree), except in patients with a functioning artificial pacemaker
• Allergy to lidocaine or other amide local anesthetics
• Pregnancy
• Age less than 6 months[31] (secondary to increased risk of toxicity related to immature hepatic function and increased free lidocaine levels)
 	
Relative Contraindications
• Chronic alcoholism or substance abuse (due to risk for additive CNS adverse events, evaluate on an individual basis if the benefit is greater than the risk)
• ECG findings:
  • PR interval > 200 milliseconds
  • QRS complex > 120 milliseconds
  • Bifascicular block regardless of QRS complex duration
• Age 6 months – 1 year[31,64] (secondary to increased risk of toxicity related to immature hepatic function and increased free lidocaine levels)
• Patients who are unable to self-report adverse events
• Seizure history or at risk for seizure[65]
	UW Health low quality of evidence, S recommendation

• Advanced age/poor functional status[66]
• Renal dysfunction[1,65,67]
• Hepatic dysfunction[1,67]
• Drug-drug interactions[1]
  • Medications that induce CYP1A2 (primary enzyme responsible for metabolism) or CYP3A4 (minor enzyme involved in metabolism) decrease lidocaine concentrations, but therefore increase active metabolites which are renally eliminated
  • Medications that inhibit CYP1A2 and CYP3A4 (will increase lidocaine concentrations)
  • Antiarrhythmic agents (concern for additive cardiac toxicity-concomitant use should be evaluated by a cardiologist prior to initiating IV lidocaine for pain)	

4. Baseline assessment

4.1. Prior to initiation of a lidocaine infusion, baseline patient assessments should be completed. There is no consensus in the literature as to when baseline ECG and laboratory evaluation should occur. It is recommended that for inpatients, these assessments be completed within one week of initiation of the infusion. For outpatients, it is recommended these assessments should be completed as close as possible to the initiation of the infusion, ideally within one month, but no more than 6 months prior to the infusion. *(UW Health very low-quality evidence, C recommendation)*

4.1.1. ECG

4.1.1.1. An ECG should be reviewed by the ordering provider. If concerns over appropriateness of lidocaine therapy arise, the ECG review should be escalated to a qualified clinician.

4.1.2. Laboratory:

4.1.2.1. Potassium
4.1.2.2. Magnesium
4.1.2.3. Serum creatinine
4.1.2.4. ALT

4.1.3. Vital signs:

4.1.3.1. Blood Pressure
4.1.3.2. Heart Rate
4.1.3.3. Respiratory Rate

4.1.4. Pain Assessment:

4.1.4.1. Location, quality, frequency and severity

4.1.5. Assessment of previous tolerability and side effects if patient has received IV lidocaine before

Table 3: Timing of Baseline Assessments

	Inpatient	Outpatient
ECG	Within 1 week of initiation	Within 1 – 6 months of initiation
Labs	Within 1 week of initiation	Within 1 – 6 months of initiation
Vital signs	Day of infusion	Day of infusion
Pain assessment	Day of infusion	Day of infusion
Previous tolerability/side effects	Day of infusion	Day of infusion

5. Patient education

5.1. Patient to have lidocaine teaching completed by RN including review of side effects and need for a driver following lidocaine trials.

5.2. A Health Facts for You (HFFY #5314) should be given to all patients prior to initiation of therapy.

6. Dosing of Lidocaine

6.1. Dosing regimens and routes of delivery are based on indication (See Table 4)

6.2. Actual body weight should be used for intermittent dosing, however for patients with body mass index (BMI) > 30 may consider using ideal body weight[59,68]. Ideal body weight should be used for continuous infusions *(UW Health very low-quality evidence, C recommendation)*.

6.3. A test dose of lidocaine is recommended prior to initiating intermittent and continuous lidocaine infusions for neuropathic pain. If the test dose is effective, and without significant adverse effects, may proceed with maintenance dose or continuous infusion *(UW Health very low-quality evidence, C recommendation)*.

6.3.1. A test dose of lidocaine is also recommended whenever an intermittent maintenance dose is increased to allow for proper monitoring and to assess for efficacy prior to scheduling further maintenance doses.

6.4. The optimal and maximum frequency of lidocaine intermittent intravenous infusions for chronic pain have not been established. Consider an initial frequency of every other week or weekly as needed based on patient response to the test dose *(UW Health very low-quality evidence, C recommendation)*.

