

## Notes for First Aid Trainers on Anaphylaxis and Use of Adrenaline Autoinjectors

### What is Anaphylaxis?

Anaphylaxis is a severe, life-threatening, generalised or systemic allergic reaction. This is characterised by rapidly developing life-threatening airway and/or breathing and/or circulation problems usually associated with skin and mucosal changes.<sup>i</sup>

### How common is it?

The American College of Allergy, Asthma and Immunology Epidemiology have concluded that the overall (international) frequency of episodes of anaphylaxis lies between 30 and 950 cases per 100,000 persons per year.<sup>i</sup>

UK primary care data indicate that approximately 1 in 1,333 of the English population has experienced anaphylaxis at some point in their lives.<sup>i</sup> The UK incidence of anaphylactic reactions is rising.<sup>ii</sup>

### What are the triggers?

Anaphylaxis can be triggered by any of a very broad range of triggers, but those most commonly identified include food, drugs and venom.<sup>iii</sup> The relative importance of these varies very considerably with age, with food being particularly important in children and medicinal products being much more common triggers in older people.<sup>iv</sup> Virtually any food or class of drug can be implicated. Of foods, nuts are the most common cause; muscle relaxants, antibiotics, NSAIDs (e.g. ibuprofen) and aspirin are the most commonly implicated drugs. In many cases no cause can be identified.<sup>i</sup>

### Is it dangerous?

The overall prognosis of anaphylaxis is good, with a case fatality ratio of less than 1% reported in most population-based studies.<sup>v,vi,vii</sup> Risk of death is, however, increased in those with pre-existing asthma, particularly if the asthma is poorly controlled or in those asthmatics who fail to use, or delay treatment with, adrenaline.<sup>viii</sup> There are approximately 20 anaphylaxis deaths reported each year in the UK, although this may be a substantial under-estimate.

### How rapidly can it be fatal?

When anaphylaxis is fatal, death usually occurs very soon after contact with the trigger. Fatal food reactions cause respiratory arrest typically after 30–35 minutes; insect stings cause collapse from shock after 10–15 minutes; and deaths caused by intravenous medication occur most commonly within five minutes. Death never occurred more than six hours after contact with the trigger (Figure 1).<sup>ix</sup>

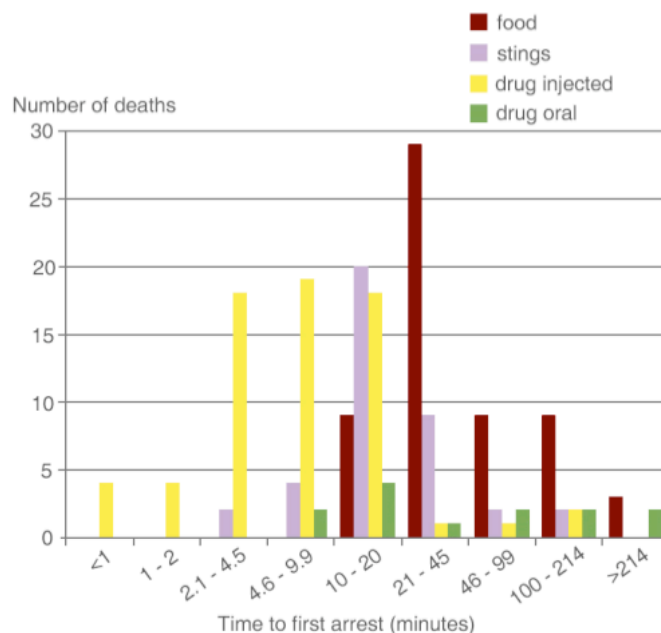


Figure 1: Time to cardiac arrest following exposure to a triggering agent<sup>ix</sup>

## How is it diagnosed?

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. Diagnosis can be difficult because there is a range of possible clinical presentations.

