# Isoprenaline – Standard concentration

## Newborn use only

2025

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| **Alert** | Also known as Isoproterenol. |
| **Indication** | Symptomatic bradyarrhythmia or heart block especially secondary to beta blocker overdose. |
| **Action** | $\beta_1$- and $\beta_2$-adrenoceptor agonist. Its action on cardiac $\beta_1$-adrenoceptors results in positive inotropic and chronotropic effects on the heart elevating blood pressure. Its action on arteriolar $\beta_2$-adrenoceptors results in vasodilation and lowering of diastolic blood pressure. The overall effect is to decrease mean arterial pressure due to the $\beta_2$-adrenoceptor mediated vasodilation. [1] |
| **Drug type** | Catecholamine, β-adrenoceptor agonist drug |
| **Trade name** | Cipla Isoprenaline<br>Isoprenaline Hydrochloride Medsurge<br>Isoprenaline Macure |
| **Presentation** | 1 mg/5 mL<br>0.2 mg/1 mL |
| **Dose** | 0.05 – 1 microgram/kg/minute.<br><br>Higher doses may be required in the management of beta blocker overdose. Consult with a clinical toxicologist (Contact information in Overdose Section). |
| **Maximum dose** | 2 microgram/kg/minute.<br>Higher doses may be required for management of B-blocker overdose. Consult with a clinical toxicologist (Contact information in Overdose Section). |
| **Route** | IV infusion. |
| **Preparation** | **IV infusion**:<br>**Note: Refer to Appendix for tables to assist with concentration selection.**<br><br>Use the smallest volume syringe available/suitable for drawing up the drug for the preparation. (e.g. for <1 mL draw up – use 1 mL syringe). For 10 mL syringe - Recommend using syringe that has markings at 0.2mL increments<br><br>The standard concentrations outlined in this monograph were developed taking into consideration a minimum patient weight of **0.4 kg** and a minimum infusion rate of **0.1 mL/hour**. For patients weighing less than 0.4kg, further dilution may be required.<br><br>Prime the line as close to the entry point as possible to reduce the dead space – however, care should be taken not to deliver excess volume.<br><br>Weight suggestions for infusion concentrations below are a guide only. Clinicians may choose infusion concentration different to the suggested based on expected dose and the corresponding 24-hour fluid volumes |

| **Isoprenaline concentration** | **10 microgram/mL** | **20 microgram/mL** | **60 microgram/mL** |
|---|---|---|---|
| **Infant weight (Guide only)** | <1 kg | 1 to 3 kg | > 3kg |
| **0.05 microgram/kg/min is equal to** | 0.3 mL/kg/hour | 0.15 mL/kg/hour | 0.05 mL/kg/hour |

### 20mL Syringe

Draw up isoprenaline and add compatible fluid* as per table below to make a final volume of 20 mL

| **Isoprenaline concentration** | **10 microgram/mL** | **20 microgram/mL** | **60 microgram/mL** |
|---|---|---|---|
| **Volume of isoprenaline (200 microgram/mL)** | 1 mL (200 microgram) | 2 mL (400 microgram) | 6 mL (1200 microgram) |
| **Volume of compatible fluid*** | 19 mL | 18 mL | 14 mL |
| **Total volume** | 20 mL | 20 mL | 20 mL |

* Compatible fluid: glucose 5% or sodium chloride 0.9%

### 50mL Syringe

Draw up isoprenaline and add compatible fluid* as per table below to make a final volume of 50 mL

| **Isoprenaline concentration** | **10 microgram/mL** | **20 microgram/mL** | **60 microgram/mL** |
|---|---|---|---|
| **Volume of isoprenaline** | 2.5 mL | 5 mL | 15 mL |

