DEPARTMENT OF PAEDIATRICS
RIPAS HOSPITAL
Policy and Procedures

SOP No: SOP-PAEDS-005	Effective Date: March 2017

SOP Title:
GUIDELINE FOR THE EMERGENCY TREATMENT OF ANAPHYLAXIS IN INFANTS AND CHILDREN

1.0 Objective

This guideline provides an evidence-based framework for the assessment, investigation and management (acute and follow-up) of children aged 12

1.0 Objectives

1.1 To improve recognition of anaphylactic reactions

1.2 To recommend treatments that are simple to learn and easy to implement, and that will be appropriate for most anaphylactic reactions.

2.0 Scope

This guideline is for healthcare providers who are expected to deal with an anaphylactic reaction during their usual clinical role (e.g., doctors, nurses, paramedics) working in the hospital or out-of-hospital setting.

3.0 Background

Anaphylaxis is a severe, acute and potentially life-threatening condition caused by the systemic release of mediators from mast cells and basophils, often in response to an allergen. Often a trigger is not identified, but food such as peanuts, tree nuts, fish, milk, eggs and shellfish (eg, shrimp, lobster, crab, scallops and oysters) are the most commonly implicated, followed by bee stings and

medications.

Multiple organ systems may be involved, 80-90% being cutaneous, 60-70% respiratory and 10-30% cardiovascular:

TABLE 1 Signs and symptoms of anaphylaxis	
System	**Signs and symptoms**
General/CNS	Fussiness, irritability, drowsiness, lethargy, reduced level of consciousness, somnolence
Skin	Urticaria, pruritus, angioedema, flushing
Upper airway	Stridor, hoarseness, oropharyngeal or laryngeal edema, uvular edema, swollen lips/tongue, sneezing, rhinorrhea, upper airway obstruction
Lower airway	Coughing, dyspnea, bronchospasm, tachypnea, respiratory arrest
Cardiovascular	Tachycardia, hypotension, dizziness, syncope, arrhythmias, diaphoresis, pallor, cyanosis, cardiac arrest
Gastrointestinal	Nausea, vomiting, diarrhea, abdominal pain

4.0 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.
- Call for help early.
- Treat the greatest threat to life first.
- Initial treatments should not be delayed by the lack of a complete history or definite diagnosis.

5.0 Definition

5.1 Anaphylaxis is highly likely when any one of the following three criteria are fulfilled:

5.1.1 Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue or both (eg, generalized hives, pruritus or flushing, or swollen lips-tongue-uvula) and at least one of the following:

a. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced PEF or hypoxemia)
b. Reduced BP or associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope or incontinence)

5.1.2 Two or more of the following that occur rapidly after exposure to **a likely allergen** for that patient (minutes to several hours):

a. Involvement of the skin-mucosal tissue (eg, generalized hives, itch-flush or swollen lips-tongue-uvula)
b. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced PEF or hypoxemia)
c. Reduced BP or associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope or incontinence)
d. Persistent gastrointestinal symptoms (eg, crampy abdominal pain or vomiting)

5.1.3 Reduced BP after exposure to **a known allergen** for that patient (minutes to hours)

a. Infants and children: low systolic BP (age specific) or greater than 30% decrease in systolic BP*

5.2 Allergic reaction

6.0 Patient risk factors

6.1 Severe or uncontrolled asthma is strongly associated with anaphylaxis. During a food-induced anaphylactic episode, a history of asthma is predictive of dyspnea, wheezing, and respiratory arrest.

6.2 Anaphylaxis during labor and delivery can lead to fatality or permanent disability from hypoxic-ischemic encephalopathy in mothers and especially in neonates. The most common triggers are intra-partum injection of penicillin, natural rubber latex, and other agents encountered in medical or perioperative settings.

6.3 A history of chronic/relapsing gastrointestinal symptoms is reported to be predictive of abdominal pain, vomiting, hypotension, bradycardia, and cardiac arrest.

6.4 In patients with anaphylaxis due to insect venom, risk factors for increased severity include older age, pre-existing cardiovascular disease or mast cell disorder, concomitant treatment with a beta-adrenergic blocker and/or angiotensin-converting enzyme(ACE) inhibitor, a previous severe reaction, and the type of stinging insect (honey bees present the highest risk).

7.0 Management of anaphylaxis in healthcare settings

7.1 Initial management of the child with suspected anaphylaxis should include a rapid, thorough assessment of the airway, breathing and circulation, with immediate and concurrent administration of IM adrenaline.

