Drug Therapy Protocols: Adrenaline (epinephrine)

Policy code  DTP_ADR_0323
Date        March, 2023
Purpose     To ensure a consistent procedural approach to adrenaline (epinephrine) administration.
Scope       Applies to Queensland Ambulance Service (QAS) clinical staff.
Health care setting  Pre-hospital assessment and treatment.
Population  Applies to all ages unless stated otherwise.
Source of funding  Internal – 100%
Author      Clinical Quality & Patient Safety Unit, QAS
Review date  March, 2025

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Adrenaline (epinephrine)

Drug class[1,2]
Sympathomimetic

Pharmacology[1-3]
Adrenaline (epinephrine) is a naturally occurring catecholamine which primarily acts on Alpha (α) and Beta (β) adrenergic receptors. The actions of these receptors cause an increase in heart rate (β1), increase in the force of myocardial contraction (β1), increase in the irritability of the ventricles (β1), bronchodilation (β2) and peripheral vasoconstriction (α1).

Metabolism[1-3]
The majority of circulating adrenaline (epinephrine) is metabolised by sympathetic nerve endings. It is subject to the process of mitochondrial enzymatic breakdown by monoamine oxidase at the synaptic level.

Indications
- Cardiac arrest
- Anaphylaxis OR severe allergic reaction
- Severe life-threatening bronchospasm
  OR silent chest (patients must only be able to speak in single words AND/OR have haemodynamic compromise AND/OR an ALOC)
- Shock unresponsive to adequate fluid resuscitation
- Bradycardia with poor perfusion (unresponsive to atropine AND/OR transcutaneous pacing)
- Croup (moderate to severe)

Contraindications
- Nil

Precautions
- Hypertension
- Hypovolaemic shock
- Concurrent MAOI therapy
- Quetiapine toxicity[4]

Side effects[1-3]
- Anxiety
- Hypertension
- Palpitations/tachyarrhythmias
- Pupil dilation
- Tremor

Presentation
- Ampoule, 1 mg/1 mL (1:1,000) adrenaline (epinephrine)
- Ampoule, 1 mg/10 mL (1:10,000) adrenaline (epinephrine)
- Pre-filled syringe EpiPen® Auto-injector, 300 microg adrenaline (epinephrine)
- Pre-filled syringe EpiPen® Jr Auto-injector, 150 microg adrenaline (epinephrine)
### Onset

<table>
<thead>
<tr>
<th>Onset</th>
<th>Duration</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 seconds (IV)</td>
<td>5–10 minutes</td>
<td>2 minutes</td>
</tr>
<tr>
<td>60 seconds (IM)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Special notes

- Ambulance officers must only administer medications for the listed indications and dosing range. Any consideration for treatment outside the listed scope of practice requires mandatory approval via the QAS Clinical Consultation and Advice Line.
- 1:1,000 (1 mg/mL) adrenaline (epinephrine) presentation should be used for all nebuliser administration.
- 1:10,000 (100 microg/mL) or a 1:100,000 (10 microg/mL) adrenaline (epinephrine) preparation should be used for all low dose IM/IV injections. Ensure all syringes are appropriately labelled.
- If possible, all time critical adrenaline (epinephrine) IM injections should be administered in the vastus lateralis (improved absorption).
- Adrenaline (epinephrine) can cause paradoxical hypotension following massive quetiapine overdose. Metaraminol is a suitable alternative.
- Suitably qualified officers should, whenever possible, administer adrenaline infusions through an appropriately placed central venous line.
- Suitably qualified officers should, whenever possible, use invasive pressure monitoring for patients being administered adrenaline (epinephrine) infusions.
- Adrenaline (epinephrine) infusions must be administered through a dedicated line.
- Patients on adrenaline (epinephrine) infusions without continuous IBP monitoring must have their NIBP measured regularly (every 5 mins at a minimum).
- All cannulae with adrenaline (epinephrine) infusions should be as proximal as possible, be freely flowing, and be watched closely for extravasation.
- NIBP cuffs must not be placed on limbs with infusions to ensure flow is not obstructed.
- All cannulae and IV lines must be flushed thoroughly with sodium chloride 0.9% following each medication administration.

### Routes of administration

- **Nebuliser (NEB)**
- **Intramuscular injection (IM)**
- **Intravenous injection (IV)**
- **Intraosseous injection (IO)**
- **Intravenous infusion (IV INF)**
- **Intraosseous infusion (IO INF)**
### Adult dosages

#### Cardiac arrest

<table>
<thead>
<tr>
<th>Route</th>
<th>Dosage</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>1 mg</td>
<td>Repeated at 3–5 minute intervals. No maximum dose.</td>
</tr>
<tr>
<td>IO</td>
<td>1 mg</td>
<td>Repeated at 3–5 minute intervals. No maximum dose.</td>
</tr>
</tbody>
</table>

#### Anaphylaxis OR severe allergic reaction

<table>
<thead>
<tr>
<th>Route</th>
<th>Dosage</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM</td>
<td>EpiPen® Auto-injector (300 microg)</td>
<td>Single dose only.</td>
</tr>
<tr>
<td>IM</td>
<td>500 microg</td>
<td>Repeated at 5 minute intervals. No maximum dose.</td>
</tr>
<tr>
<td>NEB</td>
<td>5 mg</td>
<td>Single dose only.</td>
</tr>
<tr>
<td>IV/IO</td>
<td>20–50 microg bolus (IV/IO)</td>
<td>Immediately followed by an infusion commencing at 10 microg/minute (50 mL/hr) – titrate accordingly to indication and patient’s physiological response to treatment. Maximum infusion rate 50 microg/min (50 mL/hr). Infusion preparation: Mix 3 mg (3 mL) of 1:1000 adrenaline (epinephrine) with 47 mL of sodium chloride 0.9% to achieve a final concentration of 60 microg/mL. Ensure the syringe is appropriately labelled. Administer the infusion via the Perfusor® Space Medication Library (Adrenaline-Adult (shock)).</td>
</tr>
</tbody>
</table>

