Treating individuals with severe anaphylactic type allergic reactions

INSTRUCTOR'S GUIDE

Santé et Services sociaux Québec

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Santé et Services sociaux
Québec

Produced by:
Direction des communications of Ministère de la Santé et des Services sociaux du Québec

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Foreword

This document was put together with the assistance of numerous contributors in the fields of first aid, allergies, and pre-hospital emergency services (EMS).

Given the need to rapidly treat victims of serious allergic reactions, other groups of emergency responders, including first aiders, must be authorized to administer epinephrine so that it can be used even more quickly when required.

By virtue of the Office des professions regulation to this effect, responsibility for accreditation of this program lies with the national medical director and regional medical directors of EMS.

For nearly ten years now, ambulance paramedics, and more recently first responders, have been administering epinephrine in the course of pre-hospital care. Under regional EMS quality improvement programs, hundreds of cases of epinephrine use and even more cases of non-anaphylactic reactions have been reviewed. This program takes these many years of experience into account.

We wish to thank all those who helped develop and disseminate this program.

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Special thanks to Dr. Daniel Rizzo

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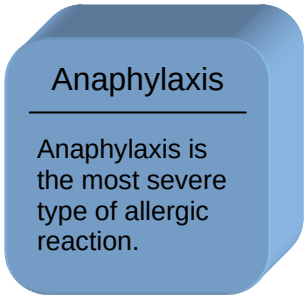
1 Introduction

Training objectives and key points

- Mission of pre-hospital emergency services
- Regulation respecting the professional activities that may be engaged in within the framework of EMS
- Definition of anaphylaxis
- Goal of the program

Mission of pre-hospital emergency services (EMS)

The mission of EMS is to ensure that persons in need of pre-hospital emergency services may at all times obtain an appropriate, efficient, and quality response aimed at reducing the mortality and morbidity rate among the recipients of pre-hospital emergency services.[1]



An anaphylactic reaction is a sudden, severe allergic reaction to a stimulus that affects one or more bodily systems and is accompanied by multiple signs and symptoms.[2] Anaphylactic reactions can cause serious breathing difficulties (distress), shock (circulatory failure), or both, which can be fatal. In most episodes, this is a potentially avoidable event.

To reduce complications, victims of anaphylactic reactions must be administered an injection of epinephrine (also known as adrenalin) and provided with medical care as quickly as possible. Epinephrine injected directly into muscle diminishes the intensity of the reaction, stopping or sufficiently slowing it so that the victim can get medical attention in time.

An estimated 1% to 2% of Canadians are at risk of anaphylactic reactions caused by food allergies or insect bites. In Québec, this represents as many as 140,000 people of all ages. One study found that 84,000 cases of anaphylaxis are reported

every year in the United States, 1% of which result in death.[3]

In fall 2006, the Office des professions du Québec tabled an amendment to the *Regulation respecting Professional activities that may be engaged in within the framework of pre-hospital emergency services and care*. This regulation lists the professional acts that are normally carried out by physicians, but that may be performed in certain circumstances by ambulance paramedics, first responders, and properly trained first aiders.

Section 3 of the regulation stipulates the following: "*In the absence of a first responder or ambulance technician, any person having received training in the administration of adrenalin approved by the regional or national medical director of pre-hospital emergency services may administer adrenalin with an auto-injection device to a person in the case of an acute anaphylactic allergic reaction*."[4]

This training program is for first aiders who, as a result of their training, may be required to administer epinephrine in the case of a severe anaphylactic type allergic reaction.

This instructor's guide, which was developed by the Direction nationale des services préhospitaliers d'urgence and its partners, contains the clinical and teaching information required to train first aiders. Each chapter features learning objectives. A course outline has been included in the appendix.

Responsibility for the training of master instructors from the various first aid organizations lies with the

Direction adjointe des services préhospitaliers d'urgence (office of the deputy director of pre-hospital emergency services) at the Ministère de la Santé et des Services sociaux du Québec.

The various organizations are then responsible for training their own instructors. Delivery of the program is left to the organizations and their well-established training structures.

2. Role and Responsibilities of First Aiders

Training objectives and key points

- Based on the roles and responsibilities of the organizations, describe the role and responsibilities of first aiders
- Identify the responses that first aiders are authorized to make

2.1 Role of first aiders

The main goal of first aiders who complete this training is to reduce morbidity (complications) and mortality (death) associated with anaphylactic reactions.

To achieve this goal, first aiders must be able to quickly recognize the signs and symptoms of an anaphylactic reaction. Once anaphylaxis has been identified, epinephrine must be administered without delay using the technique taught.

2.2 Responsibilities of first aiders

As mentioned above, this training program is intended for first aiders who, due to their accredited training, may be required to administer epinephrine in the event of a severe anaphylactic allergic reaction.

The responsibility of first aiders, who are legally protected under the Civil Code, is limited to following the protocol and keeping their knowledge up-to-date.

2.3 Responsibilities of organizations

Organizations that choose to implement a program like this are responsible for ensuring the availability of the required paediatric or adult auto-injectors at all times, and for making sure that they are replaced prior to expiration.
These organizations must also ensure that accredited first aiders keep their training up-to-date in accordance with program criteria.

In addition, they must notify the regional medical director of pre-hospital emergency services at the regional health and social services agency each time that epinephrine is used under this program.

3 Physiopathology of Anaphylaxis

Training objectives and key points

- Describe the phenomenon of sensitization
- Describe the anaphylactic reaction
- Describe the anaphylactoid reaction
- Enumerate the systems involved in an anaphylactic reaction
- Identify the most common trigger factors

3.1 From immune reaction to anaphylaxis

Most reactions by the body's immune system go unnoticed. The body discreetly defends itself against all foreign bodies (antigens), and its defensive mechanisms kick in without provoking any outwardly significant signs or symptoms.

In the case of a severe, or anaphylactic, allergic reaction, however, the immune system suddenly and explosively overreacts to a normally inoffensive substance (allergen).

Allergic and anaphylactic reactions occur in people who are said to be "sensitized."

