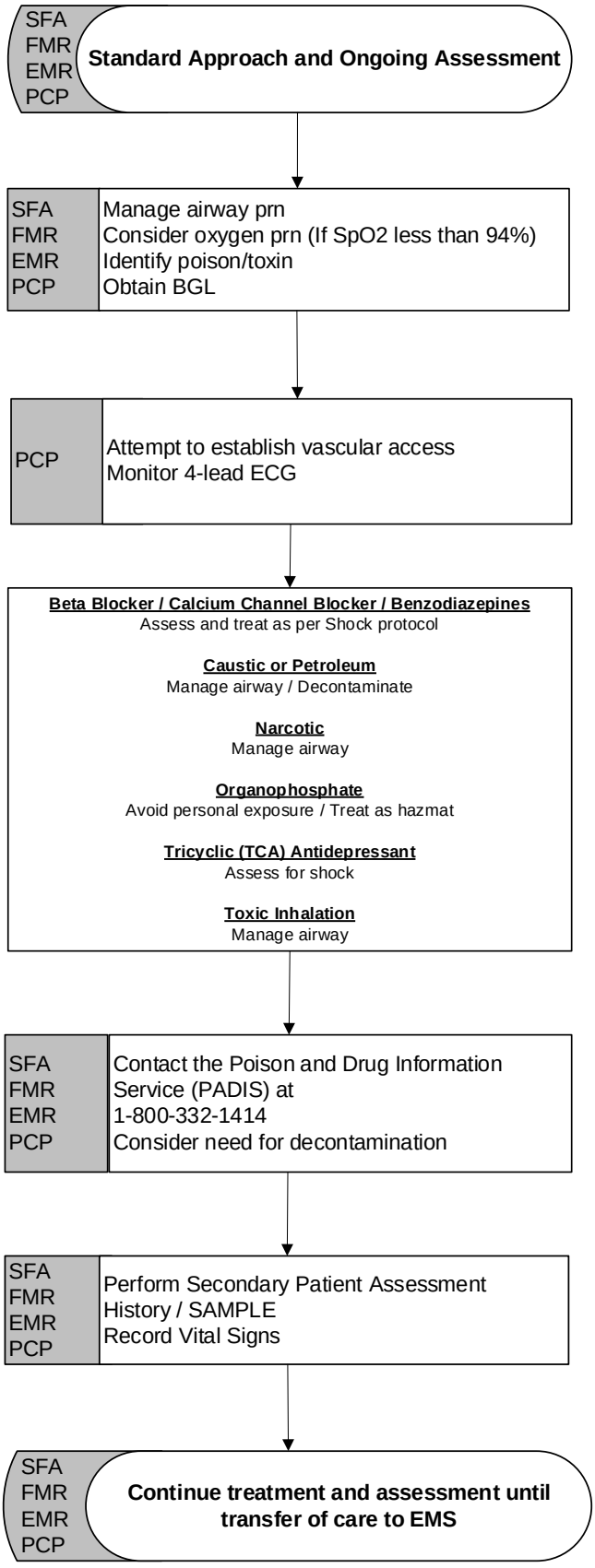
Poisoning


SFA FMR EMR PCP
Standard Approach and Ongoing Assessment
SFA FMR EMR PCP
Manage airway prn
Consider oxygen prn (If SpO2 less than 94%)
Identify poison/toxin
Obtain BGL
PCP
Attempt to establish vascular access
Monitor 4-lead ECG
Beta Blocker / Calcium Channel Blocker / Benzodiazepines
Assess and treat as per Shock protocol
Caustic or Petroleum
Manage airway / Decontaminate
Narcotic
Manage airway
Organophosphate
Avoid personal exposure / Treat as hazmat
Tricyclic (TCA) Antidepressant
Assess for shock
Toxic Inhalation
Manage airway
SFA FMR EMR PCP
Contact the Poison and Drug Information Service (PADIS) at 1-800-332-1414
Consider need for decontamination
SFA FMR EMR PCP
Perform Secondary Patient Assessment
History / SAMPLE
Record Vital Signs
SFA FMR EMR PCP
Continue treatment and assessment until transfer of care to EMS

Responding to poisonings in the MFR setting

In the setting of an unintentional or intentional poisoning, scene and personal safety of responders must be considered the first priority. If there is any uncertainty about the cause or mechanism of poisoning, take all PPE precautions. In settings of environmental poisonings such as H2S or carbon monoxide, always follow local Hazardous Materials (HAZMAT) protocols, including any that pertain to the use of a self-contained breathing apparatus (SCBA).

