Appendix 7 – Anaphylaxis Management

Anaphylaxis: Initial Management in Non-Hospital Settings

This section is intended for the initial management of patients in a public health clinic, medical office or similar non-hospital setting. For a patient with severe, life-threatening anaphylaxis, establishment of intravenous access for drug and fluid administration will be necessary, and endotracheal intubation and other manoeuvres may be required. These interventions are ordinarily best performed in a hospital's emergency department.

Since the publication of the 2002 Canadian Immunization Guide, the following changes have been made:

1) the management of an urticarial rash as the injection site has been outlined;
2) the use of self-injectors (Epipen or Twinject™) has been reviewed;
3) the use of diphenhydramine hydrochloride (Benadryl) has been expanded and the dose reduced for some age groups.

Anaphylaxis is a potentially life-threatening allergic reaction to foreign protein antigens such as food and bee stings. It is a rare complication of immunization but, even so, it should be anticipated in every vaccine. Prevention is the best approach. Pre-vaccination screening should include questions about possible allergy to any component of the product(s) being considered in order to identify this contraindication. As avoidance is not always possible, every vaccine provider should be familiar with the symptoms of anaphylaxis and be ready to initiate management and administer appropriate medications. Most instances are within 30 minutes after an injection of vaccine; shorter intervals to onset foretell more severe reactions. Thus vaccine recipients should be kept under supervision for at least 15 minutes after immunization; 30 minutes is a safer interval when there is a specific concern about possible vaccine allergy. In low-risk situations, supervision can include having vaccines remain within a short distance of the vaccinator (e.g., within a school being used for immunization) and return immediately for assessment if they feel unwell.

Anaphylaxis is one of the rarer events reported in the post-marketing surveillance system for vaccine adverse events. According to the latest analysis of complete national data collected through passive surveillance, the estimated annual reported rate of anaphylaxis ranges from 0.4 to 1.8 reports per 1,000,000 doses of vaccine distributed in Canada.

Anaphylaxis must be distinguished from fainting (vasovagal syncope), anxiety and breath-holding spells, which are more common and benign reactions. During fainting, the individual suddenly becomes pale, loses consciousness and collapses to the ground. Fainting is sometimes accompanied by brief clonic seizure activity (i.e., rhythmic jerking of the limbs), but this generally requires no specific treatment or investigations. Fainting is managed simply by placing the patient in a recumbent position. Recovery of consciousness occurs within a minute or two, but patients may remain pale, diaphoretic and mildly hypotensive for several more minutes. The likelihood of fainting is reduced by measure that lower stress in those awaiting immunizations, such as short waiting times, comfortable room temperature, preparation of vaccines out of view of recipients and privacy during procedure. To reduce injuries during fainting spells, those at risk are best immunized while seated.
People experiencing an anxiety spell may appear fearful, pale and diaphoretic and complain of light headedness, dizziness and numbness, as well as tingling of the face and extremities. Hyperventilation is usually evident. Treatment consists of reassurance and re-breathing using a paper bag until symptoms subside.

Breath-holding spells occur in some young children when they are upset and crying hard. The child is suddenly silent but obviously agitated. Facial flushing and perioral cyanosis deepens as breath-holding continues. Some spells end with resumption of crying, but others end with a brief period of unconsciousness during which breathing resumes. Similar spells may have been observed in other circumstances. No treatment is required beyond reassurance of the child and parents.

In the case of anaphylaxis, changes develop over several minutes and usually involve at least two body systems (affecting the skin, respiration, circulation). Unconsciousness is rarely the sole manifestation of anaphylaxis. It occurs only as a late event in severe cases.

The cardinal features of anaphylaxis are:
- itchy, urticarial rash (in over 90% of cases);
- progressive, painless swelling (angioedema) about the face and mouth, which may be preceded by itchiness, tearing, nasal congestion or facial flushing;
- respiratory symptoms, including sneezing, coughing, wheezing, labored breathing and upper airway swelling (indicated by hoarseness and/or difficulty swallowing) possibly causing airway obstruction;
- hypotension, which generally develops later in the reaction and can progress to cause shock and collapse.

