

ISOPRENALINE

For initiation by cardiology consultant only

Background

Isoprenaline is a non-selective β -adrenergic receptor agonist. It has a positive inotropic and chronotropic effects, increasing cardiac output by increasing the heart rate and cardiac contractility. Isoprenaline also decreases diastolic blood pressure by lowering peripheral vascular resistance.

Isoprenaline is **unlicensed** in the United Kingdom therefore its use is restricted to consultant approval. It has an immediate onset of action and its half-life is 2.5-5 minutes.

Isoprenaline Sulphate 1.125mg = Isoprenaline Hydrochloride 1mg

Indications

- Heart block.
- Treatment of permanent bradycardia due to atrio-ventricular block pending with haemodynamic compromise and pending or in case of contraindication of pacemaker.
- Treatment of Adams-Stokes syndrome.

Contraindication

- ❖ Hypersensitivity to isoprenaline or any of the excipients.
- ❖ Concomitant use with adrenaline (if concomitant administration is required give alternatively every 4 hours).
- ❖ Pre-existing ventricular arrhythmias.
- ❖ Tachyarrhythmia.
- ❖ Cardiac glycoside (digoxin) intoxication.
- ❖ Myocardial infarction – may increase myocardial oxygen demand.
- ❖ Angina – may exacerbate it.

Cautions

- ❖ Hypotension due to uncorrected hypovolaemia.
- ❖ Pheochromocytoma.
- ❖ Diabetic patients – isoprenaline stimulates insulin secretion thus increasing the risk of hypokalaemia.
- ❖ Cases of hyperthyroidism / uncontrolled hyperthyroidism.
- ❖ Cardiovascular disorders especially coronary insufficiency, arrhythmias and hypertension.
- ❖ Convulsive disorders.
- ❖ When using on patients who respond to sympathomimetic amines in unusual manner.

Preparation and administration

Available as **isoprenaline hydrochloride 2mg in 2mL** solution for injection or infusion **AND** as **isoprenaline sulphate 200micrograms/mL** solution for injection.

Dilution

IV injection

Isoprenaline hydrochloride – Dilute 2mg in 2mL concentrate with 100mL of Glucose 5% or sodium chloride 0.9% to give a concentration of 200microgram in 10mL (20microgram in 1mL). Give slowly over at least 3 minutes.

Isoprenaline sulphate – dilute the equivalent of 20microgram/mL isoprenaline hydrochloride. Give by slow IV injection over 3-5 minutes.

Continuous IV infusion – Adjust the infusion rate according to patient response.

When using isoprenaline hydrochloride

Recommended diluent is Glucose 5% and dilution should be as follow:

- Add 200microgram (0.2ml) to 100ml Glucose 5% (gives concentration of 2microgram in 1mL)

When using isoprenaline sulphate

- Add 225microgram (1.13ml) to 100ml Glucose 5% (gives concentration of 2.25 microgram in 1ml)

Dose

DOSE ISOPRENALINE HYDROCHLORIDE (microgram/minute)	DOSE ISOPRENALINE SULPHATE (microgram/minute)	Infusion rate (ml/hour)
1	1.125	30
2	2.25	60
3	3.375	90
4	4.5	120

Adjust the infusion rate according to patient response

Once diluted the infusion should be set up and **administered via an infusion pump** and the **expiry date (24 hours)** should be written on the label. **Do not allow the infusion to run out** (a new infusion should be prepared promptly when the previous one is due to finish).

Infusion rate and dose calculation

$$\text{Isoprenaline hydrochloride infusion rate (mL/hr)} = \frac{\text{Dose (micrograms/min)} \times 60 \text{ mins}}{\text{Concentration (microgram/mL)}}$$

For example, to administer a dose of 6micrograms/minute using a solution of 80microgram in 1mL of isoprenaline hydrochloride, the calculation would look as follow:

$$\text{Infusion rate} = \frac{6\text{micrograms/min} \times 60\text{mins}}{80\text{micrograms/mL}} = 4.5\text{mL/hr}$$

Flushing

To avoid adverse effects resulting from an unintentional 'bolus' dose flush with sodium chloride 0.9% at the same rate the medicine was administered:

- IV bolus: flush with sodium chloride 0.9%.
- IV infusion: disconnect the administration set before flushing the cannula with sodium chloride 0.9%.
- Central venous access device: aspirate the cannula contents before flushing with sodium chloride 0.9%

Fluid restriction

Suggested minimum dilutions: 2mg to 4mg in 50mL (40-80microgram/mL) of the equivalent of isoprenaline hydrochloride. To be administered by **central line only**.

Adverse effects

- Tachycardia, cardiac arrhythmias, palpitations, hypotension, hypertension
- Tremor
- Headache, dizziness
- Sweating, facial flushing

Both isoprenaline salts have a low pH and may cause venous irritation and tissue damage in cases of extravasation. If a central venous access device is unavailable, administer via a large peripheral vein monitoring insertion site closed. Re-site cannula at first signs of inflammation.

Monitoring

ECG, arterial blood pressure, heart rate, urine flow, central venous pressure, blood pH, blood pCO₂ or bicarbonate and cardiac output.

Compatibilities

For compatibilities details please refer to Medusa ([Medusa - Isoprenaline Hydrochloride](#)) or the IV compatibility chart from the Handbook of Drugs in Intensive Care.

Storage

Isoprenaline hydrochloride 2mg in 2mL – Store below 25 degrees Celsius.

Isoprenaline sulphate 200micrograms/mL – Store in fridge.

Protect unopened ampoules from light. Discard the injection if it is pinkish or darker than slightly yellow or contains precipitate.

References

- Injectable Medicines Guide. Isoprenaline hydrochloride access via <https://medusa.wales.nhs.uk/IVGuideDisplayNewFormat.asp>
- Injectable Medicines Guide. Isoprenaline sulfate access via <https://medusa.wales.nhs.uk/IVGuideDisplayNewFormat.asp>
- United Kingdom Clinical Pharmacy Association. Minimum Infusion Volumes.4th Edition. December 2012. Accessed online via <https://www.scottishintensivecare.org.uk/uploads/2014-07-24-19-56-30-Minimuminfusionvolumesinl-40262.pdf>
- Summary of Product Characteristic. Isoprenaline Macure 0.2mg/mL concentrate for solution. Last Updated 17/5/2021. Accessed online via: <https://www.medicines.org.uk/emc/product/12511>
- Victorian Agency for Health Information. Isoprenaline. Accessed online via <https://www.bettersafecare.vic.gov.au/clinical-guidance/critical/isoprenaline>
- Drug Bank. Isoprenaline. Accessed online via <https://go.drugbank.com/drugs/DB01064>
- Wellington ICU Drug Manual. Isoprenaline. Accessed online via <https://drug.wellingtonicu.com/F-K/I/Isoprenaline/>
- Poole Hospital NHS Foundation Trust. Isoprenaline Policy. March 2013. Accessed online via <http://www.dorsetformulary.nhs.uk/docs/bnf02/PHT%20RBCH%20Isoprenaline%20policy.pdf>
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- Medscape Online. Isoproterenol (Rx). Accessed online via: <https://reference.medscape.com/drug/isuprel-isoproterenol-342438>
- M.W.Szymanski, D.P. Singh. Isoproterenol. Last Updated 1/5/2021. Accessed online via: <https://www.ncbi.nlm.nih.gov/books/NBK526042/>
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