Furosemide (Frusemide)

Newborn use only

2018

<table>
<tr><td>Alert</td><td></td></tr>
<tr><td>Indication</td><td>Heart failure.
Fluid overload.
Short-term treatment in infants with or developing chronic lung disease.
Oliguric renal failure.
Diuresis renography.</td></tr>
<tr><td>Action</td><td>Potent loop diuretic. Inhibits sodium and chloride absorption in the ascending limb of the loop of Henle and in the proximal and the distal tubules.
Furosemide causes urinary losses of water, sodium (increases fractional excretion of sodium by 20–25%),[2] potassium and chloride. Urinary losses of calcium and magnesium and urinary pH are increased.</td></tr>
<tr><td>Drug Type</td><td>Loop diuretic.</td></tr>
<tr><td>Trade Name</td><td>IV: Furosemide Sandoz Injection, Furosemide-Claris, Lasix High Dose Concentrate, Lasix Solution. [Excipients: Sodium hydroxide, sodium chloride and water for injection].

Oral: Lasix oral solution. Note: Contains 12.7% v/v alcohol. [Other Excipients: Sorbitol, glycerol, sodium hydroxide, methyl hydroxybenzoate, propyl hydroxybenzoate, quinoline yellow, sunset yellow FCF, orange flavour, purified water]</td></tr>
<tr><td>Presentation</td><td>IV: 20 mg/2 mL, 40 mg/4 mL or 250 mg/25 mL
Oral: 10 mg/mL, 30 mL
Note: Commercial preparation “Lasix” contains 12.7% v/v alcohol.
Non-alcohol containing suspension can be compounded by local pharmacy.</td></tr>
<tr><td>Dosage / Interval</td><td>IV or PO*: 1 to 2 mg/kg/dose. Dose interval as follows:
<table>
<tr><td>Corrected gestational age/Postmenstrual age</td><td>Interval</td></tr>
<tr><td>Preterm infant ≤ 33 weeks</td><td>Every 24 hours</td></tr>
<tr><td>Preterm infant > 33 weeks</td><td>12–24 hours</td></tr>
<tr><td>Term infant 0–30 days</td><td>Every 12 hours</td></tr>
<tr><td>Term infant > 30 days</td><td>8–12 hours</td></tr>
</table>
*PO: Dose may be increased up to maximum 6 mg/kg/dose in term infants with heart failure.

IV Infusion: 0.05 to 0.2 mg/kg/hour increased to maximum 0.4 mg/kg/hour if urine output < 1 mL/kg/hour.

Diuresis renography: 1 mg/kg stat.</td></tr>
<tr><td>Maximum dose</td><td>IV: 2 mg/kg/dose
IV infusion: 0.4 mg/kg/hour
Oral: 6 mg/kg/dose</td></tr>
<tr><td>Route</td><td>IV or oral</td></tr>
<tr><td>Preparation/Dilution</td><td>IV bolus: Give undiluted. If dilution required draw up 0.5mL (5 mg of furosemide) and add 9.5mL sodium chloride 0.9% to make a final volume of 10 mL with a concentration of 0.5 mg/mL.

IV infusion:
Single-strength infusion: Draw up 0.5 mL/kg (5 mg/kg of furosemide) and make up to 10 mL with sodium chloride 0.9% or glucose 5% or glucose 10% or glucose 20% to make a 0.5 mg/kg/mL solution. Infusing at a rate of 0.1 mL/hour = 0.05 mg/kg/hour.

Double-strength infusion: Draw up 1 mL/kg (10 mg/kg of furosemide) and make up to 10 mL with sodium chloride 0.9% or glucose 5% or glucose 10% or glucose 20% to make a 1 mg/kg/mL solution. Infusing at a rate of 0.1 mL/hour = 0.1 mg/kg/hour.

Oral: Use as supplied undiluted.</td></tr>
</table>

Administration	IV bolus over 2–4 minutes: maximum rate not to exceed 0.5 mg/kg/minute or 4 mg/minute. For diuresis renography – dose should be given as a push.[1] IV infusion: Via syringe pump Oral: Solution may be administered without regard to feeds.
Monitoring	Urine output, weight, serum sodium and potassium. Screening for nephrocalcinosis may be required for preterm infants on prolonged therapy.
Contraindications	Known hypersensitivity to furosemide. Severe hypokalaemia, hyponatraemia, hypovolaemia, dehydration or hypotension must be regarded as contraindications until serum electrolytes, fluid balance and blood pressure have been restored to normal levels. Severe jaundice at risk of bilirubin encephalopathy.
Precautions	Commercially available oral furosemide solution contains ethanol and 2 mg/kg/day of solution equates to 1.4 mL/kg/week ethanol intake [equivalent to 1 unit alcohol/week for a man weighing 70 kg]. If increasing azotaemia and oliguria occur during treatment of severe progressive renal disease, discontinue furosemide. Jaundice – furosemide may displace bilirubin from albumin. However, bilirubin displacement is negligible with standard doses.
Drug Interactions	Furosemide can cause the depletion of potassium and magnesium, which can predispose patients to serious cardiac arrhythmias, particularly in the presence of digitalis therapy. The risk of electrolyte depletion is markedly enhanced when 2 diuretics are used in combination. May prolong action of muscle relaxants. Avoid concomitant usage of aminoglycosides to avoid ototoxicity.
Adverse Reactions	Furosemide is associated with renal losses of calcium, sodium, chloride and potassium. Prolonged and higher doses of furosemide are associated with ototoxicity and nephrocalcinosis.
Compatibility	Fluids: Glucose 5%, glucose 10%, glucose 20%, sodium chloride 0.9% Y-site: Amifostine, amikacin, anidulafungin, aztreonam, bivalirudin, ceftaroline fosamil, dexmedetomidine, doripenem, foscarnet, granisetron, heparin sodium, hydrocortisone sodium succinate, levosimendan, linezolid, lorazepam, metoprolol, piperacillin-tazobactam (EDTA-free), potassium chloride, remifentanil, sodium nitroprusside, tirofiban, tobramycin.
Incompatibility	Fluids: No information. Variable compatibility with parenteral nutrition solutions. Y-site: Atracurium, azithromycin, benztropine, buprenorphine, caffeine citrate, caspofungin, chlorpromazine, ciprofloxacin, dolasetron, droperidol, eptifibatide, erythromycin, esmolol, filgrastim, fluconazole, gentamicin, glycopyrrolate, haloperidol lactate, hyaluronidase, hydralazine, ketamine, labetalol, metaraminol, metoclopramide, midazolam, milrinone, moxifloxacin, mycophenolate mofetil, ondansetron, pancuronium, pentamidine, pethidine, phentolamine, phenylephrine, promethazine, protamine, quinine, rocuronium, vancomycin, vasopressin, vecuronium, verapamil.
Stability	Do not use if solution is discoloured. Diluted IV solution: Stable for 24 hours at 2−25°C (preferred storage is 2-8°C). Oral solution: Commercial preparation “Lasix”- Discard 8 weeks after opening. Compounded suspension – 14 day expiry.
Storage	Vial: Store below 25°C. Protect from light. Occasionally crystal deposits may be seen when ampoules are stored at low temperatures. Dissolve crystals by warming to 40°C and injection may be used. Discard solutions that are yellow. Oral solution:

	Commercial preparation - store below 25°C Compounded suspension – refrigerated at 2-8°C
Special Comments	Loop diuretics are preferred for initial treatment of heart failure as they have a greater effect on sodium excretion compared to distal diuretics.[2] Potassium deficits can be corrected by the short-term use of potassium supplements. Concomitant administration of a potassium-retaining agent such as spironolactone can prevent potassium depletion in most infants taking a loop diuretic. Alternate day dosing may be considered to reduce the risk of electrolyte and mineral abnormalities. Plasma $t_{½}$ of furosemide is 7.7–26.8 hours in neonates. It is longer in immature infants (mean $t_{½}$ > 20 hours).[22] The $t_{½}$ is prolonged by renal and hepatic insufficiency. Blood concentrations exceeding 0.05 mg/mL may be associated with ototoxicity.
Evidence summary	Refer to full version.
References	Refer to full version.

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