

Inverclyde Royal Hospital

**RECOGNITION AND TREATMENT
OF ANAPHYLAXIS IN ADULTS
AND CHILDREN**

Incorporating new guidance from the Resuscitation Council (UK) Guidelines – “Emergency Treatment of Anaphylactic Reactions – Guidelines for Healthcare Providers” – published January 2008

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This policy updates and replaces any other policy / procedure guideline relating to anaphylaxis

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Summary

- The UK incidence of anaphylactic reactions is increasing.
- Patients who have an anaphylactic reaction have life-threatening airway and/or breathing and/or circulation problems usually associated with skin and mucosal changes.
- Patients having an anaphylactic reaction should be recognised and treated using the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach.
- Anaphylactic reactions are not easy to study with randomised controlled trials. There are, however, systematic reviews of the available evidence and a wealth of clinical experience to help formulate guidelines.
- The exact treatment will depend on the patient's location, the equipment and drugs available, and the skills of those treating the anaphylactic reaction.
- Early treatment with intramuscular adrenaline is the treatment of choice for patients having an anaphylactic reaction.
- Despite previous guidelines, there is still confusion about the indications, dose and route of adrenaline.
- Intravenous adrenaline must only be used in certain specialist settings and only by those skilled and experienced in its use.
- All those who are suspected of having had an anaphylactic reaction should be referred to a specialist in allergy.
- Individuals who are at high risk of an anaphylactic reaction should carry an adrenaline auto-injector and receive training and support in its use.
- There is a need for further research about the diagnosis, treatment and prevention of anaphylactic reactions.

Changes from previous Guidelines

- The recognition and treatment of an anaphylactic reaction has been simplified.
- The use of an Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach to recognise and treat an anaphylactic reaction has been introduced. (further described on page 5)
- The early use of intramuscular adrenaline by most rescuers to treat an anaphylactic reaction is emphasized.
- The use of intravenous adrenaline to treat an anaphylactic reaction is clarified. It must only be used by those skilled and experienced in its use in certain specialist settings.
- The age ranges and doses for adrenaline, hydrocortisone and chlorphenamine have been simplified.

Key Points

Treatment of an anaphylactic reaction should be based on general life support principles:

- Use the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach to recognise and treat problems.
- Remove or discontinue the allergen or suspected allergen if possible, e.g. IV infusion
- **Call for help early – 2222 to summon the Resuscitation Team without delay if available. 999 to summon an emergency “blue-light” ambulance where a Resuscitation Team is not available.**
- Treat the greatest threat to life first.
- Initial treatments should not be delayed by the lack of a complete history or definite diagnosis.

Patients having an anaphylactic reaction in any setting should expect the following as a minimum:

- Recognition that they are seriously unwell.
- An early call for help.
- Initial assessment and treatments based on an ABCDE approach.
- Adrenaline therapy if indicated.
- Investigation and follow-up by an allergy specialist.

Recognition of an Anaphylactic Reaction

A diagnosis of anaphylactic reaction is likely if a patient who is exposed to a trigger (allergen) develops a sudden illness (usually within minutes of exposure) with rapidly progressing skin changes and life-threatening airway and/or breathing and/or circulation problems. The reaction is usually unexpected.

The lack of any consistent clinical manifestation and a range of possible presentations cause diagnostic difficulty. Many patients with a genuine anaphylactic reaction are not given the correct treatment. Patients have been given injections of adrenaline inappropriately for allergic reactions just involving the skin, or for vaso-vagal reactions or panic attacks. Diagnostic problems have arisen particularly in children. Guidelines for the treatment of an anaphylactic reaction must therefore take into account some inevitable diagnostic errors, with an emphasis on the need for safety.

A single set of criteria will not identify all anaphylactic reactions. There is a range of signs and symptoms, none of which are entirely specific for an anaphylactic reaction; however, certain combinations of signs make the diagnosis of an anaphylactic reaction more likely. When recognising and treating any acutely ill patient, a rational ABCDE approach must be followed and life-threatening problems treated as they are recognised (see Appendix 1 for more information about the ABCDE approach).