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| | **(200 microgram/mL)** \| (500 microgram) \| (1000 microgram) \| (3000 microgram)<br>**Volume of compatible fluid*** \| 47.5 mL \| 45 mL \| 35 mL<br>**Total volume** \| 50 mL \| 50 mL \| 50 mL<br>* Compatible fluid: glucose 5% or sodium chloride 0.9%. |
| **Administration** | Continuous IV infusion preferably via central line.<br>Change infusion every 24 hours. |
| **Monitoring** | Continuous heart rate, ECG and blood pressure monitoring preferable.<br>Assess urine output and peripheral perfusion frequently.<br>Blood glucose. |
| **Contraindications** | Tachyarrhythmias; tachycardia or heart block caused by digitalis intoxication; ventricular arrhythmias which require inotropic therapy; coronary insufficiency; hypersensitivity to isoprenaline.<br>Isoprenaline should not be given simultaneously with adrenaline because their combined effects may induce serious arrhythmia. |
| **Precautions** | Isoprenaline infusion may produce an increase in myocardial work and oxygen consumption.<br>Titrate drug dose to heart rate.<br>Correct acidosis prior to commencement.<br>Ensure adequate circulating blood volume prior to commencement. As isoprenaline is a vasodilator, additional volume expansion may be required during infusion.<br>Stimulates insulin secretion. |
| **Drug interactions** | Inhalational anaesthetics can increase the effects of isoprenaline.<br>Use of isoprenaline hydrochloride in conjunction with aminophylline and corticosteroids may be additive in cardiotoxic properties. |
| **Adverse reactions** | Tachycardia.<br>Cardiac arrhythmias.<br>Systemic vasodilation and hypotension.<br>Hypoglycaemia.<br>Extravasation |
| **Overdose** | AUSTRALIA: Contact the Poisons Information Centre on **13 11 26** for management.<br>NEW ZEALAND: Contact the National Poisons Centre on **0800 764 766** for management. |
| **Compatibility** | **Fluids** [11]: Glucose 5%; sodium chloride 0.9%.<br>**PN at Y-site** [11]: TPN (2-in-1) Total Parenteral Nutrition Admixture. No information on lipid emulsions.<br>**Y-site** [11]: Aciclovir, adrenaline (epinephrine), amikacin, amiodarone, amphotericin B liposomal, atracurium, atropine, azithromycin, aztreonam, benzylpenicillin, calcium chloride, calcium gluconate, cefaZOLin, cefOTAXIME, cefTAZIDIME, cefTRIAXONE, chloramphenicol, clindamycin, dexAMETHASOne, digoxin, dobutamine, dopamine, ERYthromycin, ertapenem sodium, fentanyl, flucONAZOLe, gentamicin, heparin, hydrocortisone, labetalol hydrochloride, lidocaine (lignocaine), linEZOLID, magnesium sulfate, metronidazole, meropenem, midazolam hydrochloride, milrinone, morphine, nitroprusside, nitroglycerin, noradrenaline (norepinephrine), octreotide acetate, pamidronate, pancuronium, piperacillin-tazobactam, potassium acetate, potassium chloride, propOFol, ranitidine, remifentanil, rocuronium bromide, ticarcillin-clavulanate, tobramycin sulfate, vancomycin, vasopressin, vecuronium bromide. |
| **Incompatibility** | **Fluids** [11]: No information<br>**PN at Y-site** [11]: No information on lipid emulsions.<br>**Y-site** [11]: amiNOPHYLLine, ampicillin sodium, amphotericin B conventional colloidal, amphotericin B lipid complex, DIAzepam, diazoxide, ganciclovir, ibuprofen, indomethacin, insulin, phenytoin, sodium bicarbonate, sulfamethoxazole-trimethoprim.<br>**Variable at Y-site** [11]: ampicillin sodium, furosemide, hydrALAZINe hydrochloride, phenobarbitone (phenobarbital), pantoprazole sodium |
| **Stability** | Do not administer if the solution is pinkish or darker than slightly yellow or if a precipitate is present.<br>Change the infusion every 24 hours. |
| **Storage** | Store below 25°C. Protect from light. |
| **Excipients** | Cipla - Citric acid, disodium edetate, hydrochloric acid or sodium hydroxide used to adjust pH, sodium chloride, sodium citrate dihydrate, water for injections.<br>Medsurge - Disodium edetate, sodium chloride, sodium citrate dihydrate, citric acid, sodium hydroxide, hydrochloric acid, water for injections<br>Macure - Sodium chloride, disodium edetate, sodium citrate dihydrate, citric acid monohydrate, water for injections, sodium hydroxide (for pH adjustment), hydrochloric acid (for pH adjustment). |
| **Evidence** | **Efficacy:** |

