

Acute management of anaphylaxis

These guidelines are intended for medical practitioners and nurses providing first responder emergency care. The appendix includes additional information for emergency department staff, ambulance staff, rural or remote medical practitioners and nurses providing emergency care.

Anaphylaxis definitions

- Any **acute onset illness** with **typical skin features** (urticarial rash or erythema/flushing, and/or angioedema), **PLUS** involvement of **respiratory** and/or **cardiovascular** and/or persistent severe **gastrointestinal** symptoms; or
- Any **acute onset** of **hypotension** or **bronchospasm** or **upper airway obstruction** where anaphylaxis is considered possible, **even if typical skin features are not present**.

Signs and symptoms of allergic reactions

Mild or moderate reactions

- Swelling of lips, face, eyes
- Hives or welts
- Tingling mouth
- Abdominal pain, vomiting (these are signs of anaphylaxis for insect allergy)

Anaphylaxis - Watch for any one of the following signs:

- Difficult/noisy breathing
- Swelling of tongue
- Swelling/tightness in throat
- Difficulty talking and/or hoarse voice
- Wheeze or persistent cough
- Persistent dizziness or collapse
- Pale and floppy (young children)
- Vomiting and/or abdominal pain for insect stings/bites

Immediate actions

1. **Remove allergen** (if still present).
2. **Call for assistance**.
3. **Lay patient flat. Do not allow them to stand or walk.** If breathing is difficult, allow them to sit.



4. **Give INTRAMUSCULAR INJECTION (IMI) OF ADRENALINE (epinephrine) into outer mid thigh** without delay using an adrenaline autoinjector if available OR adrenaline ampoule and syringe.
5. **Give oxygen** (if available).
6. **Call ambulance** to transport patient if not already in a hospital setting.

ALWAYS give adrenaline FIRST, then asthma reliever if someone with known asthma and allergy to food, insects or medication has SUDDEN BREATHING DIFFICULTY (including wheeze, persistent cough or hoarse voice) even if there are no skin symptoms.

- Administer intravenous saline (20mL/kg) if patient is hypotensive (if available).
- If required at any time, commence cardiopulmonary resuscitation (CPR).

For further information about anaphylaxis and to access an ASCIA Action Plan for Anaphylaxis see the ASCIA website www.allergy.org.au/anaphylaxis

Adrenaline administration and dosages

Give INTRAMUSCULAR INJECTION (IMI) OF ADRENALINE (1:1000) into outer mid thigh (0.01mg per kg up to 0.5mg per dose) without delay using an adrenaline autoinjector if available OR adrenaline ampoule and syringe, as follows:

Adrenaline (epinephrine) dosages chart			
Age (years)	Weight (kg)	Vol. adrenaline 1:1000	Adrenaline autoinjector
<1	5-10	0.05-0.1 mL	
1-2	10	0.1 mL	10-20 kg (~1-5yrs) 0.15mg (green labelled device)
2-3	15	0.15 mL	
4-6	20	0.2 mL	
7-10	30	0.3 mL	>20kg (~>5yrs) 0.3mg (yellow labelled device)
10-12	40	0.4 mL	
>12 and adults*	>50	0.5 mL	

* For pregnant women, a dose of 0.3mg should be used.

Note:

- Repeat every 5 minutes as needed.
- If multiple doses are required for a severe reaction (e.g. 2-3 doses), consider adrenaline infusion if skills and equipment are available.
- For emergency treatment of anaphylaxis, ampoules of adrenaline 1:1000 should be used for both IM doses and infusion if required (adrenaline 1:10 000 should not be used).

Positioning of patient

- Laying the patient flat will improve venous blood return to the heart.
- By contrast, placing the patient in an upright position can impair blood returning to the heart, resulting in insufficient blood for the heart to circulate and low blood pressure.
- The left lateral position is recommended for patients who are pregnant to reduce the risk of compression of the inferior vena cava by the pregnant uterus and thus impairing venous return to the heart.
- Fatality can occur within minutes if a patient stands or sits suddenly.
- For mainly respiratory reactions, the patient may prefer to sit and this may help support breathing and improve ventilation. BEWARE that even sitting may trigger hypotension. Monitor closely. Immediately lay the patient flat again, if there is any alteration in conscious state or drop in blood pressure.
- If vomiting, lay the patient on their side (recovery position).

- Patients must **not** be walked to/from the ambulance, even if they appear to have recovered.
- Infographics (see page 1) are included in ASCIA Action Plans to reinforce correct positioning.