7.2 Early preparation for definitive airway management is critical if signs of upper airway obstruction or severe respiratory distress are present. Additional support from anesthesia, or ENT specialist should be requested as intubation may be challenging. The benefits and risks of rapid sequence intubation should be considered, and equipment for emergency surgical airway placement should be at the bedside and ready for use if required.

7.3 All patients with signs and symptoms of anaphylaxis should receive rapid administration of IM adrenaline. Administration of IM adrenaline should not be delayed while attempting to establish intravenous access.

7.4 Patients with suspected anaphylaxis should receive supplemental oxygen and full cardiorespiratory monitoring. Those with respiratory symptoms should have their oxygen delivery titrated to optimize oxygen saturation.

7.5 Two large bore IV lines should be inserted in all patients experiencing anaphylaxis. An intraosseous needle should be placed if IV access is unobtainable, and the patient is poorly perfused and hypotensive.

7.6 Patients with tachycardia, hypotension or delayed capillary refill should receive aggressive fluid resuscitation with 20 mL/kg boluses of normal saline. This should be repeated as required to maintain cardiovascular stability.

7.7 Patients should be placed supine or with legs elevated to optimize venous return to the heart and prevent pooling of blood in the lower extremities.

7.8 Continuous reassessment of vital signs and patient condition is needed to determine need for intubation, more fluids or initiation of inotropic support.

See Figure 1 for the approach to medical management of anaphylaxis.