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| | The efficacy and dosing of isoprenaline in newborns has only been assessed in case reports.<br>**Infants with congenital complete heart block**: Case reports of response to isoprenaline infusion in newborns with congenital heart block. [2-4] (LOE IV, GOR D)<br>The European Society of Cardiology Guidelines recommend for patients with bradyarrhythmia, positive chronotropic drug infusion (e.g. isoprenaline, adrenaline (epinephrine), etc.) may be preferred for a limited time, unless there is a contra-indication, compared to use of a temporary pacemaker. [5]<br>There are insufficient data reported to determine its safety or efficacy in newborns with pulmonary hypertension.<br>**Safety:**<br>Case reports of arrhythmia/tachycardia [6] [4], elevated serum CPK-MB levels [7] and hypotension. [8]<br>In animal studies, use of isoprenaline hydrochloride in conjunction with aminophylline and corticosteroids have been shown to be additive in cardiotoxic properties and can lead to myocardial necrosis and death.[11]<br>**Pharmacokinetics:**<br>In children age 2 days to 14 years, average plasma half-life 4.2 ± 1.5 minutes, with linear relationship between steady state concentration and dosing rate. [10] |
| **References** | 1. Noori S, Seri I. Neonatal blood pressure support: the use of inotropes, lusitropes, and other vasopressor agents. Clinics in perinatology. 2012;39:221-38.<br>2. Deloof E, Devlieger H, Van Hoestenberghe R, Van den berghe K, Daenen W, Gewillig M. Management with a staged approach of the premature hydropic fetus due to complete congenital heart block. European Journal of Pediatrics. 1997;156:521-3.<br>3. Glatz AC, Gaynor JW, Rhodes LA, Rychik J, Tanel RE, Vetter VL, Kaltman JR, Nicolson SC, Montenegro L, Shah MJ. Outcome of high-risk neonates with congenital complete heart block paced in the first 24 hours after birth. The Journal of thoracic and cardiovascular surgery. 2008;136:767-73.<br>4. Quek SC, Low KT, Sim EK, Joseph R. A case report on the perinatal management of a 30-week preterm baby with congenital complete heart block. Annals of the Academy of Medicine, Singapore. 2000;29:510-3.<br>5. Brignole M, Auricchio A, Baron-Esquivias G, Bordachar P, Boriani G, Breithardt OA, et al. 2013 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy: the Task Force on cardiac pacing and resynchronization therapy of the European Society of Cardiology (ESC). Developed in collaboration with the European Heart Rhythm Association (EHRA). European heart journal. 2013;34:2281-329.<br>6. Steiner P, Rao M, Ehrlich R, Padre R. The use of intravenous isoproterenol in the treatment of status asthmaticus. The Journal of asthma research. 1975;12:215-9.<br>7. Maguire JF, Geha RS, Umetsu DT. Myocardial specific creatine phosphokinase isoenzyme elevation in children with asthma treated with intravenous isoproterenol. The Journal of allergy and clinical immunology. 1986;78:631-6.<br>8. Kussman BD, Madril DR, Thiagarajan RR, Walsh EP, Laussen PC. Anesthetic management of the neonate with congenital complete heart block: a 16-year review. Paediatric anaesthesia. 2005;15:1059-66.<br>9. Reyes G, Schwartz PH, Newth CJ, Eldadah MK. The pharmacokinetics of isoproterenol in critically ill pediatric patients. Journal of clinical pharmacology. 1993;33:29-34.<br>10. Vick J, Joseph X, Whitehurst V, Herman E, Balazs T. Cardiotoxic effects of the combined use of caffeine and isoproterenol in the minipig. J Toxicol Environ Health. 1989;26(4):425-35.<br>11. Merative™ Micromedex® Complete IV Compatibility (electronic version). Merative, Ann Arbor, Michigan, USA. Available at: https://www.micromedexsolutions.com/ (cited: 25th November 2025). |
| **Appendix** | **Infusion tables to assist concentration selection** |

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**Table 1**: Infusion rates when using isoprenaline concentration **10 microgram/mL**
(suggested for weight <1kg)

| Rate (mL/hr) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Weight (kg) | **Approximate micrograms/kg/minute** | | | | | | | | | |
| 0.5 | 0.03 | 0.07 | 0.1 | 0.13 | 0.17 | 0.2 | 0.23 | 0.27 | 0.3 | 0.33 |
| 1 | 0.02 | 0.03 | 0.05 | 0.07 | 0.08 | 0.1 | 0.12 | 0.13 | 0.15 | 0.17 |
| 1.5 | 0.01 | 0.02 | 0.03 | 0.04 | 0.06 | 0.07 | 0.08 | 0.09 | 0.1 | 0.11 |
| 2 | 0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.08 |
| 2.5 | 0.01 | 0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 |
| 3 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 |
| 3.5 | <0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 |
| 4 | <0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 |
| 4.5 | <0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.04 |
| 5 | <0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 |

**Table 2**: Infusion rates when using isoprenaline concentration **20 microgram/mL**
(suggested for weight 1 to 3 kg)

| Rate (mL/hr) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Weight (kg) | **Approximate micrograms/kg/minute** | | | | | | | | | |
| 0.5 | 0.07 | 0.13 | 0.2 | 0.27 | 0.33 | 0.4 | 0.47 | 0.53 | 0.6 | 0.67 |
| 1 | 0.03 | 0.07 | 0.1 | 0.13 | 0.17 | 0.2 | 0.23 | 0.27 | 0.3 | 0.33 |
| 1.5 | 0.02 | 0.04 | 0.07 | 0.09 | 0.11 | 0.13 | 0.16 | 0.18 | 0.2 | 0.22 |
| 2 | 0.02 | 0.03 | 0.05 | 0.07 | 0.08 | 0.1 | 0.12 | 0.13 | 0.15 | 0.17 |
| 2.5 | 0.01 | 0.03 | 0.04 | 0.05 | 0.07 | 0.08 | 0.09 | 0.11 | 0.12 | 0.13 |
| 3 | 0.01 | 0.02 | 0.03 | 0.04 | 0.06 | 0.07 | 0.08 | 0.09 | 0.1 | 0.11 |
| 3.5 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.1 |
| 4 | 0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.08 |
| 4.5 | 0.01 | 0.01 | 0.02 | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.07 | 0.07 |
| 5 | 0.01 | 0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 |

**Table 3**: Infusion rates when using isoprenaline concentration **60 microgram/mL**
(suggested for weight >3kg)

| Rate (mL/hr) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Weight (kg) | **Approximate micrograms/kg/minute** | | | | | | | | | |
| 0.5 | 0.2 | 0.4 | 0.6 | 0.8 | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2 |
| 1 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 |
| 1.5 | 0.07 | 0.13 | 0.2 | 0.27 | 0.33 | 0.4 | 0.47 | 0.53 | 0.6 | 0.67 |
| 2 | 0.05 | 0.1 | 0.15 | 0.2 | 0.25 | 0.3 | 0.35 | 0.4 | 0.45 | 0.5 |
| 2.5 | 0.04 | 0.08 | 0.12 | 0.16 | 0.2 | 0.24 | 0.28 | 0.32 | 0.36 | 0.4 |
| 3 | 0.03 | 0.07 | 0.1 | 0.13 | 0.17 | 0.2 | 0.23 | 0.27 | 0.3 | 0.33 |
| 3.5 | 0.03 | 0.06 | 0.09 | 0.11 | 0.14 | 0.17 | 0.2 | 0.23 | 0.26 | 0.29 |
| 4 | 0.03 | 0.05 | 0.08 | 0.1 | 0.13 | 0.15 | 0.18 | 0.2 | 0.23 | 0.25 |
| 4.5 | 0.02 | 0.04 | 0.07 | 0.09 | 0.11 | 0.13 | 0.16 | 0.18 | 0.2 | 0.22 |
| 5 | 0.02 | 0.04 | 0.06 | 0.08 | 0.1 | 0.12 | 0.14 | 0.16 | 0.18 | 0.2 |

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| | $\text{Rate (mL/hr)} = \frac{60 \times \text{Dose (microgram/kg/min)} \times \text{Weight (kg)}}{\text{Concentration (microgram/mL)}}$<br><br>$\text{Dose (microgram/kg/min)} = \frac{\text{Rate (mL/hr)} \times \text{Concentration (microgram/mL)}}{\text{Weight (kg)} \times 60}$ |

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