Ciprofloxacin Lactate

Brand names	Cipro IV
Medication error potential	None reported
Contraindications and warnings	**U.S. boxed warning:** Fluoroquinolones are associated with an increased risk of tendinitis and tendon rupture in all ages.[2] Ciprofloxacin should be avoided in patients with myasthenia gravis as it may exacerbate muscle weakness in these patients.[2] **Contraindications:** In persons with a history of hypersensitivity to ciprofloxacin, any member of the quinolone class of antimicrobials, or any of the product components.[2] Concomitant administration with tizanidine is contraindicated.[2] Because arthropathy has been noted in immature animals given fluoroquinolones the package insert states that ciprofloxacin should only be used in children <18 with complicated urinary tract infections and pyelonephritis (not first line) and inhalational anthrax.[2] (See Rare Adverse Effects in the Comments section.) **Other warnings:** Rare cases of sensory or sensorimotor axonal polyneuropathy affecting small and/or large axons resulting in paresthesias, hypoesthesias, dysesthesias and weakness have been reported. Ciprofloxacin should be discontinued if (1) symptoms of neuropathy (e.g., pain, burning, tingling, numbness, and/or weakness) are present, and (2) the patient develops deficits in light touch, pain, temperature, position sense, and in vibratory sensation, in order to prevent the development of an irreversible condition.[2] Prolonged use may cause superinfection and/or *Clostridium difficile*-associated diarrhea (CDAD), which has been reported and may range in severity from mild diarrhea to fatal colitis.[2] If CDAD is suspected or confirmed, appropriate fluid and electrolyte management, protein supplementation, antibiotic treatment of *C. difficile,* and surgical evaluation should be instituted as clinically indicated.[2]
Infusion-related cautions	Anaphylaxis has occurred after the first dose[2,3] and may be accompanied by cardiovascular collapse, loss of consciousness, tingling, pharyngeal or facial edema, dyspnea, urticaria, and itching.[2] Serious anaphylactic reactions require immediate emergency treatment with epinephrine and other resuscitation measures, including oxygen, IV fluids, IV antihistamines, corticosteroids, pressor amines, and airway management, as clinically indicated.[2] Thrombophlebitis, burning, pain, erythema, and swelling occur more frequently when infusion time is <30 minutes.[5]
Dosage	The AAP recommends that ciprofloxacin is not appropriate in mild-to-moderate infections.[6] **Neonates:** A systematic review has reported doses ranging from 10–60 mg/kg/day, typically divided BID, in term and preterm neonates. Most regimens ranged from 10–20 mg/kg/day divided BID. No serious adverse effects were reported.[7] **Infants and children** **Mild-to-moderate infections:** Inappropriate[6] **Severe infections:** 18–30 mg/kg/day divided q 8–12 hr up to 1200 mg/day[2,6] **Biologic warfare or bioterrorism:** The CDC and other experts recommend that treatment of inhalational anthrax spores due to biologic warfare or bioterrorism should be started on a multiple-drug parenteral regimen that includes ciprofloxacin (10–15 mg/kg/dose q 12 hr for 60 days; do not exceed 800 mg/day). Patients should be switched to oral therapy when clinically appropriate.[2,10,11] **Cystic fibrosis:** 20–30 mg/kg/day divided q 8–12 hr up to 1.2 g/day have been used.[13-15]
Dosage adjustment in organ dysfunction	If CrCl is >30 mL/min, give at normal dosing interval; if GFR is 10–29 mL/min/1.73 m^2, dose q 18 hr, if GFR <10 mL/min/1.73 m^2, dose q 24 hr.[2,18] No adjustment is required for chronic stable liver dysfunction.[2]

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Maximum dosage	1200 mg/day divided q 8 hr in *adults*[2]
Additives	None
Suitable diluents	D5W, D10W, NS, RL, D5¼NS, D5½NS, R[2,19]
Maximum concentration	2 mg/mL[2,19]
Preparation and delivery	**Compatibility:** See Appendix D for PN compatibility information.[20]
IV push	Not recommended[2]
Intermittent infusion	1–2 mg/mL over 60 minutes.[2,19] (See the Infusion-Related Cautions section.)
Continuous infusion	Not administered by this method
Other routes of administration	None
Comments	**Rare adverse effects:** Several investigators were unable to prove ciprofloxacin-induced arthropathy in pediatric patients following IV or oral dosing.[21-25] Two retrospective safety studies of 1795[26] and >1700[25] children report arthralgia rates of 1.5% and 0%, respectively. An extensive review of the issue has been published.[27] Serious and sometimes fatal hypersensitivity events have been reported.[2-5] These generally occur following multiple doses and manifestations as one or more of the following: (1) fever, rash, or severe dermatologic reactions (e.g., toxic epidermal necrolysis, Stevens-Johnson syndrome); (2) vasculitis, arthralgia, or myalgia; (3) serum sickness; (4) allergic pneumonitis; (5) interstitial nephritis, acute renal insufficiency or failure; (6) hepatitis, jaundice, acute hepatic necrosis or failure; and (7) anemia (including hemolytic and aplastic), thrombocytopenia (including thrombotic thrombocytopenic purpura), leukopenia, agranulocytosis, pancytopenia, and/or other hematologic abnormalities.[2] There may be an increased risk of hypersensitivity reactions in HIV-seropositive patients.[4] The drug should be discontinued immediately at the first sign of a skin rash, jaundice or any other sign of hypersensitivity[2]. Two desensitization regimens have been described: one in a 29-month-old child[28] and one in a 15-year-old patient with cystic fibrosis.[29] Convulsions, increased intracranial pressure, and toxic psychosis have been reported.[2] Should be used with caution in patients with known or suspected CNS disorders that may predispose to seizures or lower the seizure threshold or in the presence of other risk factors that may predispose to seizures or lower the seizure threshold (e.g., certain drug therapy, renal dysfunction). Ciprofloxacin may also cause CNS events including dizziness, confusion, tremors, hallucinations, depression, and, rarely, suicidal thoughts or acts.[2] These reactions may occur following the first dose. Ciprofloxacin should be discontinued and appropriate measures instituted.[2] **Drug interactions:** Ciprofloxacin is an inhibitor of CYP1A2.[2] Serious and fatal reactions have been reported in patients receiving concurrent administration of IV ciprofloxacin and theophylline.[2] These reactions have included cardiac arrest, seizure, status epilepticus, and respiratory failure. If concomitant use cannot be avoided, serum levels of theophylline should be monitored and dosage adjustments made as appropriate.[2] Consult appropriate resources for dosing recommendations before combining any drug with ciprofloxacin.