Some people have a tendency to overreact when they come in contact with certain substances. Upon initial contact with such substances, their immune systems react by producing antibodies (IgE) capable of recognizing the substances in the future. This is the sensitization phase.

These antibodies fix themselves to certain cells involved in inflammatory reactions. Sensitization may result in benign allergic reactions or go completely unnoticed.

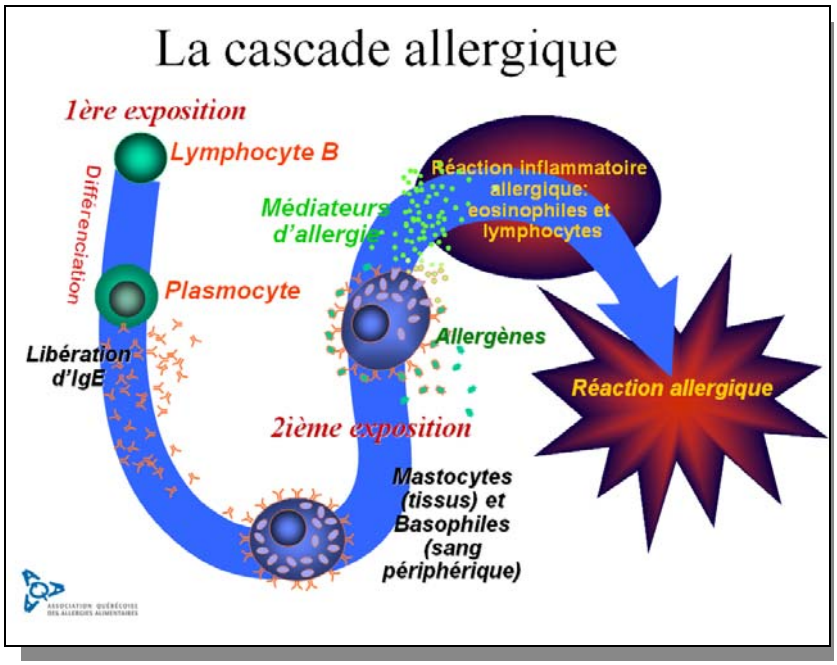
When victims come in *renewed* contact with a known antigen (i.e., a substance to which they have been sensitized), the previously produced antibodies now presented by the immune system cells recognize the allergenic substance and stick to it. The antigen-antibody (IgE) interaction triggers a *massive* release of histamine and other chemical substances by mast cells and granulocytes (cells found in human blood and tissues).

It is this massive release of substances that causes an anaphylactic reaction.

The allergic cascade

1st exposure
Lymphocyte B
Differentiation
Plasmocyte
Release of IgE
Mastocytes (tissues) and basophils (peripheral blood)

2nd exposure
Allergens
Allergy mediators
Inflammatory allergic reaction: eosinophils and lymphocytes
Allergic reaction



Allergic cascade of an anaphylactic reaction
This diagram has been adapted by the Québec Food Allergy Association

Anaphylactoid reactions are clinically similar to anaphylactic reactions. They are accompanied by the same signs and symptoms, and the same substances are released into the blood stream.

The underlying phenomenon, however, is totally different. Anaphylactoid reactions are not immune reactions. Unlike anaphylactic reactions,

they do not require previous contact with the substance. Since the two types of reactions are clinically impossible to tell apart, they are treated the same way during prehospital care.

So there is no need to worry unduly whether the patient has been previously exposed to the suspected allergen.

Chemical Substances Released by Mast Cells and Granulocytes During an Anaphylactic Reaction

These chemical substances play a role in normal inflammatory reactions within the body. In anaphylactic reactions, they are released in excessive quantities.

- Histamine
- Kinins
- Leucotrienes
- Prostaglandin

Together, these substances cause vasodilation and increase blood vessel permeability.

They also cause airway smooth muscle contraction and increase mucus secretion.

These substances are released throughout the body (in tissues by mast cells and in the blood stream by granulocytes). This is why anaphylactic reactions are multisystemic reactions that affect the following systems:

- Respiratory system
- Cardiovascular system
- Gastro-intestinal system
- Skin

In the next chapter, we will explain how these chemical substances cause the different signs,

symptoms, and complications linked to anaphylactic reactions.

3.2 Etiology of trigger factors

Trigger Factors

It is important for first aiders to be familiar with anaphylaxis triggers. In an emergency situation, trigger factors must be identified or strongly suspected before adrenalin is administered.

Anaphylactic reactions are caused by a wide variety of *trigger factors*, but some are more common than others. In the event of an anaphylactic reaction, it is important for first aiders to identify the potential trigger substance. The presence of a causal agent is a key element in deciding whether to administer epinephrine or not.

The most common trigger factors are food, insect bites, and drugs. In Canada, the most common food triggers are peanuts, nuts (almonds, cashews, pistachios, and others), milk, eggs, fish, shellfish and molluscs, and to a lesser extent, sesame seeds, soy, and wheat.[5] Most food allergens tend to cause respiratory distress[6].

In the case of insect bites, hymenoptera (bees, wasps, and ants) are the most frequently identified culprits. Circulatory failure is the most common anaphylactic reaction to bites and stings.[6]

Other trigger factors include certain drugs and pharmaceutical products. Antibiotics, acetylsalicylic acid (Aspirin), non-steroidal anti-

inflammatories (NSAID), and intravenous contrast agents (substances injected for certain radiological exams) are the ones most often associated with anaphylactic and anaphylactoid reactions.

Latex has attracted a great deal of attention, but it is rarely associated with anaphylactic reactions. In England, a register of anaphylactic incidents kept by health services over a ten-year period showed no deaths linked to proven exposure to latex.[8]

In certain people, a violent effort made after eating a normally inoffensive food can occasionally trigger an anaphylactic reaction. In others, a violent effort alone may be enough to cause such a reaction[7].

Lastly, in certain situations (up to 5%), the trigger factor remains unknown.[7] Some studies place this figure even higher.

