

INTRODUCTION

Allergic (hypersensitivity) reactions are most often secondary to an exaggerated immune system response to a harmless foreign antigen (e.g. insect bite or sting, a particular medication, or food). When first exposed to an allergen, immune cells identify the substance as a dangerous antigen and initiate a cascade of intra and intercellular events. When immunoglobulin E (IgE) antibodies are exposed to a particular antigen, they attach to mast cells and cause degranulation (release) of multiple chemical mediators (histamine, prostaglandins, several types of interleukins). It is not known why this immune response occurs in certain individuals, but it is believed to be a combination of genetic and environmental factors.

The first exposure to an antigen sensitizes the person to the foreign substance, but symptoms are usually not apparent. When the patient is confronted with that particular substance again, mast cell degranulation is much faster and more pronounced, with rapid release of the above chemical mediators. These chemicals mediate the pathophysiologic response that results in allergic reaction symptomatology. The body systems affected may include the dermatologic, respiratory, cardiovascular, gastrointestinal, neurologic, and possibly psychological systems. Skin involvement as an example is very common, typically presenting with urticaria (hives) and/or angioedema (rapid swelling of the deep dermis, mucosa, or subcutaneous tissue). Resultant symptoms involving any of the above systems may be mild, moderate, or severe.

Anaphylaxis is defined as a severe, life-threatening systemic allergic reaction that is acute in onset, and may cause death by airway obstruction or vascular collapse. The diagnosis of anaphylaxis is considered highly likely in the setting of acute onset respiratory or hemodynamic compromise co-existing with signs and/or symptoms of an allergic reaction, or following exposure to a known allergen for that patient.

SAFETY

Some allergic reactions can be caused by animal bites or stings. It is important for clinicians to ensure the animal/insect is not a threat to themselves.

In some cases of allergic reactions, the patient may require treatment with nebulized medications,

leading to aerosolized particles. Clinicians should use appropriate personal protective equipment.

Many patients with a history of allergies will have their own epinephrine auto-injector. Be aware that it is a common error for patients and responders to attempt to use the auto-injector upside down. This deploys the epinephrine dose into the users thumb, placing them at risk for ischemia and necrosis. It is important to ensure the auto-injector is being used correctly by referring to the directions on the device.

It is important for the clinician to differentiate between patients who have adverse effects due to medications and those with allergies to them (in which case it would not be appropriate for them to receive that medication). For example a patient may state they have an allergy to morphine because it makes them nauseous, however this is an adverse effect of the medication, not an allergy. If a patient states they have an allergy to a medication, ask questions to determine exactly what happens when they receive that particular substance.

ASSESSMENT

The clinician must quickly assess for the presence of anaphylaxis as this indicates that life-supporting management interventions are necessary. It may not always be obvious that anaphylaxis is present, such as when the patient has a decreased level of consciousness or shock.

The most severe reactions commonly present with airway, respiratory, and hemodynamic compromise indicated by the presence of laryngeal or airway edema, bronchoconstriction (wheezing and/or decreased air entry), tachycardia, hypotension, and an altered level of consciousness. These symptoms may be isolated or involve multiple systems.

The clinician should assess the airway early for stridor, voice changes, a barking cough, or a feeling of 'tightness' in the throat. Assess the lips, tongue, and if possible back of the throat for swelling. Any of these signs and symptoms may indicate impending airway obstruction. It is also critical to monitor the patient closely in case such findings evolve during of the course of care.

Determine the time the exposure occurred, the time the symptoms began, and how quickly they may still be evolving. Anaphylactic reactions usually begin

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within 15 minutes of exposure to an allergen and though symptoms vary, patients with a history of anaphylaxis often present with similar symptoms each time. If the patient received epinephrine prior to arrival of the clinician, determine the time it was given. Rapidly worsening symptoms are a concerning finding and should prompt the clinician to be prepared for airway and shock management.

An accurate history and physical exam will help the clinician differentiate between an allergic reaction and anaphylaxis vs. something else with a similar presentation. Presentations such as asthma, upper airway obstruction due to a variety of other etiologies, shock due to another cause, vasovagal syncope, and panic attacks may be confused with allergic reactions.

When no obvious signs of anaphylaxis are present, a more detailed history should be obtained. Ask about possible exposures to the most common allergens such as food, drugs, or bee stings. Also ask about any other (possibly new) exposures including detergents, lotions, beauty products, clothing, latex, animals, pollen or grass/tree exposures, etc. The patient may have had a similar reaction in the past and in some cases may already know they have an allergy to a particular substance. If the patient has an altered level of consciousness, obtain a history from bystanders/friends/family members.

On history and physical exam, consider all the various systems that may be involved and assess accordingly. Urticaria and angioedema are the most common presenting symptoms, followed by respiratory manifestations. Nausea, vomiting, and diarrhea are common after ingested allergens. Refer to Table 1 for a list of signs and symptoms of allergic reactions categorized by body system.