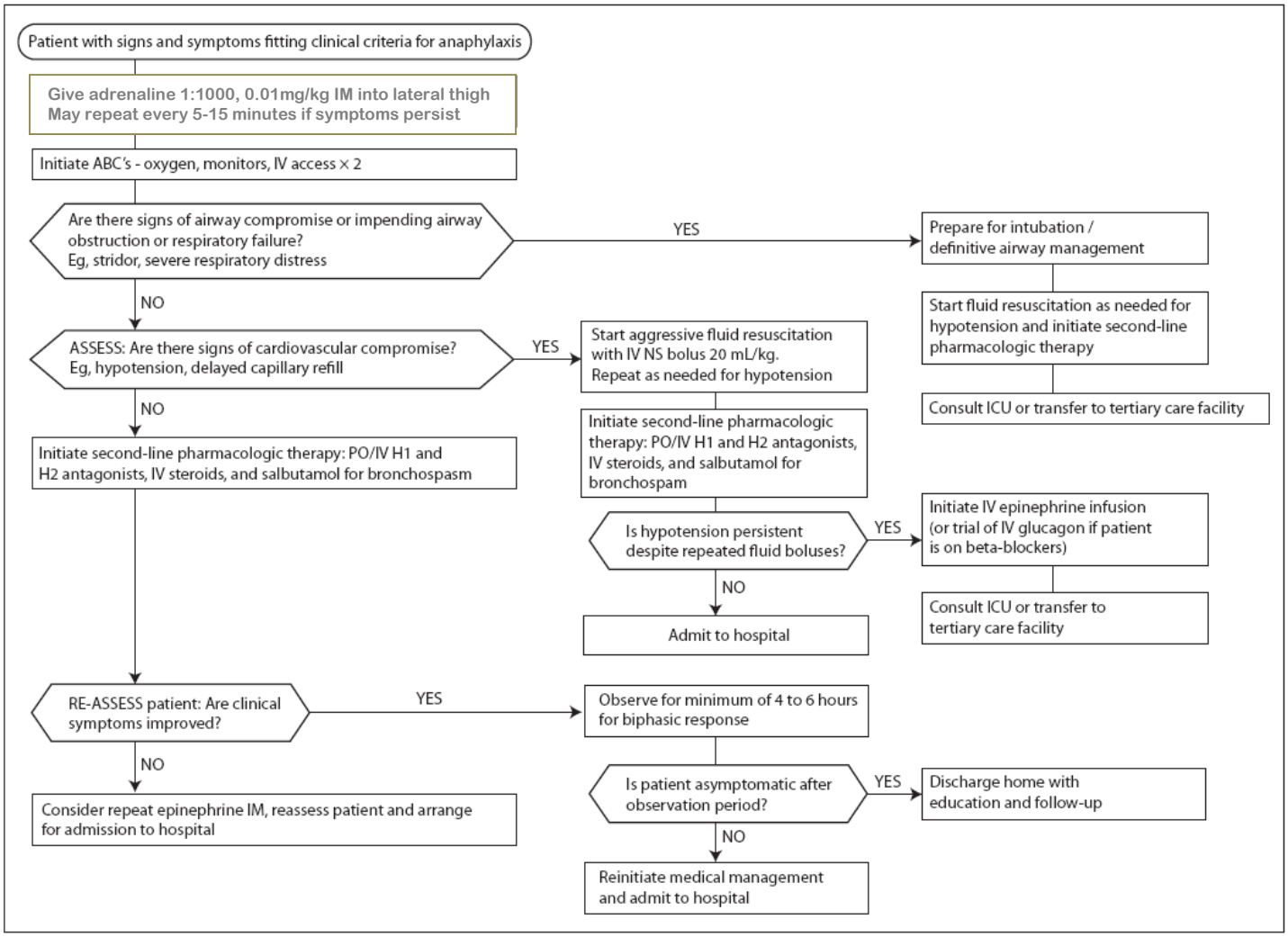


Figure 1) *Approach to medical management of anaphylaxis. ABC Airway, breathing and circulation; ICU Intensive care unit; IM Intramuscular; IV Intravenous; NS Normal saline; PO Oral*

From Paediatr Child Health 2011;16(1):35-40

8.0 Pharmacologic therapy

8.1 Adrenaline

Adrenaline is a direct-acting sympathomimetic agent with various properties that help to reverse the pathophysiological effects of anaphylaxis.

8.1.1 The alpha-adrenergic actions of adrenaline work to increase peripheral vascular resistance and reverse peripheral vasodilation while also decreasing angioedema and urticaria. The beta-1 adrenergic effects have positive chronotropic and inotropic effects on the heart, while the beta-2 adrenergic effects cause bronchodilation and reduction of inflammatory mediator release from mast cells and basophils. In combination, these effects help to reverse the anaphylactic process and, in turn, improve the cutaneous, respiratory and cardiovascular effects of the condition.

8.1.2 **Adrenaline 1:1000** should be administered **IM** into the **anterolateral thigh** at a dose of **0.01 mg/kg (maximum total dose 0.5 mg)**, and can be repeated every 5 min to 15 min depending on the patient's response to previous doses. IM administration of adrenaline into the thigh results in higher peak plasma concentrations compared with IM or subcutaneous (SC) injection into the upper arm. Additionally, peak plasma concentrations are achieved significantly faster after IM injection into the thigh compared with SC administration into the deltoid region. The local vasoconstriction caused by SC injection may inhibit absorption from the injection site.

8.1.3 Some patients with persistent symptoms may require repeat doses of adrenaline. The decision to administer a repeat dose of adrenaline should be made on an individual basis, and response to therapy should be carefully monitored with frequent reassessment of vital signs and the patient's clinical condition.

8.2 H1 and H2 antihistamines

8.2.1 These are 2nd line agents for anaphylaxis due to their slow onset of action. They should never be used in place of IM adrenaline.

8.2.2 H1 antagonists such as chlorpheniramine can be given to relieve the cutaneous symptoms of anaphylaxis (eg, urticaria, pruritus and angioedema). They have no effect on the respiratory, gastrointestinal or cardiovascular symptoms of anaphylaxis.

8.2.3 H2 antagonists, such as raniditine, can be given in combination with H1 antagonists because their combined effect is superior in treating cutaneous manifestations compared with the use of H1 antagonists alone. Chlorpheniramine for the vomiting child can be given as an IV or IM dose of 2.5mg (6 months to 6 years) or 5mg (6-12 years). Ranitidine should be given as an oral or IV dose of 1 mg/kg/dose, also with a maximum dose of 50 mg.

8.3 Corticosteroids

No randomized controlled trials have demonstrated a proven benefit of steroids in the treatment of anaphylaxis. Despite this, most experts would still recommend treatment with corticosteroids, with the knowledge that their onset of action is slow (4 h to 6 h), and that there will likely be little benefit in the acute phase of management. Oral prednisolone can be given at a dose of 1 mg/kg (maximum single dose 75 mg) or, for more severe reactions, hydrocortisone at a dose of 4 mg/kg IV (maximum single dose 100 mg).

8.4 Inhaled medications

8.4.1 Nebulised salbutamol should be given at a dose of 2.5mg (<6 years) or 5 mg (>6 years) and administered every 20 min or continuously until symptoms of wheezing or respiratory distress improve.

8.4.2 Inhaled adrenaline may be administered for children with stridor, although there is no evidence for its efficacy in the treatment of upper airway obstruction induced by anaphylaxis. IM adrenaline remains the first-line treatment for symptoms of upper or lower airway obstruction due to anaphylaxis, with inhaled salbutamol and adrenaline playing more supportive roles.