ANYPHLAXIS TRIGGERS	
CATEGORIES	**TRIGGER FACTORS**
Food Foods are the most common triggers.	▪ Peanuts, nuts (almonds, cashews, pistachios, and others), milk, eggs, fish, shellfish and molluscs, and to a lesser extent, sesame seeds, soy, and wheat
Biting insects	▪ Bees, wasps, and ants
Drugs	▪ Antibiotics, acetylsalicylic acid (Aspirin), non-steroidal anti-inflammatories (NSAID), and intravenous contrast agents

4. Clinical Manifestations Associated With Anaphylactic Reactions

Training objectives and key points

- Recognize the signs and symptoms of a serious anaphylactic reaction
- Identify the factors that can influence the severity of an anaphylactic reaction
- Describe the secondary (biphasic) reaction

Anaphylactic reaction

Anaphylactic reactions are multisystemic in nature. The speed of the reaction may vary from one episode to another. **Anaphylactic reactions are unpredictable.**

Anaphylaxis is a severe allergic reaction affecting one or more systems of the human body. **It is not a localized reaction.**

Anaphylactic reactions usually occur within the first two hours of exposure to the trigger factor. Normally, the signs and symptoms develop quickly and reach maximum intensity within approximately 30 minutes[4]. Sometimes, the reaction occurs several hours after exposure. This is rare. In exceptional circumstances, cardiopulmonary arrest can occur during the first few minutes of the reaction[14].

Severity of the reaction

The faster the signs and symptoms appear, the more severe the reaction will be.

Anaphylactic reactions are unpredictable. The speed with which the signs and symptoms develop in the same person can vary significantly from one episode to another.

The main manifestations are associated with the respiratory, circulatory, and gastro-intestinal systems and the skin. The following table lists the main signs and symptoms of anaphylactic reactions.

SIGNS AND SYMPTOMS ASSOCIATED WITH ANAPHYLACTIC REACTIONS	
SYSTEM	**SIGNS AND SYMPTOMS**
Respiratory	▪ Dyspnea (difficult breathing), noisy breathing (stridor or wheezing), choking sensation, persistent cough, hoarseness, cyanosis, nasal congestion or hay fever-like symptoms, difficulty swallowing, change in crying among infants
Cardiovascular	▪ Rapid and weak pulse, paleness, diaphoresis (cold sweat), cyanosis, changes in consciousness, dizziness
Gastro-intestinal	▪ Nausea, abdominal pain or cramps, vomiting, diarrhoea
Skin	▪ Urticaria, itchiness, angiooedema, heat, redness, and rashes
Other signs and symptoms	▪ Anxiety, sense of distress, headache and, in women, uterine cramps

Generally speaking, the faster the signs and symptoms appear, the more severe the reaction will be[7].

Deaths associated with anaphylactic reactions are caused by respiratory distress (swelling and obstruction of the airways) or circulatory failure (shock).

The following table shows how frequently the signs and symptoms of anaphylaxis manifest themselves. It is important to note that none of these signs and symptoms are found in all situations. First aiders must therefore assess the status of the victim every time they are called into action to determine whether the victim is having an anaphylactic reaction.

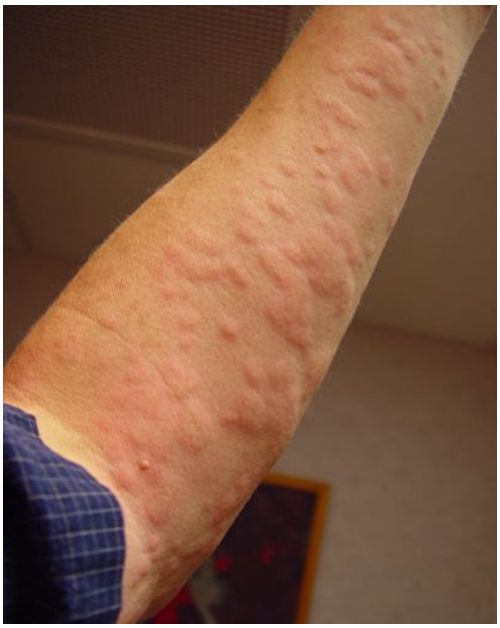
CLINICAL SIGNS AND SYMPTOMS	FREQUENCY (%)
▪ Urticaria and angiooedema	80 to 89
▪ Swelling of the upper airways	50 to 59
▪ Dyspnea and wheezing ▪ Severe erythema	40 to 49
▪ Dizziness, syncope, hypotension ▪ Nausea, vomiting, diarrhoea, abdominal cramps	30 to 39
▪ Headache ▪ Nasal discharge ▪ Chest pain ▪ Pruritis ▪ Convulsions	29 or less

A

Adapted from a table in American Family Physician, A Practical Guide to Anaphylaxis, 2003, p. 1326.

Headaches, nasal discharge, chest pain, and convulsions are non-specific symptoms that occasionally accompany serious anaphylactic reactions. Occurring on their own, they should not be considered as signs of anaphylaxis.

Signs of anaphylaxis



Urticaria

Source : http://www.4-men.org/images/hives.jpg

The severity of anaphylactic allergic reactions can vary depending on the quantity of allergen, the exposure pathway (injection vs. ingestion), and the number of repeat exposures to the allergen.

4.1 Biphasic reactions

In 5% to 23% of anaphylaxis cases, signs and symptoms reappear later on despite their decrease or disappearance after treatment[7]. Usually, the signs and symptoms of the second attack are similar to the first. This second reaction can take place anywhere from 1.8 to 28 hours after the initial one.

The literature shows that secondary reactions especially occur when there were delays in administering the epinephrine.

It is for this reason, among others, that victims of an anaphylactic reaction must quickly be administered epinephrine, and subsequently assessed by a doctor, even if their condition improves.

5 Treating Anaphylaxis With Epinephrine

Training objectives and key points

- List the effects of epinephrine
- Demonstrate the safe use of the auto-injector
- Select, based on the patient's weight, the appropriate dose
- Describe how to store the auto-injector
- Apply the five "Rs" for the administration of epinephrine

Epinephrine is the *first-line* drug for treating severe anaphylactic allergic reactions (anaphylaxis).