Gastrointestinal symptoms like nausea, vomiting and diarrhea may occur with anaphylaxis.

Swelling and urticarial rash at the injection site can occur but are not always caused by an allergic reaction. This reaction can be managed by observation. Ice can be put at the site of reaction for comfort. It can also be treated with diphenhydramine hydrochloride (Benadryl, see step 7 in the next section) alone. If diphenhydramine is given to treat such a reaction, the patient should be kept under close supervision for 1 hour after the dose. If the hives or swelling disappear without additional treatment, the patient does not need to be kept under further observation. However, if any other symptoms arise, even if considered mild (e.g., sneezing, nasal congestion, tearing, coughing, facial flushing) or if the hives progress despite the use of diphenhydramine, epinephrine, whereas delay in its administration when required may result in difficulty to treat anaphylaxis and in death.

Features of severe disease include obstructive swelling of the upper airway, marked bronchospasm and hypotension.
Management of Anaphylaxis

The following steps describe the management of anaphylaxis. Steps 1 to 4 are meant to be done rapidly or simultaneously. **The priority is prompt administration of epinephrine (step 1), which should not be delayed if earlier steps cannot quickly be completed.**

1. **Promptly administer 0.01 mL/kg (maximum 0.5 mL.) of aqueous epinephrine 1:1000 by intramuscular injection in the opposite limb to that in which the vaccination was given.** Speedy intervention is of paramount importance: failure to use epinephrine promptly is more dangerous than using it improperly (see text below for discussion of epinephrine).

2. Call for assistance, including an ambulance.

3. Place the patient in a recumbent position, elevating the feet if possible.

4. Establish an oral airway if necessary.

5. If oxygen is available, it should be given to patients with cyanosis, dyspnea or any other severe reaction. Monitor with pulse oximetry if available.

6. If the vaccine was injected subcutaneously, an additional dose of 0.005 mL/kg (maximum 0.3 mL) of aqueous epinephrine 1:1000 can be injected into the vaccination site to slow absorption. This should be given shortly after the initial dose of epinephrine (Table 7) in moderated to severe cases. It is generally not repeated. Local injection of epinephrine into an intramuscular vaccination site is contraindicated because it dilates vessels and speeds absorption of the vaccine.

7. As an adjunct to epinephrine, a dose of diphenhydramine hydrochloride (Benadryl) can be given. Oral treatment (oral dose: 1-2 mg/kg to a maximum single dose of 50 mg) is preferred for conscious patients who are not seriously ill, because Benadryl is painful when given intramuscularly. This drug has a high safety margin, making precise dosing less important. The approximate doses for injection (50mg/mL solution) are shown in Table 8.

8. If available, consider inhaled B-agonist if there is a bronchospasm resistant to an adequate dose of epinephrine (e.g., nebulized salbutamol 2.5-5.0 mg in 3mL of saline or 1 puff per 3 kg to a maximum of 10 puffs by metered dose inhalers).

9. Monitor vital signs and reassess the situation frequently to guide medication use.

10. Arrange for rapid transit to an emergency department. Since 20% of anaphylaxis episodes follow a biphasic course with recurrence of the reaction after a 2-9 hour asymptomatic period. Hospitalization or a long period of observation is recommended for monitoring for all but the mildest cases of anaphylaxis. Patients should be hospitalized overnight or monitored for at least 12 hours.
The intramuscular route for epinephrine injection is appropriate. Epinephrine dosing can be repeated twice at 5-minute intervals if necessary, for a total of three doses, again avoiding the limb in which the vaccination was given. A different limb is preferred for each dose to maximize drug absorption.

The epinephrine dose should be carefully determined. Calculations based on body weight are preferred when weight is known. Recording the weight of children before routine immunization is recommended when feasible. Excessive doses of epinephrine can add to patients’ distress by causing palpitations, tachycardia, flushing and headache. Although unpleasant, such side effects pose little danger. Cardiac dysrhythmias may occur in older adults but are rare in otherwise healthy children.