Anaphylaxis is likely when all of the following 3 criteria are met:

- Sudden onset and rapid progression of symptoms
- Life-threatening Airway and/or Breathing and/or Circulation problems
- Skin and/or mucosal changes (flushing, urticaria, angioedema)

The following supports the diagnosis:

Exposure to a known allergen for the patient

Remember:

Skin or mucosal changes alone are not a sign of an anaphylactic reaction

Skin and mucosal changes can be subtle or absent in up to 20% of reactions (some patients can have only a decrease in blood pressure, i.e., a Circulation problem)

There can also be gastrointestinal symptoms (e.g. vomiting, abdominal pain, incontinence)

Confusion arises because some patients have systemic allergic reactions that are less severe. For example, generalised urticaria, angioedema, and rhinitis would not be described as an anaphylactic reaction, because the life-threatening features — an airway problem, respiratory difficulty (breathing problem) and hypotension (circulation problem) — are not present.

Sudden onset and rapid progression of symptoms

The patient will feel and look unwell.

Most reactions occur over several minutes. Rarely, reactions may be slower in onset.

The time of onset of an anaphylactic reaction depends on the type of trigger. An intravenous trigger will cause a more rapid onset of reaction than stings which, in turn, tend to cause a more rapid onset than orally ingested triggers

The patient is usually anxious and can experience a “sense of impending doom”.

Life-threatening Airway and/or Breathing and/or Circulation problems

Patients can have either an A or B or C problem or any combination. Use the ABCDE approach to recognise these.

Airway problems:

- Airway swelling, e.g., throat and tongue swelling (pharyngeal/laryngeal oedema). The patient has difficulty in breathing and swallowing and feels that the throat is closing up.
- Hoarse voice.
- Stridor – this is a high-pitched inspiratory noise caused by upper airway obstruction.

Breathing problems:

- Shortness of breath – increased respiratory rate.
- Wheeze.
- Patient becoming tired.
- Confusion caused by hypoxia.
- Cyanosis (appears blue) – this is usually a late sign.
- Respiratory arrest.

There is a range of presentation from anaphylaxis, through anaphylaxis with predominantly asthmatic features, to a pure acute asthma attack with no other features of anaphylaxis. Life-threatening asthma with no features of anaphylaxis can be triggered by food allergy. Anaphylaxis can present as a primary respiratory arrest.

Circulation problems:

- Signs of shock – pale, clammy.
- Increased pulse rate (tachycardia).
- Low blood pressure (hypotension) – feeling faint (dizziness), collapse.
- Decreased conscious level or loss of consciousness.
- Anaphylaxis can cause myocardial ischaemia and electrocardiograph (ECG) changes even in individuals with normal coronary arteries.
- Cardiac arrest.

Circulation problems (often referred to as anaphylactic shock) can be caused by direct myocardial depression, vasodilation and capillary leak, and loss of fluid from the circulation. Bradycardia (a slow pulse) is usually a late feature, often preceding cardiac arrest. The circulatory effects do not respond, or respond only transiently, to simple measures such as lying the patient down and raising the legs. Patients with anaphylaxis can deteriorate if made to sit up or stand up.

The above Airway, Breathing and Circulation problems can all alter the patient's neurological status (**Disability problems**) because of decreased brain perfusion. There may be confusion, agitation and loss of consciousness. Patients can also have gastro-intestinal symptoms (abdominal pain, incontinence, vomiting).

Skin and/or mucosal changes

These should be assessed as part of the **Exposure** when using the ABCDE approach.

- They are often the first feature and present in over 80% of anaphylactic reactions.
 - They can be subtle or dramatic.
 - There may be just skin, just mucosal, or both skin and mucosal changes.
 - There may be erythema – a patchy, or generalised, red rash.
 - There may be urticaria (also called hives, nettle rash, weals or welts), which can appear anywhere on the body. The weals may be pale, pink or red, and may look like nettle stings. They can be different shapes and sizes, and are often surrounded by a red flare. They are usually itchy.
- Angioedema is similar to urticaria but involves swelling of deeper tissues, most commonly in the eyelids and lips, and sometimes in the mouth and throat.

Although skin changes can be worrying or distressing for patients and those treating them, skin changes without life-threatening airway, breathing or circulation problems do not signify an anaphylactic reaction. Reassuringly, most patients who have skin changes caused by allergy do not go on to develop an anaphylactic reaction.