When approaching any poisoning scene, evaluate weather conditions and approach from upwind, if possible. Maintain a high degree of vigilance for anything unusual such as any dead birds or other animals in the observable vicinity, film or residue on windows or other surfaces, and any unusual odours.

It may be difficult to determine what the causative agent is. If you are able to determine the source of the poisoning, ensure other agencies responding (such as police and EMS) are notified early through your dispatch system. This may help agencies prepare for the call, including sourcing antidotes and having the correct PPE available. The following examples are some of the more commonly encountered poisonings, but not all.

Specialized paramedic response teams and other resources

Specialized paramedic response teams, such as AHS EMS Incident Response Paramedics (IRP) and Calgary Fire Department's Fire Response Paramedic consists of specially trained group of Advanced Care Paramedics who are skilled in the management of HAZMAT, Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) and Multiple Casualty Incidents (MCI) events across the province.

These teams are trained to assess and treat patients from these unique events while collaborating with other emergency services to ensure public and patient safety. Early reporting of the causative agent to dispatch will help ensure the timely dispatch of specialized paramedic resources, should one be available. If you have access to other local specialized HAZMAT response teams activate it for a co-response.

Types of poisoning

- Household plants – may have a variety of symptoms depending on route of exposure.
- Household chemicals or cleaners.
- Prescription medications, including beta-blockers and calcium channel blockers.
- Over-the-counter medications.
- Cyanide – used in warfare, but in North America, most commonly encountered from exposure to an indoor fire.
- Organophosphate poisoning – usually encountered when used as insecticides. First responders may have a high index of suspicion of organophosphate poisoning in agricultural settings with correlating symptoms.
- Narcotic/opioid poisoning - refer to Opiate Overdose MCP.

Beta Blocker / Calcium Channel Blocker Overdose

Although their mechanisms differ, both beta blockers and calcium channel blockers can have profound effects on the heart, therefore, circulation is the main focus in their treatment. Both classes of medications are typically prescribed to patients with cardiovascular history or those at risk of cardiovascular events. These medications work by lowering blood pressure and/or decreasing heart rate, which reduces the how hard the patient's heart must work.

Some common medication names in these classes include acebutolol (Sectral), atenolol (Tenormin), metoPROLOL (Lopressor), amLODIPine (Norvasc), diltiazem (Cardizem), niFEDipine (Adalat), and verapamil (Isoptin).

Circulation is the main focus in the treatment of beta blocker and calcium channel blocker toxicity. If qualified, cardiac monitoring and IV access are important interventions.

MFR interventions

1. Airway management as required.
2. Early notification of poisoning source to incoming EMS crew.
3. Continuous vital sign monitoring, including blood pressure, SP02, heart rate, respiration rate and when available, cardiac and end-tidal monitoring.
4. Initiate intravenous access, if qualified to do so.
5. If the patient is hypotensive, administer normal saline 20 mL/kg IV bolus prn, titrated to systolic BP 90 mmHg or greater or a MAP of 65 mmHg or greater, to a total maximum of 40 mL/kg.

Cyanide Poisoning

Cyanide is a deadly toxin that has a long history of use in chemical warfare, terrorism, homicide and suicide. Presently in North America, cyanide poisoning is most commonly encountered in individuals who have been exposed to enclosed space fires.

Cyanide is used in various industrial applications ranging from gold mining to healthcare. It is also produced as a by-product of combustion of certain plastics, wood, wool, silk and nylon. Due to the presence of these substances, most house fires will generate smoke containing high concentrations of hydrogen cyanide, carbon monoxide as well as several other chemicals. Historically, it was believed that carbon monoxide was the primary cause of smoke inhalation associated death. More recently, it has been discovered that cyanide toxicity may be an equally significant cause of death.

Cyanide toxicity occurs by preventing cells from utilizing available oxygen and acts as a cellular asphyxiant. This causes a state of cellular hypoxia even when normal or elevated oxygen levels are present. Due to their high oxygen demand, organs such as the brain and heart are typically most affected.

Signs and symptoms of cyanide poisoning can vary but early symptoms include tachypnea, tachycardia, palpitations, chest pain/tightness, headache, dizziness, nausea/vomiting and mydriasis. Late signs include hypoventilation, hypotension, altered mental status, cardiac arrhythmias, seizures and eventually cardiac arrest. The classic presentation includes early phase tachypnea and hyperpnea (due to ongoing metabolic acidosis) followed by a decreasing respiratory rate progressing to apnea.