8.5 IV adrenaline

Repeated administration of IM adrenaline has no demonstrated benefit for improving persistent hypotension related to anaphylaxis. Instead, these patients should be started on an adrenaline infusion at a dose of 0.1 µg/kg/min to 1 µg/kg/min (maximum 10 µg/min), titrating towards normal blood pressure.

9.0 Observation period and disposition

9.1 Biphasic reactions can occur anywhere from 1 to 72 h after the first onset of symptoms. Approximately 5-20% of patients with anaphylaxis experience a biphasic reaction, with 3% of children having a significant reaction requiring oxygen, vasopressors or intubation.

9.2 All patients requiring IM adrenaline should be admitted to hospital and the physician must be aware that a recurrence can occur up to 72 h and counsel parents accordingly.

10.0 Discharge management

10.1 Patients suffering from anaphylaxis should be discharged with a self-injectable form of adrenaline (eg, EpiPen or EpiPen Jr). Please refer to "Guidelines for adrenaline autoinjector prescription in children" (Annex 1).

10.2 Parents and caretakers should be carefully educated about how to administer adrenaline, and counselled to err on the side of caution and administer the drug when symptoms occur after exposure to the individual's known trigger.

10.3 An adrenaline autoinjector should be kept with the child at all times (at school and with the parent or child).

10.4 The emphasis in educating parents should be placed on responding promptly to anaphylactic symptoms, rather than delaying treatment due to confusion attributed to an unknown allergen.

10.5 In addition to adrenaline, a three-day course of oral H1 and H2 antihistamines and oral corticosteroids may be prescribed on discharge. These drugs are unlikely to cause harm, and may have some added benefit in the resolution of symptoms.

10.6 All patients suffering from anaphylaxis should be provided with strict guidelines for avoidance of the precipitating trigger, and education about prevention of allergic reactions.

10.7 A personalized emergency anaphylaxis action plan should be written up for child (Annex 2).

10.8 An allergy alert needs to be documents in BruHIMS. A medical alert card/bracelet is highly recommended for a child with a history of anaphylaxis.

10.9 Asthma and other concomitant diseases should be optimally managed.

References

1. Cheng, A. (2011). Emergency treatment of anaphylaxis in infants and children. *Paediatr Child Health,* 2011;16(1):35-40
2. Simons, R., Ardusso, LF. et al. 2012 Update: World Allergy Organization Guidelines for the assessment and management of anaphylaxis. *Curr Opin Allergy Clin Immunol*, 2012, 12:389–399
3. www.allergy.org.au

Annex 1: Guidelines for adrenaline autoinjector prescription in children

Introduction

The aim of these guidelines is to outline the appropriate prescription of adrenaline autoinjectors for use in non-medical settings for the emergency/first aid treatment of potentially life-threatening severe allergic reactions (anaphylaxis).

All children with suspected or confirmed anaphylaxis should be referred to the paediatricians and admitted.

1. Adrenaline autoinjector should be prescribed to the following patients:

1) **History of anaphylaxis*** - If the patient is considered to be at continuing risk from allergic reactions to identified triggers (confirmed allergen/s) or unidentified triggers (idiopathic anaphylaxis).

2. Adrenaline autoinjector should be considered for the following patients:

1) **Food allergy *and* co-existing* *unstable or moderate to severe, persistent* asthma**. Rationale: Most food allergy related fatalities occur in those with unstable asthma.

2) **Underlying mast cell disorders** (e.g. systemic mastocytosis or elevated baseline serum tryptase concentrations) together with any previous systemic allergic reactions to insect stings.

3) **History of a generalised* allergic reaction with one or more of the following additional risk factors:**

a) **Specific allergic triggers**

Peanut, tree nuts and seafood. Fatal anaphylaxis may arise from any food, but most fatalities arise from food allergy that persists into adolescence and adult life (e.g. peanut, tree nut, sesame seed and seafood allergies).

Generalised urticaria alone without anaphylaxis following insect stings (e.g. bee, wasp or jumper ant stings) or following tick bites is not a routine indication for adrenaline autoinjector prescription, but may be considered in selected cases.

b) **Co-morbid conditions**

Asthma. Unstable or moderate to severe, persistent asthma increases the risk of respiratory compromise in those allergic to food. It is important to control asthma symptoms.

Cardiovascular disease (hypertension, ischaemic heart disease or arrhythmia) is associated with a relatively greater risk of fatal anaphylaxis from insect stings.

c) **Limited access to emergency medical care:**
   - **I.** Remote residential locations
   - **II.** Prolonged travel abroad - language barriers and lesser control over food preparation may increase the risk of accidental exposure and access to medical care may also be limited.