#### Shock unresponsive to adequate fluid resuscitation

<table>
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<th>Dosage</th>
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</tr>
</tbody>
</table>
Adrenaline (epinephrine)

**Adult dosages (cont.)**

<table>
<thead>
<tr>
<th>Bradycardia with poor perfusion (unresponsive to atropine AND/OR transcutaneous pacing)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IV/IO</strong></td>
</tr>
<tr>
<td>Repeated at 1 minute intervals. No maximum dose.</td>
</tr>
</tbody>
</table>

**Paediatric dosages**

<table>
<thead>
<tr>
<th>Cardiac arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACP2 IV</strong></td>
</tr>
<tr>
<td>Repeated at 3–5 minute intervals. No maximum dose.</td>
</tr>
<tr>
<td>Less than 10 kg (excluding newly born) – 100 microg</td>
</tr>
<tr>
<td>Repeated at 3–5 minute intervals. No maximum dose.</td>
</tr>
<tr>
<td>Newly born – 50 microg</td>
</tr>
<tr>
<td>Repeated at 3–5 minute intervals. No maximum dose.</td>
</tr>
</tbody>
</table>

**Paediatric dosages (cont.)**

<table>
<thead>
<tr>
<th>Anaphylaxis OR severe allergic reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IM</strong></td>
</tr>
<tr>
<td>1 year – less than 6 years – EpiPen® Jr Auto-injector (150 microg)</td>
</tr>
<tr>
<td><strong>IM</strong></td>
</tr>
<tr>
<td>Repeated at 5 minute intervals. No maximum dose.</td>
</tr>
<tr>
<td>1 year – less than 6 years – 150 microg</td>
</tr>
<tr>
<td>Repeated at 5 minute intervals. No maximum dose.</td>
</tr>
<tr>
<td>6 months – less than 1 year – 100 microg</td>
</tr>
<tr>
<td>Repeated at 5 minute intervals. No maximum dose.</td>
</tr>
<tr>
<td>Less than 6 months – 50 microg</td>
</tr>
<tr>
<td>Repeated at 5 minute intervals. No maximum dose.</td>
</tr>
<tr>
<td><strong>NEB</strong></td>
</tr>
<tr>
<td>Single dose only.</td>
</tr>
</tbody>
</table>

May be administered for upper airway obstruction that is refractory to 3 x IM adrenaline (epinephrine) injections.

**Infusion preparation:** Mix 3 mg (3 mL) of 1:1000 adrenaline (epinephrine) with 47 mL of sodium chloride 0.9% to achieve a final concentration of 60 microg/mL. Ensure the syringe is appropriately labelled. Administer the infusion via the Perfusor® Space Medication Library (Adrenaline-Paed (shock)).
**Severe life-threatening bronchospasm OR silent chest**
(patients must only be able to speak in single words AND/OR have haemodynamic compromise AND/OR an ALOC)

| ACP  | IM                        | 6 years or older – **300 microg**  
Repeated at 5 minute intervals.  
No maximum dose.  
1 year – less than 6 years – **150 microg**  
Repeated at 5 minute intervals.  
No maximum dose.  
6 months – less than 1 year – **100 microg**  
Repeated at 5 minute intervals.  
No maximum dose.  
Less than 6 months – **50 microg**  
Repeated at 5 minute intervals.  
No maximum dose. |
|------|--------------------------|
| CCP  | IV/IO INF                | May be administered for refractory severe life-threatening bronchospasm or silent chest unresponsive to 2 x IM adrenaline (epinephrine) injections and adequate fluid administration.  
6 years or older – **1 microg/kg bolus (IV/IO)**  
Immediately followed by an infusion commencing at 0.2 microg/kg/min (0.2 mL/kg/hr) – titrate accordingly to indication and patient’s physiological response to treatment.  
**Maximum infusion rate 0.5 microg/kg/min**  
Less than 6 years – QAS Clinical Consultation and Advice Line consultation and approval required in all situations.  
**Infusion preparation:** Mix 3 mg (3 mL) of 1:1000 adrenaline (epinephrine) with 47 mL of sodium chloride 0.9% to achieve a final concentration of 60 microg/mL.  
Ensure the syringe is appropriately labelled. Administer the infusion via the Perfusor® Space Medication Library (Adrenaline-Paed (shock)). |

**Croup** (moderate to severe)

| ACP  | NEB                        | 5 mg  
Single dose only. |
|------|-----------------------------|

**Shock unresponsive to adequate fluid resuscitation**

| CCP  | IV/IO INF                | 1 microg/kg  
Single dose not to exceed 50 microg.  
Repeated at 2 minutes intervals.  
No maximum dose. |
|------|--------------------------|

**Bradycardia**  
(unresponsive to atropine AND/OR transcutaneous pacing)

<table>
<thead>
<tr>
<th>CCP</th>
<th>IV/IO</th>
<th>QAS Clinical Consultation and Advice Line consultation and approval required in all situations.</th>
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