5.1 Pharmacology

Epinephrine is the drug of choice for treating anaphylaxis. The more quickly it is administered, the less severe the immediate allergic reaction will be.

The main effects of epinephrine are as follows :

THERAPEUTIC EFFECTS OF EPINEPHRINE (ADRENALIN)	
▪ Constricts arterioles of the skin (the largest organ in the human body) ▪ Increases the contraction force of the heart ▪ Increases the heart rate	**Increases blood pressure**
▪ Relaxes smooth muscles in the bronchial tubes	**Increases bronchial diameter**

It is important to know that epinephrine only provides temporary relief. Epinephrine has a half-life of five to ten minutes in the body. In other

words, after this period, only half of the drug remains to provide the desired effects. Because of the limited effect of adrenalin, the patient should be monitored closely for any deterioration in signs or symptoms or the reappearance of the allergic reaction. The first aider or an onlooker should call 9-1-1 as quickly as possible after administering epinephrine using an auto-injector.

The rapid administration of epinephrine can prevent death as well as biphasic reactions.[9] According to the literature, the prognostic is less favourable when epinephrine is used late (i.e., 30 to 60 minutes after the onset of the reaction).

Because of this, as soon as the first aider decides that the person is suffering from an anaphylactic reaction, he or she must immediately administer epinephrine.[3]

In many cases, when an anaphylactic reaction leads to death, epinephrine was either not administered or was given too late.[8]

In situations of anaphylaxis, there is no reason (contra-indication) not to administer epinephrine. On the other hand, when the situation is not clear, care must be taken when administering epinephrine to certain patients, notably the elderly and those known to have cardiovascular disease (angina, myocardial infarction). These patients have a higher risk of complications following the administration of epinephrine. However, when it is clear that an individual is suffering from an anaphylactic reaction, epinephrine should always be administered, even to these patients.

The most common side effects of epinephrine are palpitations, anxiety, tremors, nausea, vomiting, dizziness, sweating, fast heartbeat, and hypertension. Potential complications include arrhythmias (ventricular tachycardia, ventricular

fibrillation), angina, myocardial infarcts, and heart attack. These major complications are very rare with intramuscular injections.

5.2 Administration route, doses, and storage

5.2.1 Safety concerns regarding the use of auto-injectors

First aiders are authorized to administer epinephrine using auto-injectors. Auto-injectors are glass cartridges that look like a large pencil and that contain a pre-measured dose of drug. When the tip is pressed against the body (usually the thigh), the mechanism automatically triggers the release of the concealed needle and injects the drug. Once triggered, the needle remains exposed.

The risks related to the use of auto-injectors are mainly those associated with the first aider administering the dose.

Once the auto-injector has been used and the needle exposed, first aiders must take care not to prick themselves with the needle. While accidental contact with the soiled needle carries little risk, there still is potential for contamination.

To eliminate the risk of accidental injection, first aiders must immediately place the auto-injector securely in its case after administering the dose. Auto-injectors should never be thrown into the garbage can.

Contaminated auto-injectors in their cases should be given to the ambulance paramedics for safe disposal in the appropriate container.

Another potential danger of using auto-injectors is accidental injection of epinephrine into the thumb (or other finger) by the first aider. The

transmission of blood-borne diseases is not a major concern in this case because the needle is sterile.

Since epinephrine is a powerful vasoconstrictor, it can cause serious ischemia if injected into a finger. If ischemia persists, it can theoretically lead to necrosis and the loss of the finger. The affected finger quickly becomes white and cold.

When epinephrine is injected into a finger, the first aider must immediately go to a hospital with the patient to receive the appropriate treatment. If possible, the arm should be kept in a downward position and the finger covered with warm compresses.

5.2.2 Administration route

The EpiPen® and Twinject™ auto-injectors administer drugs intramuscularly. This is better than injecting a drug subcutaneously because it enables the epinephrine to enter the blood stream more quickly.

5.2.3 Doses

First aiders have to choose between two auto-injectors, depending on the weight of the patient. The paediatric auto-injector administers 0.15 mg of epinephrine intramuscularly while the adult version administers 0.30 mg.

While manufacturers do not recommend administering paediatric doses to children weighing less than 15 kg, Canadian recommendations (for pharmacists) recommend administering paediatric doses to children weighing up to 22 kg.

5.2.4 Storage

Auto-injectors must be stored in an accessible, unlocked location, for example, the first aid kit. In emergencies, they must be quickly accessible.

Based on the manufacturers' recommendations for ensuring the efficacy of the drug, auto-injectors must be stored under specific conditions.

Generally speaking, auto-injectors must be stored in their carrying cases at room temperature (20 to 25°C). During outings, however, epinephrine can tolerate temperatures ranging from 15°C to 30°C.

Auto-injectors must be kept from freezing (do not refrigerate) and in the dark. If the drug freezes, it must be replaced (according to the manufacturers' recommendations).

5.3 Using auto-injectors

Administering a drug involves certain responsibilities. When administering epinephrine, first aiders must verify the five "Rs":

- **Right patient**: First aiders must make sure that the inclusion criteria (symptoms of anaphylaxis) are present before administering epinephrine.

- **Right drug**: EpiPen® and Twinject™ auto-injectors only inject epinephrine (1:1,000[1]). First aiders must verify the expiry date of the auto-injectors and ensure that the drug is clear and contains no precipitate.

- **Right dose**: First aiders must choose the right auto-injector based on the patient's weight, **i.e**., 0.15 mg or 0.30 mg of epinephrine.

- **Right time**: As soon as the decision is taken to administer epinephrine, the first dose must be given immediately. A second dose may be given fifteen (15) minutes later if the symptoms persist.

- **Right Method (administration route)**: In the present context (auto-injectors), the epinephrine must be injected intramuscularly in the quadriceps (thigh). The detailed technique is described in Appendix.

[1] Epinephrine (adrenalin) 1:1000 is diluted by adding 1 part drug to 1,000 parts water.