Supportive management - when skills and equipment are available

- Check pulse, blood pressure, ECG, pulse oximetry, conscious state.
- Give high flow oxygen if available and airway support if needed.
- Obtain IV access in adults and hypotensive children.
- If hypotensive, give IV normal saline 20mL/kg rapidly and consider additional wide bore IV access.

See Appendix for additional information.

Additional measures - IV adrenaline infusion in clinical setting

If inadequate response after 2-3 adrenaline doses, or deterioration of patient, start IV adrenaline infusion, given by staff trained in its use or in liaison with an emergency/critical care specialist. See Appendix for additional information.

IV adrenaline infusions should be used with a dedicated line, infusion pump and anti-reflux valves wherever possible.

If no infusion pump is available:

- Mix 1 mL of 1:1000 adrenaline in 1000 mL of normal saline.
- Start infusion at 5 mL/kg/hour (~0.1 µg/kg/minute).
- Titrate rate up or down according to response and monitor continuously.

CAUTION: IV boluses of adrenaline are NOT recommended without specialised training as they may increase the risk of cardiac arrhythmia.

Additional measures to consider if IV adrenaline infusion is ineffective

For Upper airway obstruction	<ul style="list-style-type: none"> • Nebulised adrenaline (5mL i.e. 5 ampoules of 1:1000). • Consider need for advanced airway management if skills and equipment are available.
For persistent hypotension/shock	<ul style="list-style-type: none"> • Give normal saline (maximum of 50mL/kg in first 30 minutes). • Glucagon (1-2mg IMI or IV as starting dose) especially for patients on beta blockers or who have heart failure. • In adults, selective vasoconstrictors metaraminol (2-10mg) or vasopressin (10-40 units) only after advice from an emergency medicine/critical care specialist. • See Appendix for additional information.
For persistent wheeze	<p>Bronchodilators:</p> <ul style="list-style-type: none"> • Salbutamol 8 - 12 puffs of 100µg using a spacer OR 5mg salbutamol by nebuliser. • Note: Bronchodilators do not prevent or relieve upper airway obstruction, hypotension or shock. <p>Corticosteroids:</p> <ul style="list-style-type: none"> • Oral prednisolone 1 mg/kg (maximum of 50 mg) or intravenous hydrocortisone 5 mg/kg (maximum of 200 mg). • Note: Steroids must not be used as a first line medication in place of adrenaline.

Antihistamines and corticosteroids

Antihistamines:

- Antihistamines have no role in treating or preventing respiratory or cardiovascular symptoms of anaphylaxis.
- Do not use oral sedating antihistamines as side effects (drowsiness or lethargy) may mimic some signs of anaphylaxis.
- **Injectable promethazine should not be used** in anaphylaxis as it can worsen hypotension and cause muscle necrosis.

Corticosteroids:

- The benefit of corticosteroids in anaphylaxis is unproven.
- It is common practice to prescribe a 2-day course of oral steroids (e.g. oral prednisolone 1 mg/kg, maximum 50 mg daily) to hopefully reduce the risk of symptom recurrence after a severe reaction or a reaction with marked or persistent wheeze.

Observe patient for at least 4 hours after last dose of adrenaline

Relapse, protracted and/or biphasic reactions may occur. Patients require overnight observation if they:

- Had a severe or protracted anaphylaxis (e.g. required repeated doses of adrenaline or IV fluid resuscitation), OR
- Have a history of asthma or severe/protracted anaphylaxis, OR
- Have other concomitant illness (e.g. asthma, history of arrhythmia), OR
- Live alone or are remote from medical care, OR
- Present for medical care late in the evening.

True biphasic reactions are estimated to occur following 3-20% of anaphylactic reactions.

Follow up treatment including advice for hospital discharge

Adrenaline autoinjector

- If there is a risk of re-exposure (e.g. stings, foods, unknown cause) then prescribe an adrenaline autoinjector before discharge, pending specialist review.
- Teach the patient how to use the adrenaline autoinjector using a trainer device and provide them with an ASCIA Action Plan for Anaphylaxis - see ASCIA website www.allergy.org.au/anaphylaxis

Allergy specialist referral

- Refer ALL patients who present with anaphylaxis for specialist review
- The allergy specialist will:
 - Identify/confirm cause.
 - Educate regarding avoidance/prevention strategies, management of comorbidities.
 - Provide ASCIA Action Plan for Anaphylaxis - preparation for future reactions.
 - Initiate immunotherapy where available (some insect venoms).