6.5. In patients who had a minimal or partial response to 5 mg/kg test dose, consider repeating the same dose for 2-3 additional appointments before opting for dose escalation. It may take more than a single dose to realize the full effect of intravenous lidocaine[69] *(UW Health very low quality evidence, C recommendation)*.

6.6. Renal adjustment[1,20]

6.6.1. No dosage adjustment provided in manufacturer's labeling. However, accumulation of metabolites may be increased in renal dysfunction[1].

6.6.2. Intermittent infusions: no adjustment necessary[70]

6.6.3. Continuous infusion: use caution and start infusion at the low end of the dosing range.

6.6.3.1. Consider monitoring lidocaine and monoethylglycinexylidide (MEGX) concentrations

6.6.3.2. Limit duration to 24 hours if not monitoring lidocaine and MEGX levels[70]

6.6.3.3. Place patient on continuous ECG monitoring[48]

6.6.3.3.1. Unless otherwise directed by ordering provider secondary to patient specific factors

6.7. Hepatic adjustment

6.7.1. Use with caution in patient with hepatic impairment; reduced maintenance infusion recommended[1]

6.7.2. Intermittent infusions: no adjustment necessary[70]

6.7.3. Continuous infusion: use caution and start infusion at the low end of the dosing range.

6.7.3.1. Consider monitoring lidocaine and MEGX concentrations

6.7.3.2. Limit duration to 24 hours if not monitoring lidocaine and MEGX levels[70]

6.7.3.3. Place patient on continuous ECG monitoring[48]

6.7.3.3.1. Unless otherwise directed by ordering provider secondary to patient specific factors

Table 4: Lidocaine Dosing Recommendations

Indication	Patient population	Route	Test Dose	Test Dose Duration	Maintenance Dose	Maintenance Dose Duration
Neuropathic pain	Adult[2]	IV intermittent infusion	**Initial test dose:** 5 mg/kg Actual BW* [Suggested max dose: 500mg] **Subsequent test doses#:** Dose ranges: 5 - 7.5 mg/kg Actual BW* [Suggested max: 750 mg]	60 minutes	**First maintenance dose:** 5 mg/kg Actual BW* [Suggested max: 500 mg] **Subsequent maintenance doses based on patient response#:** Dose ranges: 3 - 7.5 mg/kg Actual BW* [Suggested max: 750 mg]	60 minutes
	Adult [13,56,71,72]	SQ continuous infusion	5mg/kg * Actual BW [Suggested max: dose 500 mg]	60 minutes	0.5-3 mg/kg/hour Ideal BW	Variable: Range days to months
	Peds[2,3,56]	IV or SQ intermittent infusion	5 mg/kg Actual BW [Suggested max dose: 500mg]	90-120 minutes	**First maintenance dose:** 5 mg/kg Actual BW **Subsequent maintenance doses based on patient response:** Dose ranges: 3 - 7.5 mg/kg Actual BW [Suggested max: 750 mg]	60 minutes

*Round dose to the nearest 50 mg increment
Subsequent test doses are recommended whenever a maintenance dose is increased to allow for proper monitoring and to assess for efficacy prior to scheduling further maintenance doses

Indication	Patient population	Route	Bolus Dose	Bolus Dose Duration	Continuous Infusion Dose	Continuous Infusion Duration
Post-operative pain	Adult[59]	IV continuous infusion	1-2 mg/kg Actual BW	1-2 minutes	0.5-3 mg/kg/hour Ideal BW	Up to 24 hours
	Peds[29,59]	IV or SQ continuous infusion	1-2 mg/kg Actual BW	1-2 minutes	0.5-2 mg/kg/hour Ideal BW	Up to 24 hours

Indication	Patient population	Route	Bolus Dose	Bolus Dose Duration	Maintenance Dose	Maintenance Dose Duration
Headache	Adult[11,14,15]	IV continuous infusion	NO	NA	60-120 mg/hour	Variable: Range 2-15 days
	Peds	IV intermittent infusion[3] (chronic headache)	NO	NA	4.8-7.2 mg/kg Actual BW (given with magnesium sulfate 1-2 grams over 2 hours)	2 hours
		IV continuous infusion[32] (status migrainosus)	3 mg/kg Actual BW	90 minutes	1 mg/kg/hour ideal BW Titrated up by: 0.1-0.2 mg/kg/hour every 4-6 hours Max infusion rate: 2.25 mg/kg/hour	Variable: Up to 24-48 hours

Indication	Patient population	Route	Bolus Dose	Bolus Dose Duration
Renal Colic[4-6]	Adult	IV bolus	1.5 mg/kg Actual BW	2-5 minutes

7. Assessment and monitoring

7.1. Vital signs and patient assessment[73,74] *(UW Health very low quality of evidence, S recommendation).*

- 7.1.1. Vital signs
  - 7.1.1.1. Heart rate
  - 7.1.1.2. Blood pressure
  - 7.1.1.3. Respiratory rate
- 7.1.2. Assessment of adverse effects
- 7.1.3. Pain Assessment: Location, quality, frequency and severity

Table 5: Frequency of Monitoring vital signs and patient assessment

	Test Dose	Intermittent Infusions	Continuous Infusions
Vitals signs, adverse effects, pain	• Baseline • 30 minutes after start of infusion • 30 minutes after infusion completion	• Baseline • Immediately post infusion completion • As needed based on presence of symptoms during infusion	• Baseline • Every 30 minutes for the first 2 hours • Then every 4 hours thereafter

7.2. ECG and laboratory assessment
- 7.2.1. There is no consensus in the literature as to when or if repeat ECG and laboratory assessment should occur when lidocaine is used for pain *(UW Health very low quality of evidence, C recommendation)*.
  - 7.2.1.1. For patients receiving chronic intermittent or chronic continuous infusion lidocaine, it is recommended that a repeat ECG and laboratory assessment should be completed yearly, unless patient condition, changes in medications or other factors warrant a different monitoring frequency. *(UW Health very low quality of evidence, C recommendation)*.
  - 7.2.1.2. For patients receiving short course intermittent or continuous infusion lidocaine, a repeat ECG and laboratory assessment may be considered, especially if renal, hepatic or other conditions warrant repeat monitoring. *(UW Health very low quality of evidence, C recommendation)*.
- 7.2.2. An ECG should be reviewed by the ordering provider. If concerns over appropriateness of lidocaine therapy arise, the ECG review should be escalated to a qualified clinician for review.
- 7.2.3. Labs:
  - 7.2.3.1. Potassium
  - 7.2.3.2. Magnesium
  - 7.2.3.3. Serum creatinine
  - 7.2.3.4. ALT

8. Therapeutic drug monitoring *(UW Health moderate quality of evidence, S recommendation)*

8.1. The utility of therapeutic drug monitoring for pain has not been clearly defined
- 8.1.1. It is NOT recommended to routinely draw lidocaine levels to establish efficacy. Literature suggests lidocaine levels between 1.5-5 mcg/mL may relate to efficacy, but there is not enough data to support this practice[59].
- 8.1.2. For patients with renal or hepatic impairment receiving continuous infusions, monitoring lidocaine or MEGX levels is recommended[70]

9. Adverse effects assessment[59,63]

9.1. Adverse effects of lidocaine are directly related to the serum lidocaine level[59,75] *(UW Health moderate quality of evidence, S recommendation).*

9.2. Side effects are more pronounced in patients with hepatic dysfunction, renal dysfunction, pulmonary diseases (when the predominant problem is carbon dioxide retention), and congestive heart failure *(UW Health very low quality of evidence, S recommendation)*

9.3. Mild side effects occur first as an early warning of lidocaine toxicity. If left unchecked side effects can progress to neurotoxicity, cardiovascular collapse and death *(UW Health low quality of evidence, S recommendation)*

9.4. If adverse effects are present, it is recommended to pause or stop the lidocaine infusion. *(UW Health low quality of evidence, S recommendation)*

9.5. Management of toxicity is based on symptoms *(UW Health low quality of evidence, C recommendation)*

Table 7: Signs of Lidocaine Toxicity & Associated Management

	Adverse effects	Management
Mild	• Numbness and tingling in the fingers and toes • Numbness and unusual sensations around the mouth • Metallic taste • Blurred vision • Ringing in the ears • Lightheadedness and dizziness • Occasional drowsiness but easily aroused	• Monitor lidocaine infusion symptoms frequently for progression of symptoms • Obtain BP/HR • Obtain pain rating • Do not increase infusion rate for continuous infusions • Consider slowing infusion rate
Moderate	• Frequent drowsiness but easily aroused • Nausea and vomiting • Severe dizziness • Decreased hearing • Tremors • Changes in blood pressure and pulse	• Stop lidocaine infusion for 30 minutes or until resolution of adverse effects • Obtain BP/HR • Obtain pain rating • Notify provider • Contact ordering provider or follow existing orders to determine if infusion should be restarted

Severe	• Loss of consciousness
	• Drowsiness with inability to arouse
	• Confusion
	• Muscle twitching
	• Seizure
	• Conduction abnormalities
		• Stop lidocaine infusion
		• Obtain BP/HR
		• Obtain pain rating if able
		• Notify provider
		• Supportive care
		  ○ Lorazepam for seizure
		  ○ Fluids for hypotension
		• Consider lipid infusion

10. Preparation and administration

10.1. Nursing administration

10.1.1. Lidocaine for pain is a UW Health Level 1 medication when used as an infusion for pain. Therefore, it may be administered on all general care nursing units, ambulatory clinics, UW Health infusion center and hemodialysis center

10.2. Preparation

10.2.1. Lidocaine will be prepared using the 2% or 4% preservative free product or the commercially available 2000 mg in 500 mL product may be used for continuous infusions

Disclaimer

Clinical practice guidelines assist clinicians by providing a framework for the evaluation and treatment of patients. This guideline outlines the preferred approach for most patients. It is not intended to replace a clinician's judgment or to establish a protocol for all patients. It is understood that some patients will not fit the clinical condition contemplated by a guideline and that a guideline will rarely establish the only appropriate approach to a problem.

Methodology

Development Process

Each guideline is reviewed and updated a minimum of every 3 years. All guidelines are developed using the guiding principles, standard processes, and styling outlined in the UW Health Clinical Practice Guideline Resource Guide. This includes expectations for workgroup composition and recruitment strategies, disclosure and management of conflict of interest for participating workgroup members, literature review techniques, evidence grading resources, required approval bodies, and suggestions for communication and implementation.

Methods Used to Collect the Evidence:

The following criteria were used by the guideline author(s) and workgroup members to conduct electronic database searches in the collection of evidence for review.

Literature Sources:

- Electronic database search (e.g., PubMed, Google Scholar)
- Databases of systematic reviews (e.g., Cochrane Library)
- Hand-searching journals, external guidelines, and conference publications

Time Period: Up to 2018

Search Terms:

- Lidocaine
- Parenteral
- Pain
- Intravenous
- Pediatric
- Neuropathic pain
- Post-operative pain
- Cancer pain
- Chronic pain
- Headache
- Renal colic

Methods to Select the Evidence:

Selection criteria included: English language only, human trials

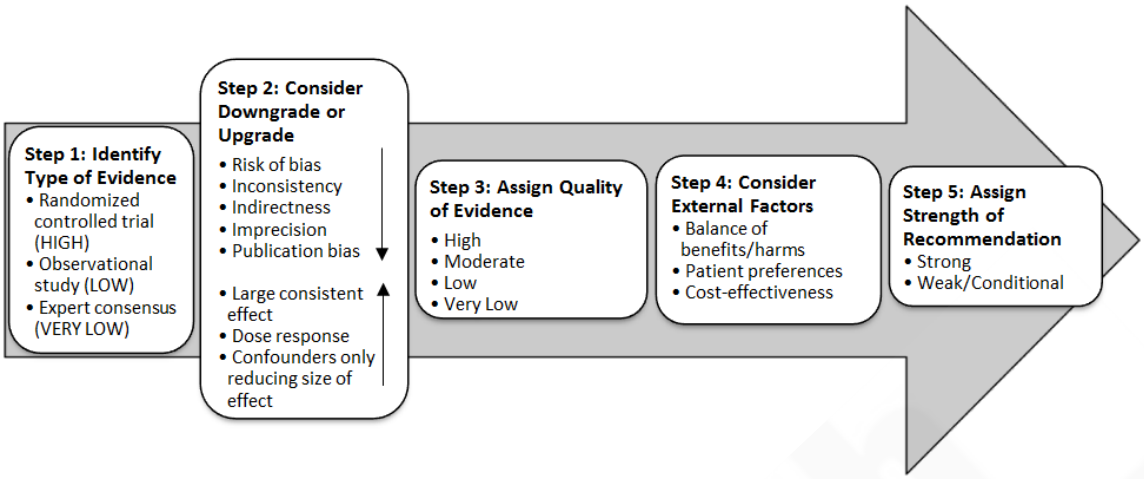
Methods Used to Formulate the Recommendations:

The workgroup members created recommendations internally via a consensus process using discussion of the literature and expert experience/opinion. If issues or controversies arose where consensus could not be reached, the topic was escalated appropriately per the guiding principles outlined in the UW Health Clinical Practice Guideline Resource Guide.

Methods Used to Assess the Quality of the Evidence/Strength of the Recommendations:

Internally developed recommendations, or those adopted from external sources without an assigned evidence grade, were evaluated by the guideline workgroup using an algorithm adapted from the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology (see **Figure 1**).

Figure 1. GRADE Methodology adapted by UW Health



Rating Scheme for the Strength of the Evidence/Recommendations:

GRADE Ranking of Evidence

High	We are confident that the effect in the study reflects the actual effect.
Moderate	We are quite confident that the effect in the study is close to the true effect, but it is also possible it is substantially different.
Low	The true effect may differ significantly from the estimate.
Very Low	The true effect is likely to be substantially different from the estimated effect.

GRADE Ratings for Recommendations For or Against Practice

S	The net benefit of the treatment is clear, patient values and circumstances are unlikely to affect the decision.
C	Recommendation may be conditional upon patient values and preferences, the resources available, or the setting in which the intervention will be implemented.

Cost Analysis: The cost of ECG monitoring and laboratory lidocaine levels was considered.

Collateral Tools & Resources

The following collateral tools and resources support staff execution and performance of the evidence-based guideline recommendations in everyday clinical practice.

Order Sets & Smart Sets

Anesthesiology - Lidocaine for Postoperative Pain - Adult – Supplemental [4100]
IP - Lidocaine Continuous Subcutaneous Titration Infusion - Adult - Supplemental [2195]
IP - Lidocaine Intravenous Infusion - Adult - Supplemental [1374]
IP - Lidocaine Intermittent Intravenous Infusion - Adult - Supplemental [1373]
IP - Lidocaine Intravenous Trial Infusion - Pediatric - Supplemental [5756]
IP - Lidocaine Low Dose Continuous or Subcutaneous Infusion - Pediatric -Supplemental [5755]
Anesthesiology - Lidocaine For Postoperative Pain - Pediatric – Supplemental [6012]

Patient Resources

Parenteral (Intravenous or Subcutaneous) Lidocaine for Neuropathic Pain Health Facts For You (HFFY #5314)

Nursing Resources

IV Lidocaine for Perioperative Pain Fast Fact:
Parenteral Lidocaine for Chronic Neuropathic Pain

Policies

UWHC Nursing Policy #10.18 – Continuous Subcutaneous Lidocaine Infusion

Appendix A

Appendix II. Budapest clinical diagnostic criteria for CRPS

(1) Continuing pain, which is disproportionate to any inciting event
(2) Must report at least one symptom in *three of the four* following categories:
  - *Sensory:* reports of hyperesthesia and/or allodynia
  - *Vasomotor:* reports of temperature asymmetry and/or skin color changes and/or skin color asymmetry
  - *Sudomotor/edema:* reports of edema and/or sweating changes and/or sweating asymmetry
  - *Motor/trophic:* reports of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)
(3) Must display at least one sign at time of evaluation in *two or more* of the following categories:
  - *Sensory:* evidence of hyperalgesia (to pinprick) and/or allodynia (to light touch and/or deep somatic pressure and/or joint movement)
  - *Vasomotor:* evidence of temperature asymmetry and/or skin color changes and/or asymmetry
  - *Sudomotor/edema:* evidence of edema and/or sweating changes and/or sweating asymmetry
  - *Motor/trophic:* evidence of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)
(4) There is no other diagnosis that better explains the signs and symptoms

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