6 Intervening in cases of anaphylaxis

Training objectives and key points

- Identify the patient who is to receive the epinephrine (inclusion criteria)
- Describe each step of the intervention protocol
- Determine whether a second dose must be administered
- List the clinical information that must be provided to ambulance paramedics
- Describe how asthma can exacerbate the anaphylactic reactions
- Use an auto-injector in situations involving severe allergic reactions (anaphylaxis)

6.1 Intervening in cases of anaphylaxis

When confronted with an anaphylactic reaction, first aiders must quickly identify the reaction and immediately administer epinephrine.

An English study reviewing 164 deaths caused by anaphylactic reactions reported that the average time between contact with the allergen and cardiopulmonary arrest in these cases was 30 minutes when the patients ingested the allergen, and 15 minutes in the case of venom.[14] The study noted that only 20% of these victims had been administered adrenalin prior to their deaths. This was due to one of two factors: lack of availability of the drug or lack of time to respond to a rapid, severe reaction.

It is important to understand that epinephrine is of no use in the event of cardiopulmonary arrest. The lack of effective blood circulation (under ideal conditions, cardiac massage provides approximately 25–30% of the normal blood flow) does not allow the drug to spread throughout the body.

To facilitate emergency interventions involving individuals with severe anaphylactic allergic reactions, the various steps have been divided into five groups:

- Providing primary care and first aid
- Identifying the inclusion criteria
- Administering epinephrine
- Providing first aid and monitoring the patient
- Taking the patient to a hospital

6.1.1 Providing primary care and first aid

First aiders must adopt a safety-first approach, including evaluating the environment and the risks for their own safety.

First aiders must also apply the principles of **universal protection**:

- Be especially careful in the presence of open wounds or with potentially infected persons.
- Wear gloves.
- When applicable, immediately and safely dispose of contaminated sharp objects.
- Wash hands thoroughly after the intervention.

If the patient is in an altered mental state, first aiders must take a **primary approach** by opening the airways, ensuring effective oxygenation (administer oxygen if available), and checking for signs of circulation.

In such situations, it is also important to move the patient as little as possible. Unless there are signs

of severe respiratory distress, when it is best to keep patients seated, patients should be rolled on their side in the recovery position.

If another first aider is present, **emergency medical services (911) must be called immediately**. Under exceptional circumstances, if the first aider is alone, he or she must administer epinephrine first before calling the emergency services.

6.1.2 Identifying severe anaphylactic allergic reactions

After the primary approach, first aiders must determine whether the patient is suffering from a severe anaphylactic allergic reaction. The first aider is faced with two possible situations; the patient is either known allergic/anaphylactic or is not.

Patients known to be allergic

First aiders must talk to the patient to know whether he or she has a history of anaphylactic reactions. If the patient is in an altered mental state, first aiders must ask close family members or friends, or check whether the patient is wearing a medical ID bracelet (e.g., MedicAlert®).

If the patient has a history of anaphylactic reactions, epinephrine must be administered using an auto-injector **at the first sign** of an allergic reaction when the patient has been or is suspected of having been in contact with an allergen.

The allergen does not have to be the same allergen that caused previous reactions.

Patients not known to be allergic

As mentioned above, it is possible that an individual may have an anaphylactic reaction with no previous history of such reactions.

In patients with no history of anaphylactic reactions, epinephrine can be administered when two conditions are present. First, the **causal agent** (stimulus that may have triggered the reaction) must be identified (or strongly suspected). The patient must have been in contact with the allergen in the 12 hours preceding the reaction. Second, the first aider must recognize the **signs and symptoms of a severe anaphylactic allergic reaction.**

In the case of causal agents, one of the following three factors is sufficient to administer epinephrine:

- **Respiratory distress**
  - Visibly difficult, laboured breathing
  - Wheezing
  - Cyanosis
- **Circulatory failure (shock)**
  - Syncope
  - Severe weakness
  - Diaphoresis
  - Tachycardia (rapid pulse)
  - Altered mental state

- **Visible oedema of the tongue**

The presence of skin lesions is not an inclusion criterion for the protocol since they may not occur during an anaphylactic shock.

There are no contra-indications (exclusion criteria) to the use of epinephrine in the case of severe allergic reactions (anaphylaxis).

If the causal agent has been identified or strongly suspected, and one of the three factors described above is present, first aiders must immediately administer epinephrine.

In certain situations, first aiders may be unable to identify the causal agent. Nevertheless, the environment or context may provide important information.

Example of a problematic scenario

You are a first aider in your workplace and you are called on to deal with a person in the cafeteria who is having serious difficulty breathing. When you arrive, you note that she has trouble answering questions and shows clears signs of respiratory distress. Her face is also swollen. Her colleagues tell you that she had begun her meal but you check and you eliminate choking as a possible explanation.

Reflections

In this scenario, it is hard for the first aider to get the information required to make a decision. However, in light of the signs of respiratory distress and the fact that the airways were not obstructed by a foreign body, it would be appropriate to administer epinephrine given the cutaneous symptoms (swollen face) and the mealtime context.

Context allergy-environment

- *Environment (restaurant, cafeteria)*

As mentioned above, if it is difficult to determine the causal agent and the patient shows signs of an anaphylactic reaction while eating (or has eaten within the preceding hour), contact with a causal agent may be suspected.

- *New drug*

Like with a recent meal, an anaphylactic reaction may appear when someone takes a new drug, even if the person is not known to be allergic to this drug.

- *Noisy breathing (not corrected by opening the airways) with unconsciousness*

When a person is unconscious and anaphylaxis is possible, the first aider must consider the possibility of an anaphylactic reaction when the patient's respiration remains noisy, even after her airways have been opened using the "head tilt – chin lift" technique.

- *Medical ID bracelet (e.g., MedicAlert®)*

Medical ID bracelets such as MedicAlert® provide vital information to first aiders when a patient is unable to speak or is unconscious.

6.1.3 Administering epinephrine

Once a severe allergic reaction (anaphylaxis) has been identified, epinephrine must be administered immediately.

The dose depends on the patient's weight. If the patient weighs **less than 25 kg**, **0.15 mg** must be administered. If he or she weighs **25 kg or more**, an adult dose (**0.30 mg**) must be administered.

