

# Emergency treatment of anaphylaxis in adults: concise guidance

Jasmeet Soar on behalf of the multidisciplinary Guideline Development Group\*

**ABSTRACT** – Anaphylaxis is a severe, life-threatening, generalised or systemic hypersensitivity reaction characterised by rapidly developing life-threatening airway, breathing and/or circulation problems usually associated with skin and mucosal changes. Updated guidance on the recognition, acute management and follow up of adults with anaphylaxis has recently been published. This is a concise version of the full guidelines published by the Resuscitation Council (UK) in 2008. The use of an airway, breathing, circulation, disability and exposure approach to recognise and treat anaphylaxis is emphasised.

**KEY WORD:** anaphylaxis

## Introduction and aims

Anaphylaxis is a severe, life-threatening hypersensitivity reaction which is estimated to affect approximately 1 in 1,333 of the English population at some point in their lives. The incidence of anaphylaxis is increasing and there has been a dramatic growth in the rate of related hospital admissions in the last two decades. Although the overall prognosis of anaphylaxis is good (case-fatality ratio of less than 1%), the risk of death is increased in those with pre-existing asthma. There are approximately 20 deaths due to anaphylaxis reported each year in the UK.

Anaphylaxis can occur following exposure to a very broad range of triggers (Table 1). It has a range of possible presentations and the lack of any consistent clinical manifestations continues to cause diagnostic difficulty. Full guidance for the emergency treatment of anaphylactic reactions has recently been published.<sup>1</sup> Information in this concise guidance has been extracted from the full guideline. Please refer to the full guidance for details of methodology.

\* This guidance was prepared on behalf of the multidisciplinary Guideline Development Group (GDG) convened by the Working Group of the Resuscitation Council (UK) in association with the Clinical Effectiveness and Evaluation Unit of the Royal College of Physicians. For membership of the GDG, see the end of paper.

The aim of this guidance is to provide updated recommendations in the following areas:

- the recognition and correct diagnosis of anaphylaxis
- the acute management and effective treatment of an anaphylactic reaction in adults
- the appropriate investigation and follow up of patients with suspected anaphylaxis.

## Pathophysiological consequences of anaphylaxis

Anaphylaxis can be caused by allergic and non-allergic mechanisms. Allergic anaphylaxis is caused by an immediate (type I) hypersensitivity reaction following exposure to an allergen to which the patient has become sensitised. The allergen stimulates IgE-mediated degranulation of mast cells, releasing large quantities of histamine into the circulation which causes intense smooth muscle contraction, increased vascular permeability and vasodilation. The clinical presentation is the same regardless of whether the reaction has an allergic or non-allergic mechanism.

Adrenaline is the most important drug for the treatment of an anaphylactic reaction. Failure to

**Jasmeet Soar**  
FRCA, Consultant in Anaesthetics and Intensive Care Medicine, North Bristol NHS Trust

Concise Guidance to Good Practice Series Editors:

**Lynne Turner-Stokes** FRCP and **Bernard Higgins** FRCP

Guest Editor: **Tabitha Turner-Stokes** BA MBBS

*Clin Med* 2009;9:181–5

**Table 1. Allergens known to trigger fatal anaphylactic reactions.** For further details, please see the full guidance document.<sup>1</sup>

Allergen	Examples
Stings	Wasp, bee
Nuts	Peanuts, walnuts, almonds, brazil nuts, hazelnuts
Other foods	Milk, fish, chickpeas, crustaceans
Antibiotics	Penicillin, cephalosporin, amphotericin, ciprofloxacin, vancomycin
Anaesthetic drugs (mostly muscle relaxants)	Suxamethonium, vecuronium, atracurium
Other drugs	NSAID, ACEI, gelatins, protamine, vitamin K, local anaesthetics, diamorphine, streptokinase
Contrast media	Iodine, technetium, fluorescein
Others	Latex, hair dye, hydatid

ACEI = angiotensin converting enzyme inhibitor; NSAID = non-steroidal anti-inflammatory drug.

**Box 1. Recognition of an anaphylactic reaction.**

Anaphylaxis is likely when **all of the following three criteria** are present:

- 1 sudden onset and rapid progression of symptoms
- 2 life-threatening compromise of:
  - airway and/or
  - breathing and/or
  - circulation
- 3 skin and/or mucosal changes, for example:
  - flushing
  - urticaria
  - angioedema.

**Box 2. Symptoms and signs of anaphylaxis.**

<b>Airway problems</b> (life-threatening)	<b>Patients may develop:</b> <ul style="list-style-type: none"> <li>• swelling of tongue or throat (pharyngeal/laryngeal oedema) leading to difficulty in breathing and swallowing</li> <li>• stridor (inspiratory noise caused by upper airway obstruction)</li> <li>• hoarse voice.</li> </ul>
<b>Breathing problems</b> (life-threatening)	<b>Patients may develop:</b> <ul style="list-style-type: none"> <li>• shortness of breath (increased respiratory rate)</li> <li>• wheeze</li> <li>• exhaustion due to the work of breathing</li> <li>• confusion caused by hypoxia</li> <li>• cyanosis (a late sign)</li> <li>• respiratory arrest.</li> </ul>
<b>Circulation problems</b> (life-threatening)	<b>Patients may develop:</b> <ul style="list-style-type: none"> <li>• signs of shock (pale, clammy)</li> <li>• tachycardia</li> <li>• hypotension (causing dizziness or collapse)</li> <li>• decrease conscious level or loss of consciousness</li> <li>• myocardial ischaemia</li> <li>• cardiac arrest.</li> </ul>
<b>Neurological problems</b>	<b>Problems with A, B and/or C may alter the patient's neurological status resulting in:</b> <ul style="list-style-type: none"> <li>• confusion</li> <li>• agitation</li> <li>• loss of consciousness.</li> </ul>
<b>Skin and mucosal changes</b>	<b>Often the first feature and may be subtle or dramatic:</b> <ul style="list-style-type: none"> <li>• erythema (a patchy, or generalised, red rash)</li> <li>• urticaria (also called hives, wheals or welts – usually itchy)</li> <li>• angioedema (caused by swelling of mucosal tissue) resulting in:                             <ul style="list-style-type: none"> <li>– swelling of eyelids and lips (most common)</li> <li>– pharyngeal and laryngeal oedema (causing upper airway obstruction).</li> </ul> </li> </ul>

inject adrenaline promptly increases the risk of death. Adverse effects of adrenaline are extremely rare when the correct doses are injected intramuscularly. Intravenous adrenaline has a much greater risk of causing harmful side effects and hence should only be used by those experienced in the use and titration of vasopressors in their normal clinical practice.

**Recognition of an anaphylactic reaction**

There is a range of signs and symptoms, none of which are entirely specific for anaphylactic reaction, however, certain combinations of signs make the diagnosis more likely (Box 1). Most anaphylactic reactions develop suddenly and evolve rapidly following exposure to a trigger (allergen). There is a rapid progression of symptoms resulting in life-threatening compromise of airway, breathing and/or circulation (Box 2).

Some patients have less severe systemic allergic reactions that are characterised by skin or mucosal changes alone (eg generalised urticaria or angioedema). These reactions are not described as anaphylaxis because life-threatening features are not present. Most patients who have skin changes caused by allergy do not go on to develop an anaphylactic reaction. The differential diagnosis of anaphylaxis is summarised in Box 3.

**Implications for implementation**

The implications for implementation of these guidelines are primarily those of staff education and awareness. All clinical staff within the hospital setting should be able to call for help and initiate treatment in a patient experiencing an anaphylactic reaction.

Resuscitation equipment and drugs to help with the rapid resuscitation of a patient with anaphylaxis must be immediately available in all clinical settings. No new drugs for the treatment of anaphylaxis are needed. Intramuscular injection of adrenaline is the initial treatment of choice.

**Box 3. Differential diagnosis of anaphylaxis.**

- Life-threatening conditions:**
- **asthma** (can present with similar symptoms and signs to anaphylaxis, particularly in children)
  - **septic shock** (hypotension with petechial/purpuric rash).
- Non-life-threatening conditions:**
- vasovagal episode
  - panic attack
  - breath holding episode in a child
  - idiopathic (non-allergic) urticaria or angioedema.

**Seek help early if there are any doubts about the diagnosis.**

## Summary of the guidelines

Recommendation	Grade
<b>A Treatment of an anaphylactic reaction</b>	
<p>1 The diagnosis of anaphylaxis is not always obvious. Clinicians must:</p> <ul style="list-style-type: none"> <li>• use the systematic ABCDE (airway, breathing, circulation, disability, exposure) approach to assess and treat the patient</li> <li>• treat life-threatening problems as they are found</li> <li>• monitor the patient with a minimum of pulse oximetry, non-invasive blood pressure and a 3-lead electrocardiogram as soon as possible.</li> </ul>	C
<p>2 Patients having an anaphylactic reaction should expect the following as a minimum:</p> <ul style="list-style-type: none"> <li>• recognition that they are seriously unwell</li> <li>• an early call for help</li> <li>• initial assessment and treatment based on the ABCDE approach</li> <li>• adrenaline therapy, if indicated</li> <li>• investigation and follow up by an allergy specialist.</li> </ul>	C
<p>3 Clinicians managing an acute anaphylactic reaction should follow the key steps outlined in Figure 1.</p>	C
<p>4 Adrenaline is the most important drug for the treatment of anaphylaxis and should be given to all patients with life-threatening features:</p> <ul style="list-style-type: none"> <li>• administer 0.5 ml of 1:1,000 adrenaline (0.5 mg) via the intramuscular (IM) route into the anterolateral aspect of the middle third of the thigh</li> <li>• use a needle long enough to ensure that adrenaline is injected into muscle</li> <li>• monitor the patient as soon as possible to assess response to adrenaline</li> <li>• repeat the IM adrenaline dose at 5-minute intervals if there is no improvement in the patient's condition.</li> </ul> <p>Intravenous (iv) adrenaline must only be given by clinicians experienced in its use eg anaesthetists, intensive care and emergency physicians.</p> <p>The use of subcutaneous or inhaled adrenaline is not recommended.</p>	C
<p>5 All patients should be placed in a comfortable position:</p> <ul style="list-style-type: none"> <li>• patients with airway and breathing problems may prefer to sit up</li> <li>• lying flat (with leg elevation) is helpful for patients with hypotension: <ul style="list-style-type: none"> <li>– do not make patients sit or stand up if they feel faint as this can cause cardiac arrest</li> </ul> </li> <li>• place unconscious patients who are breathing in the recovery position.</li> </ul>	C
<p>6 All patients with anaphylaxis should receive supportive care in addition to definitive treatment with adrenaline. This includes:</p> <ul style="list-style-type: none"> <li>• <b>oxygen:</b> <ul style="list-style-type: none"> <li>– give high flow oxygen immediately at the highest concentration possible using a mask with an oxygen reservoir</li> </ul> </li> <li>• <b>fluids:</b> <ul style="list-style-type: none"> <li>– administer a rapid iv fluid challenge of 500–1,000 ml of crystalloid or colloid as soon as possible</li> <li>– avoid colloid if it is thought to be cause of reaction</li> <li>– monitor the patient's response and give further doses if necessary</li> </ul> </li> <li>• <b>antihistamines:</b> <ul style="list-style-type: none"> <li>– administer 10 mg of chlorphenamine IM or by slow iv injection following initial resuscitation of the patient</li> </ul> </li> <li>• <b>corticosteroids:</b> <ul style="list-style-type: none"> <li>– administer 200 mg of hydrocortisone IM or by slow iv injection following initial resuscitation of the patient</li> </ul> </li> <li>• <b>other medications:</b> <ul style="list-style-type: none"> <li>– if patient has symptoms of asthma, bronchodilator therapy with salbutamol, ipratropium and/or aminophylline may be helpful.</li> </ul> </li> </ul>	C
<p>7 If the trigger for the patient's anaphylactic reaction is identified, it should be removed if possible.</p> <ul style="list-style-type: none"> <li>• Stop any drug suspected of causing an anaphylactic reaction immediately.</li> <li>• Do not delay definitive treatment of anaphylaxis if removing the trigger is not feasible.</li> <li>• After food-induced anaphylaxis, attempts to make the patient vomit are not recommended.</li> </ul>	C

*continued*

## Summary of the guidelines – continued

Recommendation	Grade
----------------	-------

### A Treatment of an anaphylactic reaction – continued

- |  |   |
|--|---|
| <p>8 If cardiorespiratory arrest occurs following an anaphylactic reaction:</p> <ul style="list-style-type: none"> <li>● start cardiopulmonary resuscitation immediately and call the cardiac arrest team</li> <li>● commence advanced life support (ALS) as soon as equipment is available</li> <li>● use the iv doses of adrenaline recommended in the ALS guidelines.<sup>2</sup></li> </ul>  | C |
| <p>9 Patients with suspected anaphylaxis should be observed in hospital for at least six hours and reviewed by a senior clinician:</p> <ul style="list-style-type: none"> <li>● patients with the following may need careful observation for up to 24 hours:               <ul style="list-style-type: none"> <li>– an asthmatic component to their anaphylactic reaction</li> <li>– previous history of biphasic reactions</li> <li>– possibility of continuing absorption of allergen</li> <li>– poor access to emergency care</li> <li>– presentation in the evening or at night</li> <li>– severe reactions with slow onset caused by idiopathic anaphylaxis.</li> </ul> </li> </ul> | C |

### B Investigation, discharge and follow up of patients with anaphylaxis

- |  |   |
|--|---|
| <p>1 Mast cell tryptase should be measured to confirm the diagnosis of anaphylaxis:</p> <ul style="list-style-type: none"> <li>● ideally, three time samples should be taken (use a serum or clotted blood sample. Plasma samples can also be tested):               <ul style="list-style-type: none"> <li>– first sample: as soon as feasible after resuscitation has started</li> <li>– second sample: one to two hours after the start of the patient's symptoms</li> <li>– third sample: after 24 hours or in a follow-up allergy clinic</li> </ul> </li> <li>● the minimum requirement is one sample taken one to two hours after the start of the symptoms.</li> </ul> <p>Mast cell tryptase is not useful in the initial recognition and treatment of anaphylaxis and should not delay resuscitation of the patient.</p> | C |
| <p>2 Before discharge from hospital, all patients must be:</p> <ul style="list-style-type: none"> <li>● reviewed by a senior clinician</li> <li>● given clear instructions to return to hospital if symptoms return</li> <li>● considered for treatment with antihistamines and oral steroids for three days to decrease the chance of a further reaction</li> <li>● considered for an adrenaline auto-injector or given a replacement</li> <li>● given a plan for follow up, including contact with their general practitioner.</li> </ul>  | C |
| <p>3 All patients presenting with anaphylaxis should be referred to a specialist allergy clinic to:</p> <ul style="list-style-type: none"> <li>● identify the cause of the reaction</li> <li>● reduce the risk of future anaphylactic reactions</li> <li>● prepare the patient to manage future episodes themselves.</li> </ul> <p>Clinicians should refer to the British Society for Allergy and Clinical Immunology website for a list of specialist allergy clinics (<a href="http://www.bsaci.org">www.bsaci.org</a>).</p>   | C |
| <p>4 All patients should be given information on:</p> <ul style="list-style-type: none"> <li>● the allergen responsible for their anaphylactic reaction and how to avoid exposure to it</li> <li>● how to recognise the early symptoms of anaphylaxis</li> <li>● how to use their adrenaline auto-injector (if provided)</li> <li>● the importance of seeking urgent medical assistance when experiencing anaphylaxis and after using an adrenaline auto-injector.</li> </ul> <p>Individuals close to the patient (eg family, carers) must be adequately informed and given training in using the adrenaline auto-injector.</p>  | C |

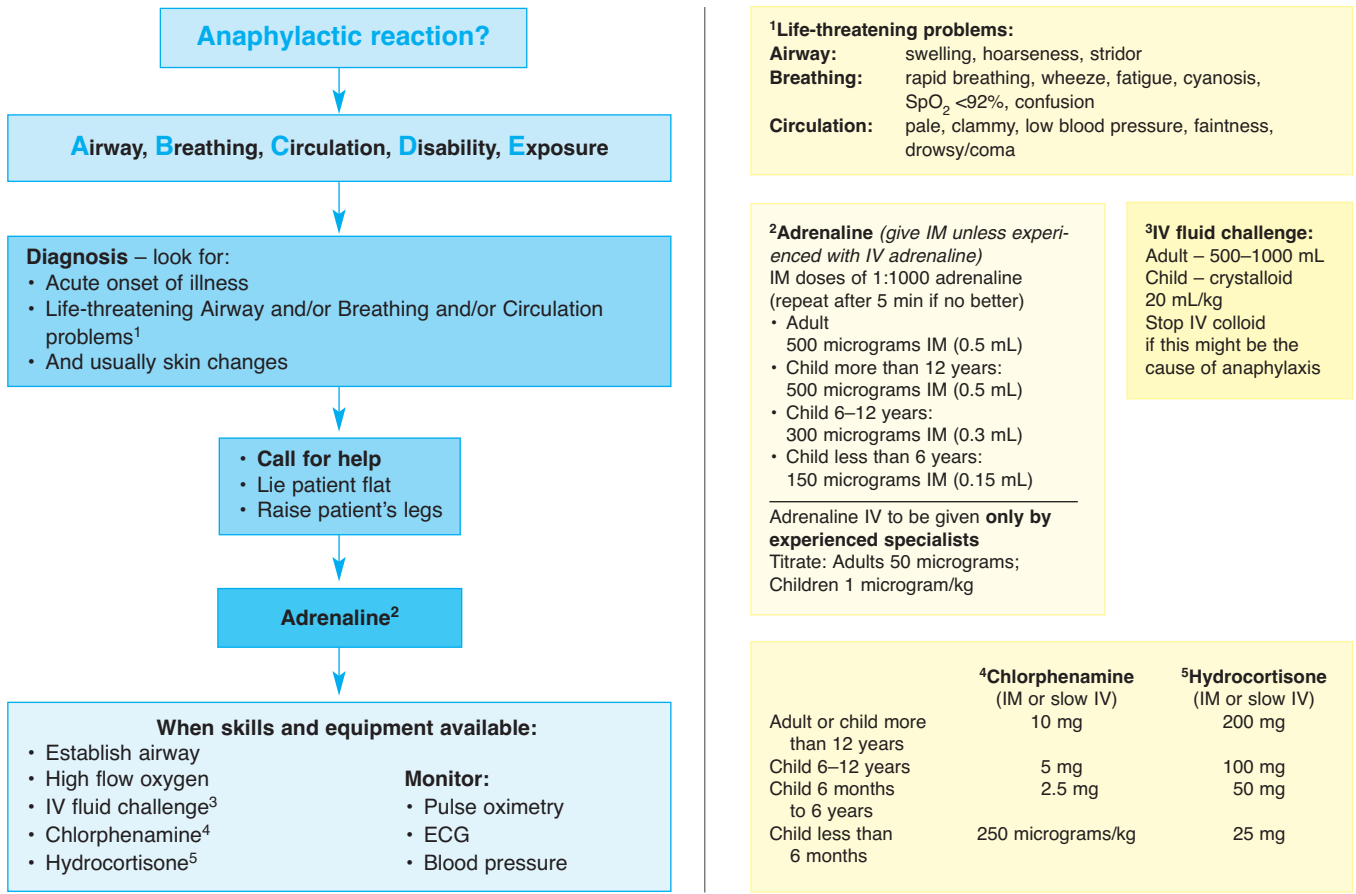


Fig 1. The anaphylaxis algorithm. Reproduced and modified with permission from the Resuscitation Council (UK). ECG = electrocardiogram; IM = intramuscular; iv = intravenously.

### Membership of the Guideline Development Group

Jasmeat Soar, Co-chair Working Group and Vice Chair, Resuscitation Council (UK); Richard Pumphrey, Co-chair Working Group, Royal College of Pathologists; Andrew Cant, Royal College of Paediatrics and Child Health; Sue Clarke, Anaphylaxis Campaign; Allison Corbett, British National Formulary; Peter Dawson, Royal College of Radiologists; Pamela Ewan, British Society for Allergy and Clinical Immunology; Bernard Foëx, College of Emergency Medicine; David Gabbott, Executive Committee Member Resuscitation Council (UK); Matt Griffiths, Royal College of Nursing; Judith Hall, Royal College of Anaesthetists; Nigel Harper, Association of Anaesthetists of Great Britain and Ireland; Fiona Jewkes, Royal College of General Practitioners, Joint Royal College Ambulance Liaison Committee; Ian Maconochie, Executive Committee Member, Resuscitation Council (UK); Sarah Mitchell, Director, Resuscitation Council UK; Shuaib Nasser, British Society of Allergy and Clinical Immunology; Jerry Nolan, Chair, Resuscitation Council (UK); George Rylance, Royal College of Paediatrics and Child Health; Aziz Sheikh, Resuscitation Council UK; David Joseph Unsworth, Royal College of Pathologists; David Warrell, Royal College of Physicians.

### References

- 1 Soar J, Pumphrey R, Cant A *et al*. Emergency treatment of anaphylactic reactions – guidelines for healthcare providers. *Resuscitation* 2008;77:157–69.
- 2 Resuscitation Council (UK). *Adult advanced life support*. London: Resuscitation Council (UK), 2005. [www.resus.org.uk/pages/als.pdf](http://www.resus.org.uk/pages/als.pdf)

### Other useful sources of information

Resuscitation Council (UK): [www.resus.org.uk](http://www.resus.org.uk)  
 British Society for Allergy and Clinical Immunology: [www.bsaci.org](http://www.bsaci.org)