Drug Guideline
Guideline Title: isoprenaline (Isuprel)

Summary: Isoprenaline is a synthetic catecholamine, a sympathomimetic.\(^2\)
It stimulates beta (\(\beta\)) receptors in the sympathetic nervous system (with minimal Alpha \(\alpha\) effects).
- \(\beta\)-1 stimulation causes a substantial increase in heart rate, with an increase in myocardial contractility. It tends to maintain or increase systolic BP and decrease diastolic BP by lowering peripheral vascular resistance.
- \(\beta\)-2 stimulation causes peripheral vasodilation and bronchodilation

Approved by: ICU Director
Publication (Issue) Date: August 2015
Next Review Date: August 2018
Replaces Existing Guideline: isoprenaline 2012

Background Information:
Isoprenaline hydrochloride is a synthetic sympathomimetic amine that is structurally related to adrenaline but acts almost exclusively on beta-adrenergic receptors.

1. Introduction contains:
The risk addressed by this policy:

Patient Safety

The Aims / Expected Outcome of this policy:

Isoprenaline should be administered safely and without any adverse side effects

Related Standards or Legislation

- NSQHS Standard 1 Governance
- National Standard 4 Medication Safety

Related Policies
LH_PD2013_C03.12 Administration of Intravenous (IV) Medications
LH_PD2013_C03.01 Drug Administration
LH_PD2013_C03.00 Drug Prescribing
2. **Policy Statement:**
   - All care provided within Liverpool Hospital will be in accordance with infection prevention/control, manual handling and minimisation and management of aggression guidelines.
   - Medications are to be prescribed and signed by a medical officer unless required during an emergency.
   - Medications are to be given at the time prescribed and are to be signed by the administering registered nurse.
   - Parenteral medication prescriptions and the drug are to be checked with a second registered nurse prior to administration.
   - Infection Control guidelines are to be followed.
   - All drugs administered during an emergency (under the direction of a medical officer) are to be documented during the event, then prescribed and signed following the event.
   - Adverse drug reactions are to be documented and reported to a medical officer.
   - Medication errors are to be reported using the hospital electronic IIMS reporting system.
   - Guidelines are for adult patients unless otherwise stated.

3. **Principles / Guidelines**

**Actions**
- Isoprenaline acts primarily on the heart, and on the smooth muscle of bronchi, skeletal muscle vasculature and gastrointestinal tract.
- It increases automaticity and atrioventricular nodal conduction, and usually improves coronary blood flow.
- Increases cardiac output due to its positive inotropic and chronotropic actions and by increasing venous return.
- Lowers peripheral vascular resistance. The diastolic pressure, therefore, may be expected to fall in normal individuals.
- The half-life of isoprenaline hydrochloride is brief, lasting only a few minutes following intravenous administration and up to 2 hours after subcutaneous administration.

**Indications**
- Mild or transient episodes of heart block that do not require electric shock or pacemaker therapy.
- Serious episodes of heart block and Adams-Stokes attacks (except when caused by ventricular tachycardia or fibrillation).
- For use in cardiac arrest until electric shock or pacemaker therapy are available.
- For bronchospasm occurring during anaesthesia.
- As an adjunct to fluid and electrolyte replacement therapy and the use of other drugs and procedures in the treatment of hypovolaemic and septic shock, low cardiac output (hypoperfusion) states, congestive heart failure and cardiogenic shock (rarely used).

**Contraindications**
- Tachyarrhythmia’s, tachycardia
- Heart block caused by digitalis intoxication
- Ventricular arrhythmias that require inotropic therapy
- Recent myocardial infarction
- May exacerbate Angina pectoris
- May increase systolic BP. Monitor closely with hypertension
- Hypersensitivity to isoprenaline
- Phaeochromocytoma

**Precautions**
- Hypovolaemia—correct before using isoprenaline.
- Hyperthyroidism—risk of tachycardia and arrhythmias.
Infusions may produce an increase in myocardial work and oxygen consumption.

Patients with disease of the atrioventricular node and its branches, isoprenaline have been reported, paradoxically, to precipitate Adams-Stokes seizures during normal sinus rhythm or transient heart block.

Patients in shock should be closely observed during isoprenaline administration. If the heart rate exceeds 110 beats/minute, it may be advisable to decrease the infusion rate or temporarily discontinue the infusion.

Doses of isoprenaline sufficient to increase the heart rate to more than 130 beats/minute may induce ventricular arrhythmia.

Careful attention should be paid to acid-base balance and to the correction of electrolyte disturbances.

Care should be taken to ensure that oxygen is always administered during isoprenaline infusions in patients with asthma.

Heart rate, blood pressure, arrhythmias and evidence of myocardial ischaemia by ECG should be monitored.

Arterial blood gases should also be monitored carefully and PaO\textsubscript{2} maintained above 60 mmHg.

Where the ECG suggests myocardial ischaemia, cardiac enzymes including cardiac specific CPK-MB isoenzymes levels should be determined.

Interactions

Isoprenaline should not be given simultaneously with adrenaline or digitalis because both drugs are direct cardiac stimulants and their combined effects may induce serious arrhythmias.