Immediately after an injection, first aiders must **safely dispose of the auto-injector** to avoid accidentally stabbing themselves with a potentially contaminated needle.

First aiders must record the time the epinephrine was administered. This information will be important for all other responders who may be called on to help. It is thus vital that this information be given to the ambulance paramedics.

The time at which the first dose was administered will also enable you to re-evaluate the patient periodically in order to decide whether a second dose of epinephrine is needed.

6.1.4 First aid and monitoring

When epinephrine has been administered and the auto-injector has been safely discarded, first aiders must continue with first aid measures.

First, if alone, the first aider must **contact the pre-hospital emergency care service (911).** If two first aiders are present, one must simply make sure that the call has been correctly made.

If the patient's mental state is altered, first aiders must continue with **the primary approach (ABC)**.

If the first aiders have access to a source of oxygen, but have not yet given it, they must do so now, **at the highest concentration possible**.

First aiders must continue monitoring the patient's condition in order to decide whether a second dose of epinephrine is needed.

A second dose of epinephrine must be administered if the patient still has inclusion criteria fifteen (15) minutes after the first dose. There is no set maximum number of injections.

A different injection site should be used for each dose.

6.1.5 Transport to hospital

Even if the patient's condition has improved, he or she must **always** be taken to a hospital by ambulance for a medical evaluation. The unpredictable nature of anaphylactic reactions, biphasic reactions, and the administration of epinephrine are sufficient reason to justify a medical evaluation.

When the paramedics take charge of the patient, the first aiders must provide the following clinical information:

Clinical information <u>to give to the paramedics</u>

- **Inclusion criteria** (including the causal agent)
- **Number of injections and the dose administered**
- **Time** of administration
- **Changes** in signs and symptoms caused by the drug

6.2 Protocol

1. Safety evaluation

a. Evaluate the safety of the scene
b. Wear gloves

2. Primary approach and first aid

a. Is the patient conscious or unconscious?
b. **A-Airway**: Is the patient's airway open?
    i. Open the airways, if needed.
c. **B-Breathing**: Is the patient breathing?
    i. If so, deliver the highest concentration of oxygen if available.
    ii. If not, begin ventilating the patient.
d. **C-Circulation**: Does the patient present signs of circulation?
    i. If not, begin CPR*.
e. If a second first aider is present, call 911.
f. If the patient is unconscious, roll him/her on his/her side in the recovery position.

3. Identify the inclusion criteria

a. Patient known to be allergic/anaphylactic
    i. Recent contact with a known or suspected allergen AND
    ii. Showing the first signs of an allergic reaction
b. Patient not known to be allergic/anaphylactic
    i. Recent contact with a known or suspected allergen AND
    ii. One or more of the following situations
        - Respiratory distress
        - Circulatory failure
        - Visible oedema (swelling) of the tongue

4. Administer the appropriate dose of epinephrine, if indicated

a. Using the technique you have been taught (in the thigh)
b. Discard the auto-injector safely

5. Monitoring and first aid

a. Deliver oxygen at the highest concentration possible, if available.

b. Call emergency services (911), if the first aider is alone.

c. Monitor changes in signs and symptoms.

d. Re-evaluate the inclusion criteria every 15 minutes; if present, administer another dose of epinephrine.

6. Take to hospital

a. Give the ambulance paramedics the following information:

i. Inclusion criteria

ii. Number and doses administered

iii. Time administered

iv. Evolution of the patient

NOTE

* If the patient is having a heart attack, the epinephrine protocol should not be used.

Doses:

- Patient weighing less than 25 kg: Epinephrine 0.15 mg
- Patient weighing 25 kg or more: Epinephrine 0.30 mg

Maximum number of doses:

Administer epinephrine Q15 minutes for as long as the inclusion criteria are present and you have a supply of the drug.

6.3 Special situations

6.3.1 Asthma and anaphylaxis

People who have asthma and who have been diagnosed with anaphylaxis in the past are more likely to suffer from severe respiratory problems during an anaphylactic reaction.

When an anaphylactic reaction is suspected, but you are not sure whether it is just an asthma attack, you must administer epinephrine if the person meets the inclusion criteria for anaphylaxis.

6.3.2 Using other drugs

For severe anaphylactic allergic reactions, epinephrine remains the drug of choice. It is the only drug that can be administered by first aiders. The patient may wish to take another drug such as an antihistamine, a bronchodilator, or cortisone.

If an attending physician has prescribed the drug, the first aider must let the patient take it. It should be remembered that these drugs act on a single chemical receptor at a time. They are thus not as effective as epinephrine in treating anaphylaxis. **Priority should be given to epinephrine, which remains the first-line medication**.

6.3.3 Expired drug

If the only auto-injector available is past its expiry date, use it anyway because the drug will probably still retain some of its efficacy.

7 Glossary

Glossary 🕮

- **Angiooedema**: A localized swelling of subcutaneous tissues and mucosa caused by an increase in the permeability of capillaries.
- **Antibody**: Protein produced by plasmocytes in response to an antigen that attaches to the antigen to neutralize it.
- **Basophil granulocytes**: White blood cells (leucocytes) that contain histamine and cytokines; similar to mast cells (mastocytes).
- **Biphasic reaction**: Recurrence of signs and symptoms of anaphylaxis following the resolution of the crisis.
- **Cyanosis**: Blue coloration of the skin (extremities), tongue, and lips due to a lack of oxygen.
- **Diaphoresis**: Excessive cold sweating.
- **Histamine**: Natural amine found in mast cells and other cells throughout the body that, when released, causes dilation of the capillaries and contraction of smooth muscles.
- **Mast cells**: Immune cells that reside in several types of tissue; mast cells detect foreign cells and trigger a local inflammatory reaction against them; they are especially numerous in skin submucosal tissues in the airways and gastrointestinal tract.
- **Neutrophil granulocytes**: White blood cells with a multilobulated nucleus and intracytoplasmic granules that have no affinity for acid or basic stains.
- **Stridor**: High pitched (usually inspiratory) sound, secondary to upper airway obstruction.
- **Urticaria**: Skin condition characterized by raised red wheals that are generally raised and pruritic (itchy) and that can occur anywhere on the body.
- **Wheezing**: Audible, respiration described as a high-pitched, musical sound and caused by a narrowing or obstruction of the bronchioles.