Table 1: Manifestations of allergic reactions by body system (adapted from Arnold & Williams, 2011)

<p>Dermatologic/mucosal Periorbital swelling/erythema, injected (red) conjunctiva, swelling of the tongue and lips, urticarial, pruritis, flushing, swelling, goosebumps</p>
<p>Respiratory Upper airway: rhinorrhea, sneezing, throat constriction, dry cough, difficulty breathing, swallowing, or speaking, changes in voice, stridor,</p>

<p>cyanosis Lower airway: wheeze or cough, chest tightness, tachypnea</p>
<p>Cardiovascular Tachycardia, diaphoresis, hypotension, shock</p>
<p>Gastrointestinal Nausea, vomiting, abdominal cramps, diarrhea</p>
<p>Neurologic Headache, dizziness, confusion, tunnel vision, loss of consciousness</p>
<p>Psychological Anxiety, metallic taste, paresthesia in extremities, feeling of “impending doom”</p>

Non-immune Reactions	Mediated	(Anaphylactoid)
<p>Non-immune Anaphylaxis, previously referred to as an “anaphylactoid” reaction, is triggered by mechanical/direct activation and degranulation of mast cells, as opposed to IgE-mediated activation. Such non-immune reactions may occur secondary to temperature, exercise, or the administration of radiocontrast dyes, ASA, NSAIDS, or opioids for example. Signs, symptoms, and treatment options are the same as with any other anaphylactic reaction.</p>		

MANAGEMENT

Basic Principles

The patient should be removed from the source of the allergen if possible. Where feasible, have the patient wash their hands in the event of a mild/moderate reaction of unknown etiology. This will reduce the risk of recontamination from an allergen that may be on the hand. Anyone who may come into contact with the patient (e.g. family) should also be asked to wash their hands. The clinician should be careful that the patient does not become exposed to any medical supplies which they may be allergic to (e.g. latex-based products, alcohol-based swabs, medication preservative agents, etc.)

Airway management

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Patients with allergic reactions involving the respiratory system should receive oxygen as required to maintain an SpO₂ of at least 92%.

If there is airway compromise secondary to angioedema, the airway is managed in keeping with principles discussed in the Airway Management Guideline. Decision to proceed with intubation must take into account transport time to receiving hospital, and rapidity with which upper airway obstruction is occurring. If obstruction is imminent despite aggressive medical management (see below), and transport time is “long”, a preemptive attempt at an awake intubation is warranted. Significant difficulty should be predicted, therefore the clinician should be prepared to promptly perform a surgical airway should intubation, as well as ventilation and oxygenation with BVM become impossible. Extraglottic devices are unlikely to be of assistance in the setting of angioedema. If medical management and BLS airway maneuvers allow for adequate “temporizing” of oxygenation and ventilation, and transport time is relatively short, further airway interventions should be deferred until arrival at hospital.

Medical Management

Anaphylactic reactions will require aggressive medical management. Epinephrine is given IM whenever there are airway obstructive or hemodynamic symptoms (**PEP 2 supportive**). IV epinephrine is indicated for patients who are worsening despite IM dosing. Epinephrine is a mast cell stabilizer, therefore preventing further histamine release. It also reduces symptoms by causing vasoconstriction and bronchodilation.

Diphenhydramine is an H1 anti-histamine and should be given to all patients who receive epinephrine for a suspected anaphylactic reaction (**PEP 2 neutral**), as well as patients with less severe, non-life threatening allergic reactions (**PEP 1 supportive**). It will often improve symptoms and alleviate the discomfort associated with most allergic reactions.

If a patient with an allergic reaction develops signs of bronchoconstriction (e.g. wheezes) salbutamol should be administered (**PEP white**).

If considering the use of dimenhydrinate for vomiting in the presence of an allergic reaction, use caution,

as vomiting is often a way for the body to expel the allergen.

Hemodynamic Supportive Care

Anaphylaxis can cause widespread vasodilation, and therefore a relative depletion of intravascular volume, which can quickly lead to shock and hypotension. For patients who are hypotensive or showing signs of shock, despite administration of maximum doses of epinephrine, an IV bolus of normal saline (20 ml/kg) should be administered and repeated as required if there is ongoing hemodynamic instability (**PEP 3 supportive**). If hypotension persists despite epinephrine, as well as 1-2 boluses of normal saline, vasopressor administration should be considered for further hemodynamic support.

Subsequent ED Management

Subsequent ED management includes the same principles and medications as outlined above. Ranitidine may be administered as an additional anti-histamine (blocks H₂ receptors), and a steroid may be given to help suppress an ongoing reaction or prevent reoccurrences over the next few days. If epinephrine is administered either by the patient, the prehospital clinician, or in the ED, the patient requires several hours of observation in the ED to ensure symptoms do not reoccur after the effects of the epinephrine have subsided. This is an important consideration should a patient refuse transport after epinephrine administration.