Documentation of episodes

Patients should be advised to document the circumstances of episodes of anaphylaxis to facilitate identification of avoidable causes (e.g. food, medication, herbal remedies, bites and stings, co-factors like exercise) in the 6-8 hours preceding the onset of symptoms.

The ASCIA allergic reactions event record form can be used to collect and document this information.

www.allergy.org.au/health-professionals/anaphylaxis-resources/anaphylaxis-event-record

Preparation: Equipment required for acute management of anaphylaxis

The equipment on your emergency trolley should include:

- Adrenaline 1:1000 (consider adrenaline autoinjector availability, particularly in rural locations, for initial administration by nursing staff)
- 1mL syringes; 21 gauge needles
- Oxygen
- Airway equipment, including nebuliser and suction
- Defibrillator
- Manual blood pressure cuff
- IV access equipment (including large bore cannulae)
- Pressure sleeve (aids rapid infusion of fluid under pressure)
- At least 3 litres of normal saline
- A hands-free phone in resuscitation room, to allow health care providers in remote locations to receive instructions by phone whilst keeping hands free for resuscitation.

Acknowledgements

The information in these guidelines is consistent with the Australian Prescriber Anaphylaxis Management wall chart www.australianprescriber.com

These guidelines are based on the following international guidelines:

- International Liaison Committee on Resuscitation (ILCOR) and Australian and New Zealand Committee on Resuscitation (ANZCOR) guidelines
- American Academy of Allergy, Asthma and Immunology (AAAAI) anaphylaxis parameter
- World Allergy Organisation (WAO) anaphylaxis guidelines

The appendix includes information on advanced acute management of anaphylaxis for emergency department staff, ambulance staff, rural or remote medical practitioners and nurses providing emergency care. This additional information was previously in a separate document titled ASCIA Guidelines for advanced acute management of anaphylaxis.

Disclaimer

This document has been developed and peer reviewed by ASCIA members and is based on expert opinion and the available published literature at the time of review. Information contained in this document is not intended to replace medical advice and any questions regarding a medical diagnosis or treatment should be directed to a medical practitioner. Development of this document is not funded by any commercial sources and is not influenced by commercial organisations.

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ASCIA is the peak professional body of clinical immunology/allergy specialists in Australia and New Zealand

Website: www.allergy.org.au

Email: info@allergy.org.au

Postal address: PO Box 450 Balgowlah NSW Australia 2093

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Appendix

Advanced acute management of anaphylaxis

This additional information is intended for health professionals working in emergency departments, ambulance staff, and rural or remote medical practitioners and nurses providing emergency care.

Supportive management (when skills and equipment available)

- Monitor pulse, blood pressure, respiratory rate, pulse oximetry, conscious state.
- Give high flow oxygen (6-8 L/min) and airway support if needed.
- Supplemental oxygen should be given to all patients with respiratory distress, reduced conscious level and those requiring repeated doses of adrenaline.
- Supplemental oxygen should be considered in patients who have asthma, other chronic respiratory disease, or cardiovascular disease.
- Obtain intravenous (IV) access in adults and in hypotensive children.
- If hypotensive:
 - Give intravenous normal saline (20 mL/kg rapidly under pressure), and repeat bolus if hypotension persists.
 - Consider additional wide bore (14 or 16 gauge for adults) intravenous access.

During severe anaphylaxis with hypotension, marked fluid extravasation into the tissues can occur: DO NOT FORGET FLUID RESUSCITATION.

Assess circulation to reduce risk of overtreatment

- Monitor for signs of overtreatment (especially if respiratory distress or hypotension were absent initially) – including pulmonary oedema, hypertension.
- In this setting (anaphylaxis) it is recommended that if possible a simple palpable systolic blood pressure (SBP) should be measured:
 - Attach a manual BP cuff of an appropriate size and find the brachial or radial pulse.
 - Determine the pressure at which this pulse disappears/reappears (the "palpable" systolic BP).
 - This is a reliable measure of initial severity and response to treatment
 - Measurement of palpable SBP may be more difficult in children.

Note: If a patient is nauseous, shaky, vomiting, or tachycardic but has a normal or elevated SBP, this may be adrenaline toxicity rather than worsening anaphylaxis.

Additional measures - IV adrenaline infusion

IV adrenaline infusions should only be given by, or in liaison with, an emergency medicine/critical care specialist.

If your centre has a protocol for IV adrenaline infusion for critical care, this should be utilised and titrated to response with close cardio-respiratory monitoring.

If there is not an established protocol for your centre, two protocols for IV adrenaline infusion are provided, one for pre-hospital settings and a second for emergency departments/tertiary hospital settings only.

It is important to note that the two infusion protocols have *different* concentrations and *different* rates of infusion.

It is vital that IV adrenaline infusions should be used with the following equipment wherever possible:

- Dedicated line,
- Infusion pump,
- Anti-reflux valves in intravenous line.

Additional measures - IV adrenaline infusion for pre-hospital settings

If there is inadequate response to IMI adrenaline or deterioration, start an intravenous adrenaline infusion. IV adrenaline infusions should only be given by, or in liaison with, an emergency medicine/critical care specialist.

The protocol for 1000 mL normal saline is as follows:

- Mix 1 mL of 1:1000 adrenaline in **1000 mL** of normal saline.
- Start infusion at **~5 mL/kg/hour** (~0.1 microgram/kg/minute) using a pump.
 - If you do not have an infusion pump, a standard giving set administers ~20 drops per mL;
 - Therefore, start at ~2 drops per second for an adult.
- Titrate rate up or down according to response and side effects.
- Monitor continuously – ECG and pulse oximetry and frequent non-invasive blood pressure measurements as a minimum to maximise benefit and minimise risk of overtreatment and adrenaline toxicity.

Note:

- This protocol is intended for temporary use, when no infusion pump is available.
- Most anaphylactic reactions settle with only 1 mg adrenaline in 1 litre.
- Indefinite continuation of low concentration infusion increases risk of fluid overload.
- **Caution - Intravenous boluses of adrenaline are NOT recommended due to risk of cardiac ischaemia or arrhythmia UNLESS the patient is in cardiac arrest.**

Additional measures - IV adrenaline infusion for emergency departments and tertiary hospitals only

This infusion will facilitate a more rapid delivery through a peripheral line and **should only be used in emergency departments and tertiary hospital settings.**

The protocol for 100 mL normal saline is as follows:

- Mix 1 mL of 1:1000 adrenaline in **100 mL** normal saline.
 - Initial rate adjusted accordingly to **0.5 mL/kg/hour**.
 - Should *only* be given by infusion pump.

- Monitor continuously – ECG and pulse oximetry and frequent non-invasive blood pressure measurements as a minimum to maximise benefit and minimise risk of overtreatment and adrenaline toxicity.

Additional measures to consider if IV adrenaline infusion is ineffective

For persistent hypotension/shock	<ul style="list-style-type: none">• Give normal saline (maximum of 50mL/kg in first 30 minutes).• In patients with cardiogenic shock (especially if taking beta blockers) consider an intravenous glucagon bolus of:<ul style="list-style-type: none">- 1-2mg in adults- 20-30 microgram/kg up to 1mg in childrenThis may be repeated or followed by an infusion of 1-2mg/hour in adults.• In adults, selective vasoconstrictors metaraminol (2-10mg) or vasopressin (10-40 units) only after advice from an emergency medicine/critical care specialist. Beware of side effects including arrhythmias, severe hypotension and pulmonary oedema.• In children, metaraminol 10 micrograms/kg/dose can be used. Noradrenaline infusion may be used in the critical care setting only with invasive blood pressure monitoring.
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Advanced airway management

- Oxygenation is more important than intubation *per se*.
- Always call for help from the most experienced person available.
- If airway support is required, first use the skills you are most familiar with (e.g. jaw thrust, Guedel or nasopharyngeal airway, bag-valve-mask with high flow oxygen attached). This will save most patients, even those with apparent airway swelling (these patients have often stopped breathing due to circulatory collapse rather than airway obstruction and can be adequately ventilated with basic life support procedures).
- DO NOT make prolonged attempts at intubation - remember the patient is not getting any oxygen while you are intubating.

If unable to maintain an airway and the patient's oxygen saturations are falling further approaches to the airway (e.g. cricothyrotomy) should be considered in accordance with established difficult airway management protocols. Specific training is required to perform these procedures.

Special situation: Overwhelming anaphylaxis (cardiac arrest)

Key points:

- Massive vasodilatation and fluid extravasation.
- Unlikely that IMI adrenaline will be absorbed in this situation due to poor peripheral circulation.
- Even if absorbed, IMI adrenaline on its own may be insufficient to overcome vasodilatation and extravasation.
- Need both IV adrenaline bolus (cardiac arrest protocol, 1 mg every 2-3 minutes) AND aggressive fluid resuscitation in addition to CPR (Normal Saline 20mL/kg stat, through a large bore IV under pressure, repeat if no response).
- Do not give up too soon - this is a situation when prolonged CPR should be considered, because the patient arrested rapidly with previously normal tissue oxygenation, and has a potentially reversible cause.