8 Appendix I – Using and Storing EpiPen® and Twinject™ Auto-injectors

Training objectives and key points

- Learn how to administer the drug using both types of auto-injectors

8.1 Using the EpiPen®

Following are detailed instructions on how to use the EpiPen®.

1. Unscrew the yellow or green cap and remove the auto-injector from its storage tube.
2. Grasp the auto-injector with the black tip pointing downward.
3. Remove the grey safety release.
4. Hold the black tip against the outer thigh and jab firmly to activate the auto-injector. Hold in place for approximately 10 seconds, then remove.
5. Massage injection area for 10 seconds.

8.2 Using the Twinject™

STEP 1: PREPARING THE AUTO-INJECTOR

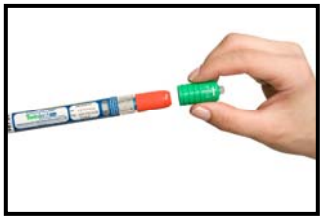
Check the Twinject 0.3 mg or Twinject 0.15 mg auto-injector regularly. The drug may not be effective if the solution is cloudy (contains particles), rose-coloured or a yellow that is darker than clear yellow, or the expiration date has passed.

In the event of a life-threatening allergic reaction, you should use an out-of-date auto-injector, if that is all you have.

Do NOT remove the GREEN caps until you are ready to use the Twinject.

STEP 2: FIRST DOSE

1. Pull off the **GREEN (1)** end cap. You will now see a RED tip. **Never put thumb, finger, or hand over the RED tip.**



2. Pull off the second **GREEN (2)** end cap.

3. Put the RED tip against the middle of the outer thigh (the needle can go through clothing).

4. Press down firmly until the mechanism is triggered. Hold in place while slowly counting to 10.

5. Remove the auto-injector from your thigh and check the RED tip. If the needle is exposed, you have received the dose. If not, repeat steps **3** and **4**.

NOTE : Only the first dose delivered by the Twinject can be used during the program. The regulation governing professional activities specifies that epinephrine must be administered using an auto-injector.

9 Appendix II – Course Outline

Treating individuals with severe anaphylactic allergic reactions

9.1 Course Introduction

An anaphylactic reaction is a sudden, severe allergic reaction to a stimulus that affects one or more bodily systems and is accompanied by multiple signs and symptoms. Without rapid intervention, the reaction can cause death due to circulatory failure or obstruction of the airways.

In fall 2006, the Office des professions du Québec tabled the *Regulation respecting Professional activities that may be engaged in within the framework of pre-hospital emergency services and care*. This regulation lists the professional acts that are normally carried out by physicians, but that may be performed in certain circumstances by ambulance paramedics, first responders, and designated members of the public.

Section 3 of the regulation stipulates the following: "*In the absence of a first responder or ambulance technician, any person having received training in the administration of adrenalin approved by the regional or national medical director of pre-hospital emergency services may administer adrenalin with an auto-injection device to a person in the case of an acute anaphylactic allergic reaction*."

This course is designed to teach first aiders how to recognize the symptoms of a serious anaphylactic allergic reaction and rapidly administer epinephrine using an auto-injector.

9.2 Prerequisites for the course

CPR training (infant, child, adult) with AED. Workplace first aiders only need to have adult CPR with AED.

9.3 Certificate validity period

3 years

9.4 Course duration

The suggested time for the course is four hours. Depending on the student/instructor ratio, this may be shortened so long as all aspects of the training, including the practical scenarios, are covered.

9.5 Student/instructor ratio

The suggested student/instructor ratio is 6:1. The maximum ratio should not exceed 12:1. The time allocated for the training session should be sufficient to cover all the course content, including all the practical scenarios.

9.6 Final training objectives

The goal of the training session is to allow first aiders to:

- Identify the trigger factors for anaphylactic reactions.
- Recognize the signs and symptoms of a serious anaphylactic allergic reaction.
- Apply the decision process for administering epinephrine.
- Safely and quickly administer adrenalin using an auto-injector.

9.7 Conduct of course

The time allocated for the course is four hours. The goal of the instructor is to have students learn the required skills. A continuous practical evaluation will be performed.

9.7.1 Course preparation

Prior to the training session, participants must read the PowerPoint summary and complete the pretest, which they must hand in at the start of the session. Ideally, participants should receive the documents at least two weeks in advance. They must also prepare their questions. The session is meant to be highly practical. By reading the material in advance, participants will allow the instructor to get to the case studies as quickly as possible.

9.7.2 Course Syllabus

Training objectives	Specific training objectives
▪ Introduce participants and trainers ▪ Describe the course and its goals and final objectives	
▪ Present first aider roles and responsibilities	
▪ Physiopathology of anaphylaxis	o Describe the phenomenon of sensitization o Describe the main stages of an anaphylactic reaction o Describe an anaphylactoid reaction
▪ Clinical manifestations of anaphylaxis	o Identify the bodily systems associated with anaphylactic reactions o List the main signs and symptoms associated with an anaphylactic reaction o Recognize a severe anaphylactic reaction
▪ List the trigger factors	o List the main trigger categories o List examples of trigger factors from each category
▪ Effect of adrenalin in an anaphylactic situation	o Describe the main effects of adrenalin o Identify the paediatric and adult dose
▪ Demonstration of auto-injectors (paediatric and adult)	o Recognize the auto-injectors (paediatric and adult) o Demonstrate safe auto-injector operation o Demonstrate safe disposal of used auto-injectors
▪ Present the clinical intervention protocol for first aiders	o List the factors that must be present to administer the drug (inclusion criteria) o Distinguish between the protocol for persons with a known history of severe allergic reactions and those without o Describe each step in the intervention protocol
▪ Practical application of the intervention protocol	o Apply the intervention protocol in a potential anaphylactic situation o Treat the person with signs and symptoms of an anaphylactic reaction

9.8 Evaluation grid

Continuous Practical Evaluation

Student's name: **Date:**

	Yes	No	Needs improvement
Safety	☐	☐	☐
ABC	☐	☐	☐
Oxygen (if available)	☐	☐	☐
Correct assessment of anaphylaxis	☐	☐	
Choice of proper dose	☐	☐	
Choice of proper injection site	☐	☐	
Administration technique OK	☐	☐	☐
Surveillance and repeat dose	☐	☐	☐
Call 911 at appropriate time	☐	☐	☐

Pass ☐ **Fail** ☐

Instructor:
Name: **Signature:**

NOTE: Completion of objectives must be evaluated in the course of practical work: each concept is evaluated separately.