TRANSFER OF CARE

It is important to provide pre-arrival information to receiving hospitals for patients with airway or hemodynamic compromise. This will allow time to mobilize resources and prepare for management of complicated patients.

It is important to provide all relevant details to the receiving facility in terms of time of exposure, initial presentation, treatment rendered, time of epinephrine administration (patient’s own and/or administration by clinician), and patient’s response to treatment.

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CHARTING

In addition to the mandatory fields it is important to document the following in the ePCR text fields:

- ✓ Time of allergen exposure
- ✓ Initial patient presentation
- ✓ Treatment provided before and after clinician arrival
- ✓ Time/dose/route of epinephrine administration (before and/or after clinician arrival)
- ✓ Post-intervention vital signs
- ✓ Reassessment findings

Key Points – Allergic Reactions

Allergic reactions can be immediate or delayed; high risk non-transport

Important for the clinician to differentiate between adverse effects due to medication vs medication allergies

Symptoms can progress rapidly and become life-threatening (reassess frequently)

An accurate history, physical exam, and frequent reassessment will help differentiate between an acute allergic reaction and other etiologies

KNOWLEDGE GAPS

The safety and efficacy of pre-hospital administration of H2 inhibitors and corticosteroids is unknown at this time.

EDUCATION

As management depends on the severity of the reaction, it is important for clinicians to recognize the acuity of mild/moderate/severe allergic reactions.

QUALITY IMPROVEMENT

Anaphylaxis is a time-sensitive management therefore recording accurate time stamps on the ePCR in terms of allergen exposure time and epinephrine administration time is important.

Documentation of epinephrine administration prior to clinician arrival (e.g. by school staff, MFR, bystander, etc.) is an important piece of information in order to measure the quality of the system.

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PEP 3x3 TABLES for ALLERGIC REACTIONS

Throughout the EHS Guidelines, you will see notations after clinical interventions (e.g.: **PEP 2 neutral**). PEP stands for: the Canadian Prehospital Evidence-based Protocols Project.

The number indicates the Strength of cumulative evidence for the intervention:

- 1 = strong evidence exists**, usually from randomized controlled trials;
- 2 = fair evidence exists**, usually from non-randomized studies with a comparison group; and
- 3 = weak evidence exists**, usually from studies without a comparison group, or from simulation or animal studies.

The coloured word indicates the direction of the evidence for the intervention:

- Green = the evidence is supportive** for the use of the intervention;
- Yellow = the evidence is neutral**;
- Red = the evidence opposes** use of the intervention;
- White** = there is no evidence available for the intervention, or located evidence is currently under review.

PEP Recommendations for Allergic Reaction Interventions, as of 2014/07/02. PEP is continuously updated. See: <https://emspep.cdha.nshealth.ca/TOC.aspx> for latest recommendations, and for individual appraised articles.

Mild Allergic Reaction

Recommendation		RECOMMENDATION FOR INTERVENTION			
		SUPPORTIVE (Green)	NEUTRAL (Yellow)	AGAINST (Red)	NOT YET GRADED (White)
STRENGTH OF RECOMMENDATION FOR INTERVENTION	1 (strong evidence exists)	• Diphenhydramine			
	2 (fair evidence exists)				
	3 (weak evidence exists)				

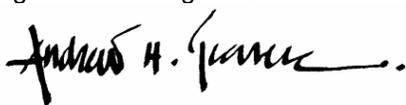
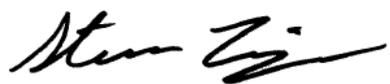
Anaphylaxis

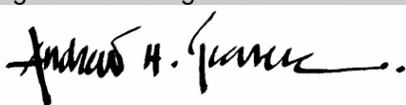
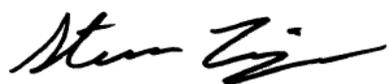
Recommendation		RECOMMENDATION FOR INTERVENTION			
		SUPPORTIVE (Green)	NEUTRAL (Yellow)	AGAINST (Red)	NOT YET GRADED (White)
STRENGTH OF RECOMMENDATION FOR INTERVENTION	1 (strong evidence exists)	• H2 blocker with Benadryl			• Beta Agonist • Dopamine Infusion • Glucagon • Intubation • Steroid
	2 (fair evidence exists)	• Epinephrine			
	3 (weak evidence exists)	• Crystalloid Infusion	• Diphenhydramine		

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Program Document Number Management System

PDN: 6208.05	Title: Allergic Reaction	Type: CPG
Effective Date: July 16 2014	Revision Date:	
Approval Date: July 16 2014	Revision Date:	
Review Date: July 2 2014	Revision Date:	
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Signature of Program Director 	Signature of Program Document Coordinator 	

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