

Safe Use of Local Anesthetics

full update April 2026

Local anesthetics (e.g., bupivacaine, lidocaine, ropivacaine) are often part of multimodal pain regimens.²⁰ The checklist below provides administration and monitoring strategies to improve safe use of local anesthetics. Use it as a tool to develop safety protocols and provide education to your colleagues.

Goal	Suggested Strategies/Pertinent Information
Prevent errors with local anesthetics.	☐ Confirm desired product and strength to avoid mix-ups. Bupivacaine formulations (e.g., Exparel [US], Zynrelef [US]) aren't interchangeable due to differences in dosing, indication, etc. Zynrelef comes in four strengths and Exparel comes in two strengths for different indications.^{11,12} ☐ Avoid mix-ups between propofol and Exparel, which are both milky white in appearance. Accidentally giving Exparel systemically, instead of propofol, could lead to toxic bupivacaine levels and possible cardiac arrest.²⁴ € Store Exparel and propofol separately in the pharmacy and other areas where both products may be stored and used.²⁴ € When possible, purchase propofol products that have labels that are NOT blue and white (similar to Exparel).²⁴ € Ensure all syringes are clearly labeled to avoid administration via an inappropriate route.²⁴ ☐ Ensure clear communication and the “six rights” (e.g., right patient, drug, dose, route, time, labeling) to ensure patient safety, especially when verbal orders may be used (e.g., in the operating room).²⁵ ☐ Use positive wording, like “for regional anesthesia” to order and label local anesthetic infusion lines and/or tubing.⁸ Avoid negative wording, such as “not for IV injection,” because the “not” could be overlooked.⁸ ☐ Ensure staff avoid dislodging the local anesthetic delivery catheter when changing dressings. ☐ To avoid neurologic or cardiovascular toxicity, avoid additional local anesthetics within 96 hours after administration of liposomal bupivacaine (Exparel), or bupivacaine and meloxicam (Zynrelef).^{11,12} Consider using wristbands or health record flags to better identify these patients. ☐ For patients receiving continuous local anesthetic infusions (e.g., On-Q pumps), make sure post-op orders have administration instructions.¹³ ☐ Consider storing and dispensing bags or bottles of neuraxial medications (e.g., bupivacaine) with NRFit administration sets and appropriate auxiliary labels (e.g., requires NRFit tubing).²⁶

Goal	Suggested Strategies/Pertinent Information
Reduce risks associated with use of local anesthetics.	Systemic administration and/or absorption of local anesthetics can lead to life-threatening toxicity.²² Watch for: ☐ Exposure of the On-Q pump, or its temperature sensor, to hot or cold therapies. This can alter local anesthetic delivery rate and cause the On-Q pump bulb to empty too rapidly, increasing toxicity risk. Ensure On-Q pumps remain at room temperature.¹³ ☐ Correct positioning of the On-Q pump air filter and temperature sensor to ensure placement against the skin.¹³ ☐ Taping over the in-line filter. This can affect the infusion rate, leading to increased rate of delivery for On-Q pump.^{7,13} ☐ Accidental connection of epidural, regional block, or continuous infusions to an IV catheter.^{3,8,9} ☐ Misplacement or migration of local anesthetic delivery catheter into or next to a highly vascularized area.^{10,16} For example, a misplaced upper extremity brachial plexus nerve block catheter may feed into the brachial artery.¹⁶
Use best practices to monitor local anesthetics.	☐ Monitor and assess vital signs, level of consciousness, sensory block/pain control, and motor function.⁴ ☐ Ensure local anesthetic: ☐ Delivery catheter insertion site, dressing, and filter and sensor filters are checked every two hours.¹³ ☐ Tubing set function is assessed every two hours to ensure clamp is open, and tubing has not become kinked.¹³ ☐ Document the details of any presumed allergic reaction (e.g., rash, delayed local swelling, hives, angioedema, bronchospasm, hypotension) so that the reaction can be correctly categorized.^{18,21,27} ☐ There are two basic classes of local anesthetics, esters and amides (see footnote a for which local anesthetics fall into each). ☐ Esters tend to be associated with a higher incidence of allergic reactions, and cross-reactivity between agents is more common.²⁷ Conversely, amides tend to have less cross-reactivity and allergic reactions, and are often preferred in practice.^{18,27} ☐ Referral for allergy testing is recommended for patients who experience immediate hypersensitivity reactions.¹⁸ ☐ Monitor for signs and symptoms of toxicity. Milder CNS symptoms may progress to life-threatening toxicity; however, cardiac toxicity can occur with or without CNS symptoms.¹⁹ ☐ Patient and family member education should include the symptoms and signs of local anesthetic toxicity.^{6,7} ☐ Recognize and know how to manage symptoms of local anesthetic toxicity (see next section).¹⁹ Milder CNS symptoms (i.e., subjective, excitatory symptoms) may include:^{2,5,6,14,19,23} € Perioral paresthesia, fingers, or toes; dysarthria; metallic taste € Ringing in the ears, auditory changes, vision changes € Agitation, anxiety, confusion € Dizziness, lightheadedness € Shivering Severe signs and symptoms include:^{2,14,15,19} € Seizures € CNS depression (e.g., decreased level of consciousness, coma, respiratory arrest) € Hypertension and tachyarrhythmias progressing to cardiovascular depression and collapse (e.g., bradycardia [most common cardiovascular sign], conduction blocks, hypotension, asystole)

Goal	Suggested Strategies/Pertinent Information
Manage local anesthetic toxicity.	☐ Consider local anesthetic toxicity in any patient with CNS toxicity or cardiotoxicity who has received a local anesthetic.^{14,19} Toxicity can sometime present over an hour after local anesthetic administration.¹⁹ Urgent intervention is needed because patients can progress rapidly from CNS toxicity to life-threatening cardiotoxicity.²⁸ Seizures worsen hypoxia and acidemia, which in turn may worsen cardiotoxicity.²⁸ ☐ Once local anesthetic toxicity is suspected, the local anesthetic should be stopped.^{2,14,15} ☐ Call for help and activate the rapid response team.^{1,2,15} ☐ Ensure oxygenation and ventilation, and perform chest compressions if needed.^{2,15} ☐ Consider early administration of 20% lipid emulsion to reduce local anesthetic concentrations in the blood if toxicity is deemed potentially serious.^{1,19,28} ☐ Create a “lipid kit” with supplies needed for administration (e.g., 20% lipid emulsion 500 mL, IV tubing, 60 mL Luer-Lok syringes [two], 19-gauge needles, and ASRA checklist [https://www.asra.com/news-publications/asra-updates/blog-landing/guidelines/2020/11/01/checklist-for-treatment-of-local-anesthetic-systemic-toxicity]).^{2,29} ☐ Dose based on ideal body weight.¹⁴ ☐ Start with 100 mL (patients ≥ 70 kg) or 1.5 mL/kg (patients < 70 kg) given over two to three minutes.^{1,22} ☐ Follow with a 250 mL infusion over 15 to 20 minutes (patients ≥ 70 kg) or 0.25 mL/kg/min (patients < 70 kg). Consider using a pump for patients weighing < 40 kg.¹ ☐ Assess heart rate, blood pressure, and other pertinent parameters regularly (e.g., every 15 minutes) during infusion to gauge for stabilization of circulation.¹⁷ ☐ If the patient remains unstable, repeat bolus and double the infusion rate.¹ Continue intravenous lipids for at least 15 minutes after hemodynamic stabilization.¹ ☐ Avoid exceeding the max total dose of 12 mL/kg (of 20% IV lipid).¹ ☐ Ensure processes are in place to keep track of the total dose given, such as checking every 15 minutes, to avoid exceeding the maximum lipid infusion dose. ☐ Use a benzodiazepine to control seizures.^{1,28} ☐ Propofol can be used if a benzodiazepine is not available.¹ Propofol can worsen cardiac depression.¹⁹ If given, use small doses, and avoid if cardiac function is depressed.^{1,19} ☐ Sodium bicarbonate is reasonable for treatment of life-threatening wide complex tachycardia.²⁸ ☐ Atropine is reasonable for treatment of life-threatening bradycardia.²⁸ ☐ Be aware that resuscitation is different than standard advanced cardiac life support (ACLS) protocols.² ☐ Start with smaller-than-normal epinephrine doses (≤ 1 mcg/kg).¹ ☐ AVOID beta blockers, calcium channel blockers (because they are cardiac depressants), vasopressin, phenylephrine (because they increase systemic vascular resistance), and lidocaine (because it is a local anesthetic).^{1,2} ☐ Monitor for at least 4 to 6 hours after a cardiovascular event, or at least 2 hours after a CNS event.^{1,2} Watch for pancreatitis.¹⁴

- a. Examples of ester-type local anesthetics include procaine, tetracaine, chlorprocaine, and benzocaine.²⁷ Examples of amide-type local anesthetics include lidocaine, mepivacaine, bupivacaine, ropivacaine, prilocaine, and articaine.²⁷

Abbreviations: CNS = central nervous system

Users of this resource are cautioned to use their own professional judgment and consult any other necessary or appropriate sources prior to making clinical judgments based on the content of this document. Our editors have researched the information with input from experts, government agencies, and national organizations. Information and internet links in this article were current as of the date of publication.

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