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

1. Sudden onset and rapid progression of symptoms
2. Life-threatening Airway *and/or* Breathing *and/or* Circulation problems:
  - A *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*  
*Hoarse voice*  
*Stridor – this is a high-pitched inspiratory noise caused by upper airway obstruction*
  - B *Shortness of breath – increased respiratory rate*  
*Wheeze*  
*Confusion caused by lack of oxygen*  
*Cyanosis (appears blue) – this is usually a late sign*  
*Respiratory arrest*
  - C *Signs of shock – pale, clammy*  
*Increased pulse rate (tachycardia)*  
*Low blood pressure (hypotension) – feeling faint (dizziness), collapse*  
*Decreased conscious level or loss of consciousness*  
*Cardiac arrest*
3. Skin and/or mucosal changes (flushing, itchy rash, swelling)

- Exposure to a known allergen for the patient supports the diagnosis.
- 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.<sup>x</sup>
- Anaphylaxis can present as a primary respiratory arrest.<sup>iii, ix</sup>
- Anaphylaxis can cause myocardial ischaemia and electrocardiograph (ECG) changes even in individuals with normal coronary arteries.<sup>xi</sup>
- The circulatory effects do not respond, or respond only transiently, to simple measures such as lying the patient down and raising the legs. Patients who feel faint can deteriorate if made to sit up or stand up.<sup>xii</sup>
- Patients can also have gastro-intestinal symptoms (abdominal pain, incontinence, vomiting).
- Skin and/or mucosal changes are often the first feature and present in over 80% of anaphylactic reactions.<sup>xiii</sup> They can be subtle or dramatic.
- 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.

## What is the emergency treatment?

1. Call for help (dial Emergency Medical Services)
2. Place the patient in a comfortable position:
  - *Patients with Airway and Breathing problems may prefer to sit up as this will ease breathing.*
  - *Lying flat with or without leg elevation is helpful for patients with a low blood pressure.*
  - *If the patient feels faint, do not sit or stand them up - this can cause cardiac arrest.<sup>xii</sup>*
  - *Patients who are breathing and unconscious should be placed in a Safe Airway Position.*
3. Remove the trigger if possible:
  - *Remove the stinger after a bee sting. Early removal is more important than the method of removal.<sup>xiv</sup>*
  - *After food-induced anaphylaxis, do not induce vomiting.*
  - *Do not delay definitive treatment if removing the trigger is not feasible.*
4. Adrenaline (Epipen, Anapen or Twinject) by intramuscular autoinjector:
  - *If symptoms do not improve after 5 minutes, use a second autoinjector.*

- Note the time of each dose.
- Make the used autoinjector safe, and take it with the patient to definitive medical care.

5. Antihistamine (e.g. Piriton™) by mouth.
6. Urgent hospital care.

### Why Adrenaline?

Adrenaline is the most important drug for the treatment of an anaphylactic reaction.<sup>xv</sup> Although there are no randomised controlled trials, adrenaline is a logical treatment<sup>xvi</sup> 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 cells<sup>xvii</sup> that inhibit activation<sup>xviii</sup>, 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<sup>xix</sup> but it is not without risk, particularly when given intravenously.<sup>ix</sup> Adverse effects are extremely rare with correct doses injected intramuscularly (IM).<sup>i</sup> Sometimes there has been uncertainty about whether complications (e.g. myocardial ischaemia – heart muscle damage) have been caused by the allergen itself or by the adrenaline given to treat it.<sup>i</sup>

### Why Antihistamine?

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.<sup>xx</sup> Antihistamines (H<sub>1</sub>-antihistamine, e.g. Chlorpheniramine (Piriton™)) 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 life-saving in a true anaphylactic reaction.<sup>i</sup>

### What will people at risk of anaphylaxis have been told by their doctor?

Patients at risk of an anaphylactic reaction should (where possible) have been told the allergen responsible and how to avoid it. If the allergen is a food, they should know what products are likely to contain it, and all the names that can be used to describe it. Where possible they should also know how to avoid situations that could expose them to the allergen.<sup>i</sup>

Patients should 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.<sup>xxi</sup>

Patients must always seek urgent medical assistance when experiencing anaphylaxis and after using an adrenaline auto-injector. Although there are no randomised clinical trials,<sup>xxii</sup> there is evidence that individualised action plans for self-management should decrease the risk of recurrence.<sup>xxiii , xxiv</sup>

### Are first aiders legally allowed to administer adrenaline autoinjectors?

UK medicines legislation restricts the administration of injectable medicines. Unless self administered, they may only be administered by or in accordance with the instructions of a doctor (e.g. by a nurse). However, in the case of adrenaline there is an exemption to this restriction which means in an emergency, a suitably trained lay person is permitted to administer it by injection for the purpose of saving life. The use of an EpiPen to treat anaphylactic shock falls into this category. Therefore, first aiders may administer an EpiPen if they are dealing with a life-threatening emergency in a casualty who has been prescribed and is in possession of an EpiPen and where the first aider is trained to use it.<sup>xxv</sup>

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