3. Adrenaline autoinjector is not recommended for the following patients:

1) Asthma without a history of anaphylaxis or generalised allergic reactions. If known allergen can be successfully avoided (e.g. drug allergy, latex allergy). Under these circumstances the wearing of medical identification jewellery is strongly recommended.

2) Elevated specific IgE only (positive blood or skin allergy test) without a history of clinical reactivity

3) Family (rather than personal) history of anaphylaxis or allergy - Whilst the risk for allergic disease such as asthma, allergic rhinitis and atopic eczema is in part inherited, there is not a substantial genetic contribution to food, sting or drug allergy risk, and the risk of anaphylaxis is not inherited.

4) Local reactions to insect stings in adults and children - Follow up studies demonstrate that these rarely progress to anaphylaxis.

5) Generalised skin rash (only) to bee or wasp stings in children - Follow up studies of subsequent bee stings in children presenting with local reactions or generalised skin rash (only) show that these children are at a very low risk of experiencing anaphylaxis with subsequent stings.

6) Resolved food allergy

7) Isolated angioedema - The risk of fatal angioedema (unrelated to food or insect sting allergy, hereditary angioedema or use of ACE inhibitor medication) is very low.

Adrenaline autoinjector dose recommendations

Adrenaline autoinjectors include EpiPen Jr (0.15 mg) and EpiPen (0.3 mg).

Children less than 10kg
Adrenaline autoinjectors are not usually recommended for children less than 10kg as the risk of fatal anaphylaxis in children this age is very low, and even the lower dose adrenaline autoinjector would provide a significant overdose. If there is a concern, patients should be referred to a paediatric specialist for assessment.

Children 10-20kg
EpiPen Jr (0.15 mg) is recommended for children between 10 and 20kg

Children over 20kg
EpiPen (0.3 mg) is recommended for children over 20kg

Anaphylaxis Management Plan

An adrenaline autoinjector should only be prescribed within the context of a comprehensive Anaphylaxis Management Plan that includes the following:

1. Referral to a paediatric specialist

2. Identification of anaphylaxis trigger(s)

This should include a comprehensive history, clinical examination, appropriate use and interpretation of allergy testing and to consider referral to a dermatologist.

3. Education on the avoidance of trigger(s)

This is particularly important with food allergy induced anaphylaxis.

4. Provision of an action plan for anaphylaxis (Annex 2)

This documents the following:

- Name of child
- Confirmed allergens
- Parent/guardian contact details
- Symptoms and signs indicating when to use the adrenaline autoinjector
- Instructions on how to use the adrenaline autoinjector
- Doctor's name and signature.

5. Appropriate follow-up

Yearly review by paediatrics should occur to:

- Review any allergic reactions that have occurred since their last review
- Examining co-factors (such as poorly controlled or persistent asthma) that may increase the risk of more serious reactions
- Examining the need for the provision of an adrenaline autoinjector for those who do not currently have one available

Adapted from:
Australasian Society of Clinical Immunology and Allergy Limited http://www.allergy.org.au/

Annex 2

ANAPHYLAXIS ACTION PLAN

Mild to moderate allergic reaction

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

Action

- Stay with child and call for help
- Locate EpiPen or EpiPen Jr
- Phone family/emergency contact

Mild to moderate allergic reactions do not always occur before anaphylaxis

Anaphylaxis (severe allergic reaction)

- 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)

Action for anaphylaxis

1. Lay child flat. Do not allow them to stand or walk. If breathing is difficult allow them to sit.
2. Give EpiPen or EpiPen Jr adrenaline autoinjector.
3. Seek medical help immediately

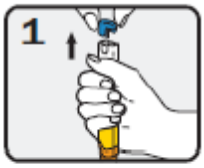
If in doubt, give EpiPen or EpiPen Jr

Start CPR at any time if child is unresponsive and not breathing normally.

Adapted from: Australasian Society of Clinical Immunology and Allergy at www.allergy.org.au

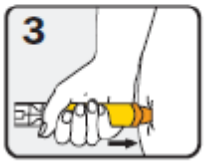
Prepared for the Department of Paediatrics, RIPAS Hospital by Dr Diana Tahir

How to give EpiPen®



Form fist around EpiPen® and PULL OFF BLUE SAFETY RELEASE.

PLACE ORANGE END against outer mid-thigh (with or without clothing).



PUSH DOWN HARD until a click is heard or felt and hold in place for 10 seconds.

REMOVE EpiPen®. Massage injection site for 10 seconds.

Name:

BruHIMS number:

Date of birth:

Confirmed allergens:

Family contact name & phone number:

Plan prepared by Dr:

Date: