Bupivacaine

Brand names	Exparel, Marcaine, Sensorcaine, Sensorcaine-MPF
Medication error potential	ISMP high-alert medication that has an increased risk of causing significant patient harm if it is used in error.[1] Look-alike, sound-alike drug names USP reports that bupivacaine has been confused with levobupivacaine, lidocaine, and ropivacaine; no patient harm resulted.[2] USP reports that Marcaine has been confused with Sensorcaine; no patient harm resulted.[2]
Contraindications and warnings	**U.S. boxed warning:** Convulsions followed by cardiac arrest with difficult resuscitation or death have occurred following the use of 0.75% bupivacaine for epidural anesthesia in obstetric patients; the 0.75% concentration of bupivacaine is not recommended for use in obstetrical anesthesia.[3] **Contraindications:** Bupivacaine is contraindicated in obstetrical paracervical block anesthesia (has resulted in fetal bradycardia and death).[3] Also contraindicated in patients with a hypersensitivity to bupivacaine or any amide anesthetic.[3] **Other warnings:** Bupivacaine should only be administered by persons specifically trained in the use of local anesthetics.[3] The FDA notified healthcare professionals in November 2009 of the risk of chondrolysis following continuous intra-articular infusion of local anesthetics, including bupivacaine, via elastomeric infusion devices. The FDA has received 35 reports of chondrolysis; some were in previously healthy young *adults,* and most following shoulder surgery. The cases had received the local anesthetics for postoperative pain for periods of 48–72 hours. Chondrolysis symptoms (joint pain, stiffness, loss of motion) occurred as early as 2 (median 5) months following therapy with the local anesthetic.[3,4]
Infusion-related cautions	*Not for IV infusion or IM administration. Administer only by infiltration, or by epidural, spinal, peripheral, or sympathetic nerve block as a single or repeat injections.*[5] Accidental IV injection may result in cardiac arrhythmia or cardiac arrest, seizures, coma, and respiratory arrest.[3] Oxygen, CPR, intubation equipment, medications, and trained personnel in emergency management should be immediately available when using bupivacaine.[3]
Dosage	Dose varies with the anesthetic procedure, the area to be anesthetized, the vascularity of the tissues, the number of neuronal segments to be blocked, the depth and duration of anesthesia required, as well as individual response.[3] Once the catheter is placed, negative aspiration of blood or cerebrospinal fluid[6-11] with the absence of cardiovascular changes following a test dose indicates correct position of the catheter.[10,12,13] In neonates and infants, these tests alone may be insufficient; ultrasound guidance may aid in detecting proper catheter placement.[14,15] The manufacturer does not recommend the use of bupivacaine with or without epinephrine in children <12 years and the solution for spinal anesthesia should not be used in those <18 years.[3,16] However, epinephrine-containing solutions of bupivacaine have been used in neonates, infants, and children.[9,12,13] **Dosage adjustment in obesity:** Studies in *adults* with BMI ≥27.5 kg/m² and ≥30 kg/m² undergoing spinal (intrathecal) anesthesia suggested that dosage adjustments are not required for obesity[24,25] but also that duration of anesthesia may be prolonged in obese patients.[24] **Caudal block (preservative-free solution only)** **Infants and children:** 1.25–2.5 mg/kg (0.5–1 mL/kg of the 0.25% solution).[6,7-11,17] To minimize potential for toxicity, some recommend using concentrations less than 0.25% in infants.[15]

Dosage *(cont.)*	**Peripheral nerve block:** 5 mL of 0.25% or 0.5% solution (12.5–25 mg) not to exceed 400 mg/day (the *adult* maximum)[18] **Sympathetic nerve block:** 20–50 mL of 0.25% solution (50–125 mg) (without epinephrine)[3,18] **Continuous epidural (caudal or lumbar) infusion (preservative-free solution only)** **Loading dose:** 1.25–2.5 mg/kg (0.5–1 mL/kg of 0.25% bupivacaine)[12,13,18,19] **Infusion:** Use with caution in infants due to reduced levels of alpha 1-acid-glycoprotein leading to higher concentrations of unbound drug.[12,13] **Neonates and infants ≤4 months:** 0.2–0.25 mg/kg/hr (0.05%, 0.125%, or 0.25% solution)[12,18,19] **Infants >4 months and children:** 0.375–0.5 mg/kg/hr (0.05%, 0.125%, or 0.25% solution)[13,18,19] **Continuous local infiltration for regional anesthesia:** 4 mL/hr of 0.5% solution (20 mg/hr) was continuously infused via a catheter placed adjacent to the operative site (NOT epidural or IT) for approximately 100 hours to provide analgesia in children >10 years old after posterior spinal fusion.[20]
Dosage adjustment in organ dysfunction	Reduce dosage and use with caution in patients with hepatic disease.[3] There is a potential for increased toxicity in patients with renal impairment, but no specific dosage adjustment is recommended.[3] Reduce dosage in patients with cardiac disease or in those who are acutely ill.[3]
Maximum dosage	In *adults*, do not exceed a maximum of 400 mg within a 24-hour period.[3]
Additives	Available with epinephrine 1:200,000. Products containing epinephrine should not be used for sympathetic nerve blocks.[3] Epinephrine-containing solutions contain metabisulfite.[3] (See Appendix C for more specific information about potential adverse effects of sulfites.) Multidose vials contain paraben preservatives and should not be used for epidural or caudal blocks.[3] (See Appendix C for more specific information about potential adverse effects of parabens.)
Suitable diluents	Not diluted
Maximum concentration	0.75% (7.5 mg/mL) is available. However, the maximum recommended concentration varies by indication.[3] (See the Dosage section.)
Preparation and delivery	Epinephrine-containing solutions should not be used if they are a pinkish color, darker than slightly yellow, or if there is visible precipitate.[3,5]
IV push	Do not administer IV.[3,5] (See the Infusion-Related Cautions section.)
Intermittent infusion	Do not administer IV.[3,5]
Continuous infusion	Do not administer IV.[3,5]
Other routes of administration	Do not administer IM.[3,5] One case report described IT bupivacaine 0.1–2 mg/kg/hr (with clonidine) in a 3-year-old child to provide palliative analgesia.[21]