The onset of symptoms may vary depending on the extent of the exposure but can be as little as one minute after inhalation and three minutes after ingestion.

Definitive diagnosis of cyanide poisoning is extremely difficult in the field. The decision to treat should be based on the presence of risk factors and presenting signs and symptoms. **If a patient has been exposed to smoke in an enclosed space or presents with soot around their nose and/or mouth, cyanide exposure should be suspected. Any symptomatic patient with a suspected exposure should be presumed to be experiencing acute cyanide toxicity and treated without delay.**

MFR Interventions

1. Remove the patient from the source if safe to do so and PPE is available.
2. Early identification of cyanide poisoning and administration of an antidote is an important contributing factor to survival; assess for signs and symptoms of cyanide poisoning and provide early notification to the incoming EMS crew through your dispatch system.
3. Administer 100% high flow oxygen to all patients suspected of cyanide poisoning, regardless of their SpO_2 and SpCO readings, since cyanide prevents the use of oxygen which leads to tissue and organ hypoxia.
4. Treatment of cyanide poisoning is aimed at preserving organ function and should include basic supportive management of respiratory function including adequate oxygenation, airway management and respiratory support as required, adequate hydration and cardiovascular support.
5. Treat clinical signs and symptoms concurrently with the appropriate MFR Medical Control Protocol.

Cyanide Antidote (Cyanokit)

1. The only cyanide poisoning antidote approved by Health Canada for administration is hydroxocobalamin which is distributed in cyanide antidote kits called Cyanokit.

2. Incident Response Paramedics (IRP) are the only Emergency Medical Services (EMS) vehicles that carry the cyanide antidote hydroxocobalamin; it **may** be available through a limited number of fire departments, industrial sites and research laboratories. The cyanide antidote kit provides all equipment, with the exception of normal saline, needed for administration.

Contamination Reduction (Decontamination)

Patients with suspected cyanide exposure should undergo contamination reduction once they have been removed from the source when it is safe to do so and using proper PPE. Airborne PPE, at a minimum for this patient population, is gloves, gown and N95. Request assistance from other hazardous materials units if available.

For patients suspected of contamination by airborne particulate and inhalation:

a. Remove all clothing from the contaminated patient due to clothes being permeated with cyanide and to minimize off-gassing.

For patients suspected of contamination with liquids or solids:

a. Remove all clothing from the contaminated patient.
b. Remove skin contaminants by showering and washing the patient when at the hospital.
c. Remove solid particles by gently brushing them off of the patient.

Organophosphate Overdose

Organophosphate compounds include herbicides and insecticides such as malathion and parathion as well as chemical warfare nerve agents such as sarin and VX. Additionally, you may encounter carbamates, which are also used as insecticides and herbicides and cause the same signs and symptoms as organophosphate poisonings. Common carbamate compounds include insecticides such as Carbofuran, Furadan, Carbaryl and polyurethanes such as Bisphenol-A.

These compounds work by blocking normal neurotransmission in the organs, glands and muscles of the affected patient(s). The blocked neurotransmission means that organs, glands, and muscles act continuously because they are unable to receive messages to halt biological mechanisms. This is why many of the symptoms include the excess production of bodily fluids such as mucous and tears (lacrimation). Poisoning by organophosphates and carbamates can lead to respiratory system failure, cardiovascular effects, paralysis of skeletal muscles, and overstimulation of the brain causing convulsions and death.

Signs and symptoms of organophosphate/carbamate poisoning develop rapidly (less than one minute to 60 minutes) after exposure and in order of appearance and severity include constricted pupils, running nose, excess salivation, chest tightness, muscle weakness, cramps and diarrhea, difficulty breathing and convulsions.

A useful mnemonic to remember these signs of toxicity is SLUDGEM/BBB:

- S Salivation
- L Lacrimation
- U Urination
- D Defecation
- G GI upset
- E Emesis
- M Miosis (pupil constriction)
- B Bronchorrhea
- B Bronchospasm
- B Bradycardia

Other chemicals such as cholinergics and cholinesterase inhibitors (e.g. nicotine, muscarinic/poisonous mushrooms, neostigmine, cevimeline) have similar effects on the nerve synapses. Treatment for these chemicals is the same as for organophosphates. These poisonings may include different signs and symptoms such as dilated pupils, tachycardia, high blood pressure, high blood glucose levels and

rapid, flickering contractions of the stomach muscles.

