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.
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Adrenaline (epinephrine)

March, 2023

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 (β_1), increase in the force of myocardial contraction (β_1), increase in the irritability of the ventricles (β_1), bronchodilation (β_2) and peripheral vasoconstriction (α_1).

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)*

Adrenaline (epinephrine)

Onset	Duration	Half-life
30 seconds (IV) 60 seconds (IM)	5–10 minutes	2 minutes

Schedule

- 1 mg/1 mL (1:1,000), S3 (therapeutic poison)
- 1 mg/10 mL (1:10,000), S3 (therapeutic poison)
- 300 microg EpiPen® Auto-injector, S3 (therapeutic poison)
- 150 microg EpiPen® Jr Auto-injector, S3 (therapeutic poison)

Routes of administration

Nebuliser (NEB)	ACP2, CCP
Intramuscular injection (IM)	FR, AT, P, ACP1, ACP2, CCP
Intravenous injection (IV)	ACP2, CCP
Intraosseous injection (IO)	CCP
Intravenous infusion (IV INF)	CCP
Intaosseous infusion (IO INF)	CCP

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/1 mL) or a 1 : 100,000 (10 microg/1 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.[4] 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.

Adrenaline (epinephrine)

Adult dosages[1,2,4–7]

Cardiac arrest

ACP2 CCP	IV	**1 mg** Repeated at **3–5 minute** intervals. **No maximum dose.**
CCP	IO	**1 mg** Repeated at **3–5 minute** intervals. **No maximum dose.**

Anaphylaxis OR severe allergic reaction

FR AT P	IM	**EpiPen® Auto-injector (300 microg)** **Single dose only.**
ACP1 ACP2 CCP	IM	**500 microg** Repeated at **5 minute** intervals. **No maximum dose.**
ACP2 CCP	NEB	**5 mg** **Single dose only.** May be administered for upper airway obstruction that is refractory to 3 X IM adrenaline (epinephrine) injections.
CCP	IV/IO INF	May be administered for refractory anaphylaxis or severe allergic reaction **unresponsive to 2 x IM adrenaline (epinephrine) injections and adequate fluid administration.** **20–50 microg bolus (IV/IO)** Immediately followed by an infusion commencing at **10 microg/minute (10 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))*

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)

ACP1 ACP2 CCP	IM	**500 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.** **20–50 microg bolus (IV/IO)** Immediately followed by an infusion commencing at **10 microg/minute (10 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)).*

Shock unresponsive to adequate fluid resuscitation

CCP	IV/IO INF	**20–50 microg bolus (IV/IO)** Immediately followed by an infusion commencing at **10 microg/minute (10 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)).*

Adult dosages *(cont.)*

Bradycardia with poor perfusion
(unresponsive to atropine AND/OR transcutaneous pacing)

CCP	IV/IO	**20 – 50 microg** Repeated at **1 minute** intervals. **No maximum dose.**

Paediatric dosages[1–6, 5–7]

Cardiac arrest

ACP2 CCP	IV	10 kg or more (≥ 1 year) – **10 microg/kg** Repeated at **3–5 minute** intervals. **No maximum dose.** Less than 10 kg (excluding newly born) – **100 microg** Repeated at **3–5 minute** intervals. **No maximum dose.** Newly born – **50 microg** Repeated at **3–5 minute** intervals. **No maximum dose.**
CCP	IO	10 kg or more (≥ 1 year) – **10 microg/kg** Repeated at **3–5 minute** intervals. **No maximum dose.** Less than 10 kg (excluding newly born) – **100 microg** Repeated at **3–5 minute** intervals. **No maximum dose.** **Newly born – 50 microg** Repeated at **3–5 minute** intervals. **No maximum dose.**

Paediatric dosages *(cont.)*

Anaphylaxis OR severe allergic reaction

FR AT P	IM	6 years or older – **EpiPen® Auto-injector (300 microg). Single dose only.** 1 year – less than 6 years – **EpiPen® *Jr* Auto-injector (150 microg)**
ACP1 ACP2 CCP	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.**
ACP2 CCP	NEB	**5 mg** **Single dose only.** May be administered for upper airway obstruction that is refractory to 3 x IM adrenaline (epinephrine) injections.
CCP	IV/IO INF	May be administered for refractory anaphylaxis or severe allergic reaction **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)).*

Paediatric dosages *(cont.)*

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)

ACP1 ACP2 CCP	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)

ACP2 CCP	NEB	**5 mg** **Single dose only.**

Shock unresponsive to adequate fluid resuscitation

CCP	IV/IO	**1 microg/kg** Single dose not to exceed 50 microg. Repeated at **2 minutes** intervals. **No maximum dose.**
CCP	IV/IO INF	*QAS Clinical Consultation and Advice Line* consultation and approval required in all situations.

Bradycardia
(unresponsive to atropine AND/OR transcutaneous pacing)

CCP	IV/IO	*QAS Clinical Consultation and Advice Line* consultation and approval required in all situations.