FAIL = 1 "no" or 3 "needs improvement"

10 Appendix III – List of Drugs

List of commonly encountered nonsteroidal anti-inflammatory drugs (NSAID) and antibiotics

The names of the drugs on the left are their generic names, while the names on the right are those given by the pharmaceutical companies that manufacture them. The suffixes Apo-, Gen-, Novo-, Nu-, etc. refer to the pharmaceutical companies that produce the drugs. For example: Apo- refers to APOTEX.

This list is not exhaustive. Only the most commonly encountered drugs have been listed. The names of some companies have been omitted because the name of the drug is composed of the suffix and the generic name.

If a patient is known to be allergic to ASA, he or she must be considered as being allergic to all ASA derivatives and all NSAIDs.

If a patient is known to be allergic to an antibiotic, he or she must be considered as being allergic to all antibiotics in the same class.

1. NSAIDs

Salicylic acid derivatives

ASA (acetylsalicylic acid) – Aspirin
The following products contain ASA.

ASA
Aggrenox
Alka-seltzer
AAS
Asaphen
Aspirin
Entrophen
Fiorinal
Midal
Novasen
Percodan

	Ratio-oxycodon
	Robaxisal
	Trianal
	222
Diflunisal	Dolobid
Sulfasalazine	Salazopyrin

Other NSAIDs

Celecoxib	Celebrex
Diclofenac	Apo-Diclo
	Arthotec
	Novo-Difenac
	Voltaren
Etodolac	Apo-Etodolac
Flurbiprofen	Ansaid
	Froben
Ketolorac	Toradol
Ibuprofen	Advil
	Motrin
	Robax Platinum
Indomethacin	Apo-indomethacin
	Indocid
	Novo-methacin
	Nu-Indo
Naproxen	Anaprox
	Naprosyn
Meloxicam	Mobicox
Sulindac	Apo-sulin
	Novo-Sudac

2. Antibiotics

Cephalosporins

Cefaclor	Ceclor
Cefadroxil	Duricef

Cefixime	Suprax
Cefprozil	Cefzil
Cefuroxime	Ceftin
Cephalexin	Keflex
	Novo-Lexin

Macrolides

Azithromycin	Zithromax
	Z-pak
Clarithromycine	Biaxin
Erythromcyin	EES
	Eryc
	Novo-Rythro
	PCE
	Pediazole (Erythro + Sulfa)

Penicillins

Amoxicillin	Amoxil
	Novamoxin
	Clavulin (Amoxil + clavulinic acid)
Cloxacillin	Apo-Cloxi
	Novo-Cloxin
	Nu-Cloxi
Penicillin V	Apo-Pen VK
	Novo-Pen VK
Pivampicillin	Pondocillin

Quinolones

Ciprofloxacin	Cipro
Levofloxacin	Levaquin
Moxifloxacin	Avelox
Norfloxacin	Apo-Norflox
Ofloxacine	Floxin

Sulfonamides

Sulfamethoxazole + trimethoprim	Apo-Sulfatrim
	Bactrim
	Novo-Trimel
	Nu-Cotrimox
	Septra

Tetracyclines

Doxycycline	Doxycin
	Novo-doxilin
	Vibra-Tabs
Minocyline	Enca
	Minocin
Tetracyline	Apo-Tetra
	Nu-Tetra

Others

Clindamycin	Dalacin C
Metronidazole	Flagyl
Nitrofurantin	MacroBid
Nitrofurantoin	Macrodantin
Rifampine	Rifadin
	Rofact

11 Appendix IV - Forest Worker Program - Specifics

Background

The epinephrine administration program for forest workers was set up in the 1990s, even before the pre-hospital services program.

Regional public health teams composed of occupational health and safety nurses and physicians, in collaboration with the CSST, have run the program since its inception. Insect bites are the only causal agents that are taken into consideration in this program.

The program will have to be harmonized with the provisions of the new Regulation. However, the special context of forest workers must be taken into consideration when training is provided to them.

Specifics

When training is provided to forest workers, the following elements must be adapted to their particular situation:

- The definition of forest worker is as follows: The worker must be more than 30 minutes from emergency pre-hospital services.
- Forest workers are advised not to wear jewellery and thus do not wear MedicAlert bracelets. They are therefore encouraged to notify fellow workers of their medical status and allergies, if any.
- Since the pants worn by forest workers are thicker, for better protection against chain saw injuries, the needle of the auto-injector may not penetrate through to the muscle of the thigh. Because of this, the pants must be pulled down to inject the epinephrine into the bare thigh.
- The principles set out in the guide for evacuating and transporting injured forest workers must be followed when contacting emergency pre-hospital services (EMS); 911 must not be used to contact EMS.

12 References

Documents

Québec Food Allergy Association – Guide (French only)
Paramedic Textbook

Articles

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Web resources

Québec Food Allergy Association (AQAA) (www.aqaa.qc.ca) (French only)
Sécurité allergie (www.securit-allergie.ca/pages/default.asp) (French only)

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[2]Canadian Society of Allergy and Clinical Immunology (CSACI), *Anaphylaxis in Schools & Other Settings*

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[4]Regulation respecting the Professional activities that may be engaged in within the framework of pre-hospital emergency services and care (R.Q. c. C-26, r.155.7). Professional Code (R.S.Q. c. C-26), section 94, subsection h***

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