When body weight is not known, the dose of aqueous epinephrine 1:1000 can be approximated from the subject’s age (Table 7).

### Table 7
**Appropriate Dose of Epinephrine (1:1000 According to Age)**

<table>
<thead>
<tr>
<th>Age</th>
<th>Dose Injected (ml)</th>
<th>Dose Injected (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 to 6 months*</td>
<td>0.07 ml</td>
<td>0.07 mg</td>
</tr>
<tr>
<td>12 months</td>
<td>0.10 ml</td>
<td>0.10 mg</td>
</tr>
<tr>
<td>18 months to 4 years</td>
<td>0.15 ml</td>
<td>0.15 mg</td>
</tr>
<tr>
<td>5 years</td>
<td>0.20 ml</td>
<td>0.20 mg</td>
</tr>
<tr>
<td>6-9 years</td>
<td>0.30 ml</td>
<td>0.30 mg</td>
</tr>
<tr>
<td>10-13 years</td>
<td>0.40 ml +</td>
<td>0.40 mg</td>
</tr>
<tr>
<td>≥ 14 years</td>
<td>0.50 ml +</td>
<td>0.50 mg</td>
</tr>
</tbody>
</table>

* Dose for children between the ages shown should be approximated, the volume being intermediate between the values shown or increased to the next larger dose, depending on practicability.

+ For a mild reaction a dose of 0.3 mL can be considered.

### Table 8
**Appropriate Dose of Diphenhydramine Hydrochloride**

<table>
<thead>
<tr>
<th>Age</th>
<th>Dose Injected (50mg/mL)</th>
<th>Dose Oral or Injected</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 2 years</td>
<td>0.25 mL</td>
<td>(12.5 mg)</td>
</tr>
<tr>
<td>2-4 years</td>
<td>0.50 mL</td>
<td>(25.0 mg)</td>
</tr>
<tr>
<td>5-11 years</td>
<td>0.50-1.00 mL</td>
<td>(25-50 mg)</td>
</tr>
<tr>
<td>≥ 12 years</td>
<td>1.00 mL</td>
<td>(50 mg)</td>
</tr>
</tbody>
</table>

An epinephrine self-injector (Epipen or Twinject™) can also be used if the person who administers it is knowledgeable about proper use. The junior preparations contain 0.15 mL of epinephrine 1:1000, which is ideal for children weighing 15 kg. The regular preparations contain 0.3 mL of epinephrine 1:1000 and should be used for people weighing ≥ 30 kg. For those weighing below 15 kg or between 15 and 30 kg, judgement should be used to decide which, if any, self-injector should be used.

The anaphylactic state in patients receiving B-adrenergic antagonist therapy (for elevated blood pressure) will be more resistant to epinephrine therapy.
Epinephrine vials and other emergency supplies should be checked on a regular basis and replace if outdated.

**Recommended epinephrine kit contains:**

- Copy of the anaphylaxis procedures and doses recommended of epinephrine and diphenhydramine for weight and age
- 2-1 cc syringes with attached needles (1-25 gauge, 5/8” needle; 1-25 gauge, 1” needle)
- 2 vials of epinephrine 1:1000 (check expiry date monthly and replace once expired)
- 1 vial of diphenhydramine (pills or oral solutions optional, check expiry date monthly and replace once expired)
- 1-25 gauge, 5/8” needle (extra)
- 1-25 gauge, 1” needle (extra)
- 2 alcohol swabs (optional)

**Selected references:**


Joint Task Force on Practice Parameters; American Academy of Allergy, Asthma and Immunology; American College of Allergy, Asthma and Immunology; Joined Council of Allergy, Asthma and Immunology. The diagnosis and management of anaphylaxis: an updated practice parameter. Journal of Allergy and Clinical Immunology 2005; 115: S483-523.