Differential diagnosis

Life-threatening conditions:

- Sometimes an anaphylactic reaction can present with symptoms and signs that are very similar to life-threatening asthma – this is commonest in children.
- A low blood pressure (or normal in children) with a petechial or purpuric rash can be a sign of septic shock.
- Seek help early if there are any doubts about the diagnosis and treatment.
- Following an ABCDE approach will help with treating the differential diagnoses.

Non life-threatening conditions (these usually respond to simple measures):

- Faint (vaso-vagal episode).
- Panic attack.
- Breath-holding episode in child.
- Idiopathic (non-allergic) urticaria or angioedema.

There can be confusion between an anaphylactic reaction and a panic attack. Victims of previous anaphylaxis may be particularly prone to panic attacks if they think they have been re-exposed to the allergen that caused a previous problem.

The sense of impending doom and breathlessness leading to hyperventilation are symptoms that resemble anaphylaxis in some ways. While there is no hypotension, pallor, wheeze, or urticarial rash or swelling, there may sometimes be flushing or blotchy skin associated with anxiety adding to the diagnostic difficulty. Diagnostic difficulty may also occur with vaso-vagal attacks after immunisation procedures, but the absence of rash, breathing difficulties, and swelling are useful distinguishing features, as is the slow pulse of a vaso-vagal attack compared with the rapid pulse of a severe anaphylactic episode. Fainting will usually respond to lying the patient down and raising the legs.

Treatment of Anaphylactic Reactions

As the diagnosis of anaphylaxis is not always obvious, all those who treat anaphylaxis must have a systematic approach to the sick patient. In general, the clinical signs of critical illness are similar whatever the underlying process because they reflect failing respiratory, cardiovascular, and neurological systems, i.e., ABCDE problems. Use an ABCDE approach to recognise and treat an anaphylactic reaction. Treat life-threatening problems as you find them. The basic principles of treatment are the same for all age groups.

The specific treatment of an anaphylactic reaction depends on:

1. Location.
2. Training and skills of rescuers.
3. Number of responders.
4. Equipment and drugs available.

Location

Treating a patient with anaphylaxis in the community will not be the same as in an acute hospital. Out of hospital, an ambulance must be called early and the patient transported to an emergency department.

Training of rescuers

All clinical staff should be able to call for help and initiate treatment in a patient with an anaphylactic reaction. Rescuers must use the skills for which they are trained. Clinical staff who give parenteral medications should have initial training and regular updates in dealing with anaphylactic reactions. The Health Protection Agency recommends that staff who give immunisations should have annual updates.

Number of responders

The single responder must always ensure that help is coming. If there are several rescuers, several actions can be undertaken simultaneously.

Equipment and drugs available

Resuscitation equipment and drugs to help with the rapid resuscitation of a patient with an anaphylactic reaction must be immediately available in all clinical settings. Clinical staff should be familiar with the equipment and drugs they have available and should check them regularly.

All patients who have had an anaphylactic reaction should be monitored (e.g., by ambulance crew, in the emergency department etc.) as soon as possible. Minimal monitoring includes pulse oximetry, non-invasive blood pressure and 3-lead ECG. Monitoring must be supervised by an individual who is skilled at interpreting and responding to any changes.

Patient positioning

All patients should be placed in a comfortable position. The following factors should be considered:

- Patients with Airway and Breathing problems may prefer to sit up as this will make breathing easier.
- Lying flat with or without leg elevation is helpful for patients with a low blood pressure (Circulation problem). If the patient feels faint, do not sit or stand them up - this can cause cardiac arrest.
- Patients who are breathing and unconscious should be placed on their side (recovery position).
- Pregnant patients should lie on their left side to prevent caval compression.

Remove the trigger if possible

Removing the trigger for an anaphylactic reaction is not always possible.

- Stop any drug suspected of causing an anaphylactic reaction (e.g., stop intravenous infusion of a gelatin solution or antibiotic).
- Remove the stinger after a bee sting. Early removal is more important than the method of removal.
- After food-induced anaphylaxis, attempts to make the patient vomit are not recommended.
- Do not delay definitive treatment if removing the trigger is not feasible.

Cardiorespiratory arrest following an anaphylactic reaction

Start cardiopulmonary resuscitation (CPR) immediately and follow current guidelines. Rescuers should ensure that help is on its way as early advanced life support (ALS) is essential. Use doses of adrenaline

recommended in the ALS guidelines. The intramuscular route for adrenaline is not recommended after cardiac arrest has occurred.

Anaphylaxis algorithm

The key steps for the treatment of an anaphylactic reaction are shown in the algorithm (Appendix 1)

Adrenaline (Epinephrine)

Adrenaline is the most important drug for the treatment of an anaphylactic reaction. Although there are no randomised controlled trials, adrenaline is a logical treatment and there is consistent anecdotal evidence supporting its use to ease breathing difficulty and restore adequate cardiac output. As an alpha-receptor agonist, it reverses peripheral vasodilation and reduces oedema. Its beta-receptor activity dilates the bronchial airways, increases the force of myocardial contraction, and suppresses histamine and leukotriene release. There are also beta-2 adrenergic receptors on mast cells⁴⁰ that inhibit activation, and so early adrenaline attenuates the severity of IgE-mediated allergic reactions. Adrenaline seems to work best when given early after the onset of the reaction but it is not without risk, particularly when given intravenously. Adverse effects are extremely rare with correct doses injected intramuscularly (IM). Sometimes there has been uncertainty about whether complications (e.g., myocardial ischaemia) have been caused by the allergen itself or by the adrenaline given to treat it. Difficulties can arise if the clinical picture is evolving when the patient is first assessed. Adrenaline should be given to all patients with life-threatening features. If these features are absent but there are other features of a systemic allergic reaction, the patient needs careful observation and symptomatic treatment using the ABCDE approach. Adrenaline must be readily available in clinical areas where an anaphylactic reaction could occur.

Intramuscular (IM) Adrenaline

The intramuscular (IM) route is the best for most individuals who have to give adrenaline to treat an anaphylactic reaction. Monitor the patient as soon as possible (pulse, blood pressure, ECG, pulse oximetry). This will help monitor the response to adrenaline. The IM route has several benefits:

- There is a greater margin of safety.
- It does not require intravenous access.
- The IM route is easier to learn.

The best site for IM injection is the anterolateral aspect of the middle third of the thigh. The needle used for injection needs to be sufficiently long to ensure that the adrenaline is injected into muscle.

The subcutaneous or inhaled routes for adrenaline are not recommended for the treatment of an anaphylactic reaction because they are less effective.

Adrenaline IM dose – adults

0.5 mg IM (= 500 micrograms = 0.5 mL of 1:1000) adrenaline

Adrenaline IM dose – children

The scientific basis for the recommended doses is weak. The recommended doses are based on what is considered to be safe and practical to draw up and inject in an emergency.⁴⁷

(The equivalent volume of 1:1000 adrenaline is shown in brackets)

> 12 years:	500 micrograms IM (0.5 mL) i.e. same as adult dose
	300 micrograms (0.3 mL) if child is small or prepubertal
> 6 – 12 years:	300 micrograms IM (0.3 mL)
> 6 months – 6 years:	150 micrograms IM (0.15 mL)
< 6 months:	150 micrograms IM (0.15 mL)

Repeat the IM adrenaline dose if there is no improvement in the patient's condition. Further doses can be given at about 5-minute intervals according to the patient's response.

Intravenous (IV) adrenaline (for specialist use only)

The intramuscular (IM) route for adrenaline is the route of choice for most healthcare providers. There is a much greater risk of causing harmful side effects by inappropriate dosage or misdiagnosis of anaphylaxis when using IV adrenaline. This is why the IM route is recommended for most healthcare providers. This section on IV adrenaline only applies to those experienced in the use and titration of vasopressors in their normal clinical practice (e.g., anaesthetists, emergency physicians, intensive care doctors).

Many healthcare providers will have given IV adrenaline as part of resuscitating a patient in cardiac arrest. This alone is insufficient experience to use IV adrenaline for the treatment of an anaphylactic reaction. In patients with a spontaneous circulation, intravenous adrenaline can cause life-threatening hypertension, tachycardia, arrhythmias, and myocardial ischaemia.

If IV access is not available or not achieved rapidly, use the IM route for adrenaline. Patients who are given IV adrenaline must be monitored – continuous ECG and pulse oximetry and frequent non-invasive blood pressure measurements as a minimum. Patients who require repeated IM doses of adrenaline may benefit from IV adrenaline. It is essential that these patients receive expert help early. If the patient requires repeated IV bolus doses of adrenaline, start an adrenaline infusion.

FOR SPECIALIST USE ONLY

Ensure patient is monitored

Adrenaline IV bolus dose – adult:

Titrate IV adrenaline using 50 microgram boluses according to response. If repeated adrenaline doses are needed, start an IV adrenaline infusion.

The pre-filled 10 mL syringe of 1:10,000 adrenaline contains 100 micrograms/mL. A dose of 50 micrograms is 0.5 mL, which is the smallest dose that can be given accurately.

Do not give the undiluted 1:1000 adrenaline concentration IV.

Adrenaline IV bolus dose – children:

IM adrenaline is the preferred route for children having an anaphylactic reaction. The IV route is recommended only in specialist paediatric settings by those familiar with its use (e.g., paediatric anaesthetists, paediatric emergency physicians, paediatric intensivists) and if the patient is monitored and IV access is already available. There is no evidence on which to base a dose recommendation - the dose is titrated according to response. A child may respond to a dose as small as 1 microgram/kg. This requires very careful dilution and checking to prevent dose errors.

Adrenaline infusion

An infusion of adrenaline with the rate titrated according to response in the presence of continued haemodynamic monitoring is an effective way of giving adrenaline during anaphylaxis.⁴⁶ Use local guidelines for the preparation and infusion of adrenaline.

FOR SPECIALIST USE ONLY

Adrenaline in special populations

Previous guidelines recommended adrenaline dose adjustments in certain circumstances (e.g., in patients taking tricyclic antidepressants, the previous recommendation was to give half the dose). It is now considered unhelpful to have caveats such as this in the setting of an acute anaphylactic reaction. There is large inter-individual variability in the response to adrenaline. In clinical practice, it is important to monitor the response; start with a safe dose and give further doses if a greater response is needed, i.e., titrate the dose according to effect.

Adrenaline can fail to reverse the clinical manifestation of an anaphylactic reaction, especially when its use is delayed or in patients treated with beta-blockers. The decision to prescribe a beta-blocker to a patient at increased risk of an anaphylactic reaction should be made only after assessment by an allergist and cardiologist.

Adrenaline auto-injectors

Auto-injectors are often given to patients at risk of anaphylaxis for their own use. At the time of writing, there are only two doses of adrenaline auto-injector commonly available: 0.15 and 0.3 mg. The more appropriate dose for an auto-injector should be prescribed for individual patients by allergy specialists. Healthcare professionals should be familiar with the use of the most commonly available auto-injector devices. The dose recommendations for adrenaline in this guideline are intended for healthcare providers treating an anaphylactic reaction. If an adrenaline auto-injector is the only available adrenaline preparation when treating anaphylaxis, healthcare providers should use it.

Oxygen (give as soon as available)

Initially, give the highest concentration of oxygen possible using a mask with an oxygen reservoir. Ensure high flow oxygen (usually greater than 10 litres min) to prevent collapse of the reservoir during inspiration. If the patient's trachea is intubated, ventilate the lungs with high concentration oxygen using a self-inflating bag.

Fluids (give as soon as available)

Large volumes of fluid may leak from the patient's circulation during an anaphylactic reaction. There will also be vasodilation, a low blood pressure and signs of shock. If there is intravenous access, infuse intravenous fluids immediately. Give a rapid IV fluid challenge (20 mL/kg in a child or 500-1000 mL in an adult) and monitor the response; give further doses as necessary. There is no evidence to support the use of colloids over crystalloids in this setting. Consider colloid infusion as a cause in a patient receiving a colloid at the time of onset of an anaphylactic reaction and stop the infusion. Hartmann's solution or 0.9% saline are suitable fluids for initial resuscitation. A large volume of fluid may be needed. If intravenous access is delayed or impossible, the intra-osseous route can be used for fluids or drugs when resuscitating children or adults, but only by healthcare workers who are accustomed to do so. Do not delay the administration of IM adrenaline attempting intra-osseous access.

Antihistamines (after initial resuscitation)

Antihistamines are a second line treatment for an anaphylactic reaction. The evidence to support their use is weak, but there are logical reasons for them. Antihistamines (H1-antihistamine) may help counter histamine-mediated vasodilation and bronchoconstriction. They may not help in reactions depending in part on other mediators but they have the virtue of safety. Used alone, they are unlikely to be lifesaving in a true anaphylactic reaction. Inject chlorphenamine slowly intravenously or intramuscularly.

The dose of chlorphenamine depends on age:

- >12 years and adults: 10 mg IM or IV slowly
- >6 – 12 years: 5 mg IM or IV slowly
- >6 months – 6 years: 2.5 mg IM or IV slowly
- <6 months: 250 micrograms/kg IM or IV slowly

There is little evidence to support the routine use of an H2-antihistamine (e.g., ranitidine, cimetidine) for the initial treatment of an anaphylactic reaction.

Steroids (give after initial resuscitation)

Corticosteroids may help prevent or shorten protracted reactions. In asthma, early corticosteroid treatment is beneficial in adults and children. There is little evidence on which to base the optimum dose of hydrocortisone in anaphylaxis. In hospital patients with asthma, higher doses of hydrocortisone do not seem to be better than smaller doses. Inject hydrocortisone slowly intravenously or intramuscularly, taking care to avoid inducing further hypotension.

The dose of hydrocortisone for adults and children depends on age:

- >12 years and adults: 200 mg IM or IV slowly
- >6 – 12 years: 100 mg IM or IV slowly
- >6 months – 6 years: 50 mg IM or IV slowly
- <6 months: 25 mg IM or IV slowly

Other drugs

Bronchodilators

The presenting symptoms and signs of a severe anaphylactic reaction and life-threatening asthma can be the same. If the patient has asthma-like features alone, follow the British Thoracic Society – SIGN asthma guidelines (www.brit-thoracic.org.uk). As well as the drugs listed above, consider further bronchodilator therapy with salbutamol (inhaled or IV), ipratropium (inhaled), aminophylline (IV) or magnesium (IV).

Remember that intravenous magnesium is a vasodilator and can cause hot flushes and make hypotension worse.

Cardiac drugs

Adrenaline remains the first line vasopressor for the treatment of anaphylactic reactions. There are animal studies and case reports describing the use of other vasopressors and inotropes (noradrenaline, vasopressin, metaraminol and glucagon) when initial resuscitation with adrenaline and fluids has not been successful. Only use these drugs in specialist settings (e.g., intensive care units) where there is experience in their use. Glucagon can be useful to treat an anaphylactic reaction in a patient taking a beta-blocker. Some patients develop severe bradycardia after an anaphylactic reaction. Consider IV atropine to treat this.

Investigations

Undertake the usual investigations appropriate for a medical emergency, e.g., 12-lead ECG, chest X-ray, urea and electrolytes, arterial blood gases etc.

Mast cell tryptase

The specific test to help confirm a diagnosis of an anaphylactic reaction is measurement of mast cell tryptase. Tryptase is the major protein component of mast cell secretory granules. In anaphylaxis, mast cell degranulation leads to markedly increased blood tryptase concentrations. Tryptase levels are useful in the follow-up of suspected anaphylactic reactions, not in the initial recognition and treatment: measuring tryptase levels must not delay initial resuscitation. Tryptase concentrations in the blood may not increase significantly until 30 minutes or more after the onset of symptoms, and peak 1-2 hours after onset. The half-life of tryptase is short (approximately 2 hours), and concentrations may be back to normal within 6-8 hours, so timing of any blood samples is very important.

Sample timing

The time of onset of the anaphylactic reaction is the time when symptoms were first noticed. It is important that this time is accurately recorded.

a) Minimum: one sample at 1-2 hours after the start of symptoms.

b) Ideally: Three **timed** samples:

1) Initial sample as soon as feasible after resuscitation has started – do not delay resuscitation to take sample.

2) Second sample at 1-2 hours after the start of symptoms

3) Third sample either at 24 hours or in convalescence (for example in a followup allergy clinic). This provides baseline tryptase levels - some individuals have an elevated baseline level. Serial samples have better specificity and sensitivity than a single measurement in the confirmation of anaphylaxis.

Sample requirements

1) Use a serum or clotted blood ('liver function test' bottle) sample. Some laboratories ask for a plasma sample – either plasma or serum samples can be tested.

2) **Record the timing of each sample accurately** on the sample bottle and request form. State on the request form the time of onset of the reaction (symptoms). Record on the sample bottle the number of minutes or hours after the onset of symptoms the sample was taken

3) As little as 0.5 mL of sample can be enough (children), but 5 mL (adults) is better.

4) Optimally, store the serum from spun samples frozen (-20oC) in the local laboratory, before dispatch to a reference laboratory.

5) Tryptase is very stable (50% of tryptase is still detectable after 4 days at room temperature), so even samples stored at room temperature over a weekend can give useful, though sub-optimal, information.

6) Consult the biochemistry laboratory if you have any queries.

Discharge and follow-up

Discharge from hospital

Patients who have had a suspected anaphylactic reaction (i.e. an airway, breathing or circulation (ABC) problem) should be treated and then observed for at least 6 hours in a clinical area with facilities for treating life-threatening ABC problems.

They should then be reviewed by a senior clinician and a decision made about the need for further treatment or a longer period of observation. Patients with a good response to initial treatment should be warned of the possibility of an early recurrence of symptoms and in some circumstances should be kept under observation for up to 24 hours. This caution is particularly applicable to:

- Severe reactions with slow onset caused by idiopathic anaphylaxis.
- Reactions in individuals with severe asthma or with a severe asthmatic component.
- Reactions with the possibility of continuing absorption of allergen.
- Patients with a previous history of biphasic reactions.
- Patients presenting in the evening or at night, or those who may not be able to respond to any deterioration.
- Patients in areas where access to emergency care is difficult.

The exact incidence of biphasic reactions is unknown. Although studies quote an incidence of 1-20%, it is not clear whether all the patients actually had an anaphylactic reaction and whether the initial treatment was appropriate. There is no reliable way of predicting who will have a biphasic reaction. It is therefore important that decisions about discharge are made for each patient by an experienced clinician.

Before discharge from hospital all patients must be:

- Reviewed by a senior clinician.
- Given clear instructions to return to hospital if symptoms return.
- Considered for anti-histamines and oral steroid therapy for up to 3 days. This is helpful for treatment of urticaria and may decrease the chance of further reaction.
- Considered for an adrenaline auto-injector (see below), or given a replacement.
- Have a plan for follow-up, including contact with the patient's general practitioner.

Record keeping

To help confirm the diagnosis of anaphylaxis and identify the most likely trigger, it is useful for the allergy clinic to have:

- A description of the reaction with circumstances and timings to help identify potential triggers.
- A list of administered treatments.
- Copies of relevant patient records, e.g., ambulance charts, emergency department records, observation charts, anaesthetic charts.
- Results of any investigations already completed, including the timings of mast cell tryptase samples.

Reporting of reaction

Adverse drug reactions that include an anaphylactic reaction should be reported to the Medicines and Healthcare products Regulatory Agency (MHRA) using the yellow card scheme (www.mhra.gov.uk). The British National Formulary (BNF) includes copies of the Yellow Card at the back of each edition. Discuss all cases of fatal anaphylactic reaction with the procurator fiscal.

When to prescribe an adrenaline auto-injector

Emergency departments should liaise with their nearest specialist allergy service to devise a local guideline for which patients should be given an adrenaline auto-injector on discharge. An auto-injector is an appropriate treatment for patients at increased risk of an idiopathic anaphylactic reaction, or for anyone at continued high risk of reaction e.g., to triggers such as venom stings and food-induced reactions (unless easy to avoid). An auto-injector is not usually necessary for patients who have suffered drug induced anaphylaxis, unless it is difficult to avoid the drug. Ideally, all patients should be assessed by an allergy specialist and have a treatment plan based on their individual risk. Individuals provided with an auto-injector on discharge from hospital must be given instructions and training and have appropriate follow-up including contact with the patient's general practitioner.

Specialist referral

All patients presenting with anaphylaxis should be referred to an allergy clinic to identify the cause, and thereby reduce the risk of future reactions and prepare the patient to manage future episodes themselves. There is a list of specialist clinics on the British Society for Allergy and Clinical Immunology (BSACI) website. A list of clinics with a specific interest in anaphylactic reactions during anaesthesia is available at the BSACI and Association of Anaesthetists of Great Britain and Ireland websites (www.bsaci.org and www.aagbi.org).

Patient education

Refer patients at risk of an anaphylactic reaction to an appropriate allergy clinic. Patients need to know the allergen responsible and how to avoid it. If the allergen is a food, they need to know what products are likely to contain it, and all the names that can be used to describe it. Where possible they also need to know how to avoid situations that could expose them to the allergen.

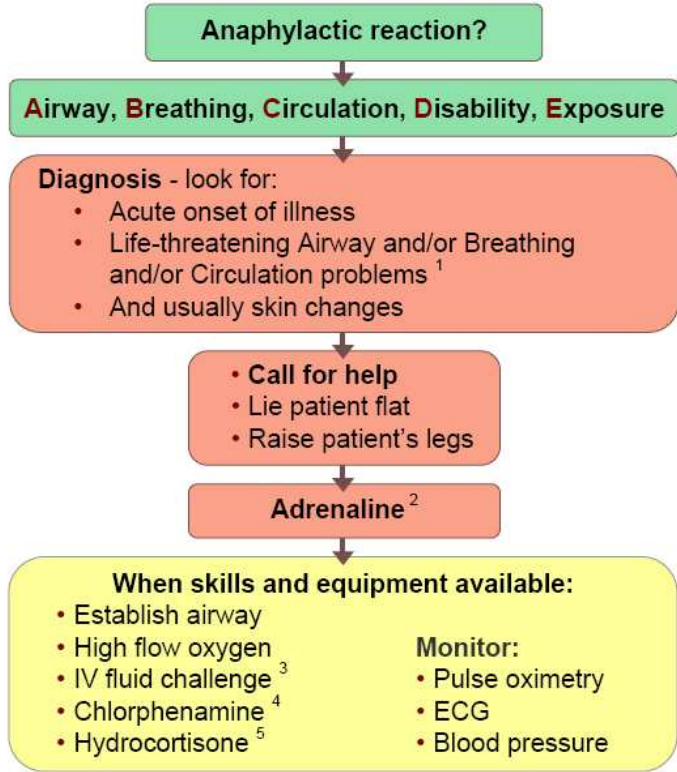
Patients need to be able to recognise the early symptoms of anaphylaxis, so that they can summon help quickly and prepare to use their emergency medication. Patients at risk are usually advised to carry their adrenaline auto-injector with them at all times. Patients and those close to them (i.e., close family, friends, and carers) should receive training in using the auto-injector and should practise regularly using a suitable training device, so that they will know what to do in an emergency.

Patients must always seek urgent medical assistance when experiencing anaphylaxis and after using an adrenaline auto-injector. Information about managing severe allergies can be obtained from their allergy specialist, general practitioner, other healthcare professional or the Anaphylaxis Campaign. Although there are no randomised clinical trials, there is evidence that individualised action plans for self-management should decrease the risk of recurrence.

Specific guidance and training is available for schools with children at risk of allergic reactions (www.allergyinschools.org.uk).

All those at high risk of an anaphylactic reaction should consider wearing some device, such as a bracelet (e.g., Medic Alert), that provides information about their history of anaphylactic reaction.

APPENDIX 1 ANAPHYLAXIS TREATMENT ALGORITHM – UPDATED JANUARY 2008



1 Life-threatening problems:
Airway: swelling, hoarseness, stridor
Breathing: rapid breathing, wheeze, fatigue, cyanosis, SpO₂ < 92%, confusion
Circulation: pale, clammy, low blood pressure, faintness, drowsy/coma

<p>2 Adrenaline (give IM unless experienced with IV adrenaline) IM doses of 1:1000 adrenaline (repeat after 5 min if no better)</p> <ul style="list-style-type: none"> • Adult 500 micrograms IM (0.5 mL) • Child more than 12 years: 500 micrograms IM (0.5 mL) • Child 6 -12 years: 300 micrograms IM (0.3 mL) • Child less than 6 years: 150 micrograms IM (0.15 mL) <p>Adrenaline IV to be given only by experienced specialists Titrate: Adults 50 micrograms; Children 1 microgram/kg</p>	<p>3 IV fluid challenge: Adult - 500 – 1000 mL Child - crystalloid 20 mL/kg</p> <p>Stop IV colloid if this might be the cause of anaphylaxis</p>
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<p>4 Chlorphenamine (IM or slow IV)</p> <ul style="list-style-type: none"> Adult or child more than 12 years 10 mg Child 6 - 12 years 5 mg Child 6 months to 6 years 2.5 mg Child less than 6 months 250 micrograms/kg 	<p>5 Hydrocortisone (IM or slow IV)</p> <ul style="list-style-type: none"> 200 mg 100 mg 50 mg 25 mg
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