Isoprenaline should not be used with chlorpromazine or monoamine oxidase inhibitors (MAOIs) since the effects of isoprenaline may be magnified.

Caution should be maintained when using continuous intravenous isoprenaline hydrochloride infusions in conjunction with intravenous methylxanthines (aminophylline, theophylline) and intravenous corticosteroids. The use of isoprenaline hydrochloride with aminophylline and corticosteroids may be additive in cardiotoxic properties and can lead to myocardial necrosis and death.

Severe cardiac symptoms of sympathetic over activation, i.e. hypertension, tachycardia, arrhythmias, seizures, myocardial ischaemia, and fatal myocardial necrosis, have been reported.

Adverse Effects

**CNS**

- Nervousness, headache, dizziness, restlessness, tension, fear of excitement and, rarely, tinnitus, light-headedness and asthenia.

**Cardiovascular**

- Tachycardia, palpitations, angina, Adams-Stokes attacks, hypertension, hypotension, ventricular arrhythmias, tachyarrhythmias and pulmonary oedema. In patients with acute myocardial infarction, isoprenaline may increase the ischaemic injury to the myocardium.

**Ocular:**

- Blurred vision

**Respiratory**

- Dyspnoea, pulmonary oedema

**Other**

- Hot flashes, flushing of the skin, sweating, mild tremors, weakness and, rarely, nausea and vomiting.

- These effects disappear quickly and usually do not require discontinuation of treatment with isoprenaline. No cumulative effects have been reported. Pulmonary oedema has been reported in a patient extremely intolerant of all sympathomimetic drugs.
Presentation
Solution for injection (sterile) 1mg/5mL. Stored below 25 degrees

Administration Guidelines
Isoprenaline should generally be started at the lowest recommended dose and the rate of administration gradually increased if necessary while carefully monitoring the patient.

• Dilute 1mg isoprenaline to 45mL sterile 5% glucose (total 50mL) to make a final concentration of 20 microgram/mL
• Commence at 1 microgram/minute (3mL/hr) and titrate up to 10 micrograms/minute (30mL/hr) to achieve a heart rate > 50 and/or stable blood pressure.

Isoprenaline 20 micrograms/mL infusion

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Anaesthesia - Bronchospasm
- The recommended initial dose is:
  - 0.02 mg IV bolus and repeat as needed to control bronchospasm occurring during anaesthesia.

Bradyarrhythmia, acute symptomatic
- The recommended dosage for the treatment of symptomatic bradycardia, unresponsive to atropine is:
  - 2 to 10 mcg/min IV and titrate to heart rate and rhythm response

Cardiogenic shock
- The recommended dose in the treatment of cardiogenic shock is:
  - 0.5 to 5 mcg/min IV, adjusted according to heart rate, central venous pressure, systemic blood pressure, and urine flow. In advanced stages of shock rates over 30 mcg/min IV has been used. If the heart rate exceeds 110 beats per minute it may be necessary to decrease or temporarily discontinue the infusion

Heart block
- The recommended initial dose for heart block is:
  - 0.02 mg to 0.06 mg IV bolus followed by 0.01 mg to 0.2 mg IV bolus depending on response.
The recommended IV infusion rate is 5 mcg/min and titrate to response. The usual IV dose for patients with AV block is 1 to 2 mg in 500 mL of 5% Glucose infused at a rate of 0.5 to 2 mL/min. The dose should be titrated to produce the desired clinical response.

**Shock, Hypovolaemic and septic**
- The recommended dose is:
  - 0.5 to 5 mcg/min IV, adjusted according to heart rate, central venous pressure, systemic blood pressure, and urine flow. In advanced stages of shock rates over 30 mcg/min IV has been used. If the heart rate exceeds 110 beats per minute it may be necessary to decrease or temporarily discontinue the infusion.

**Stokes-Adams syndrome**
- The recommended initial dose for serious attacks of Adams-Stokes syndrome is:
  - 0.02 mg to 0.06 mg IV bolus followed by 0.01 mg to 0.2 mg IV bolus depending on response. The recommended initial infusion rate is 5 mcg/min and titrate to response.

### 4. Performance Measures
All incidents are documented using the hospital electronic reporting system: IIMS and managed appropriately by the NUM and staff as directed.

### Clinical Considerations
- Monitoring Parameters
  - ECG, heart rate, respiratory rate, arterial blood pressure, CVP
  - arterial blood gas
  - serum glucose, serum potassium, serum magnesium
- A pacing wire insertion should be considered if there is a lack of response to isoprenaline.
- Ensure adequate oxygenation during therapy.

- **Syringe Change** - when changing from a near completed infusion to a new syringe:
  - Commence new infusion, **prior** to the completion of the old infusion.
  - Observe MAP, when this begins to rise, you may safely cease the old infusion.

### 6. References / Links
1. Isuprel. [www.mimsonline.com](http://www.mimsonline.com) CIAP Liverpool Hospital
2. Isoproterenol. Drug Information. [www.uptodate.com](http://www.uptodate.com)
3. Isoprenaline. [www.amhonline.amh.net.au](http://www.amhonline.amh.net.au) CIAP Liverpool Hospital

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