MFR Interventions

Contamination Reduction (Decontamination)
The priority in managing organophosphate exposures is to protect responders, the patient, and hospital staff from further harm by reducing the contamination as much as possible.

1. Request assistance from any hazardous materials units if available.
2. Provide early notification of the poisoning source to the incoming EMS crew.
3. Do not approach the patient until properly trained and equipped personnel are able to perform contamination reduction:
    a. Remove all clothing from the contaminated victim.
    b. Wash the victim with copious amounts of water; be sure to contain contaminated runoff.

Sympathomimetic Overdose

Sympathomimetics are stimulant drugs that mimic the effects of the sympathetic nervous system. First responders will most typically encounter these poisonings through street and prescription drug misuse. Examples include amphetamines (Benzedrine), methamphetamines (Meth, Crank, Desoxyn), cocaine, phencyclidine (PCP), caffeine, methylphenidate (Ritalin), MDMA (3,4-methylenedioxyamphetamine) and ephedrine (found in Ephedra). There are multiple street names used for sympathomimetics such as including beannies, pink hearts, side, rock and ice, among many others.

Some common signs and symptoms include high blood pressure, fast heart rate, euphoria, agitation, delusions paranoia, chest pain, seizures, dilated pupils, fever and overactive bodily reflexes. Without treatment, these poisonings can result in cardiac arrest. It is important to note that sympathomimetics can cause high body temperatures (hyperthermia, hyperpyrexia) as a result of the drug directly affecting the hypothalamus, the organ in the brain that regulates body temperature. These patients may escalate into a state of excited delirium.

The expanding consumption of highly caffeinated sports drinks and energy drinks may increase the incidence of sympathomimetic emergency responses and in different settings than responders might anticipate, such as sport competitions and recreational settings.

MFR Interventions

1. Remove the patient from a warm environment; activate the air conditioning in the back of the ambulance.
2. Spray the patient with cool water and promote evaporation using a fan or open window.
3. Apply ice packs to the groin, neck, and axilla; do not apply ice packs directly to the skin.
4. If available, cardiac monitoring and a 12-lead ECG are important due to the high risk of cardiac infarction and arrest.

Tricyclic Antidepressant (TCA) Overdose

Tricyclic antidepressants (TCAs) are used to treat depression, chronic pain, and to prophylactically treat migraines. They have a narrow therapeutic index which means that a relatively small increase in dose can cause toxic effects. Examples of TCAs include amitriptyline (Elavil), clomipRAMine (Anafranil), doxepin (Adapin / Sinequan), and imipramine (Tofranil).

Signs of TCA poisoning typically include sedation, but may also include confusion, delirium, or hallucinations. Rapid heartrate, low blood pressure, hyperthermia, flushing, dilated pupils and urinary retention are common signs and symptoms. Of note, patients with TCA poisoning can appear stable but deteriorate rapidly and significant toxicity can occur despite falsely reassuring ECG findings.

MFR Interventions

1. Obtain IV access.
2. If the patient is hypotensive, administer normal saline 20 mL/kg IV bolus prn, titrated to systolic BP 90 mmHg or greater Or Mean Arterial Pressure (MAP) 65 mmHg or greater, to a total maximum of 40 mL/kg.

If available, perform continuous cardiac monitoring.

Toxic Inhalation

Toxic inhalations occur when a patient has inhaled smoke or fumes which damage the lungs or poison the body. Chemicals that directly damage the lungs cause a chemical pneumonia. Other chemicals such as carbon monoxide and hydrogen sulphide enter the body via the respiratory system, but affect other organs.

Carbon monoxide (CO) is a colourless, odourless gas produced by the incomplete combustion of a material containing carbon. It has a much higher affinity for hemoglobin than oxygen, resulting in hypoxemia. The smaller the patient's body size, the greater the effect of CO. Signs and symptoms include headache, nausea, flushed skin, shortness of breath, altered level of consciousness, dizziness and chest pain.

Hydrogen sulphide (H_2S) is a colourless gas that can smell like rotten eggs. However, at higher concentrations it impairs the olfactory nerves and has no smell. H_2S is produced as a result of the bacterial breakdown of organic matter in the absence of oxygen and also occurs in natural gas (sour gas). H_2S blocks cellular respiration by preventing oxygen from binding in the mitochondria. Signs and symptoms include eye and respiratory irritation, shortness of breath, sudden collapse and cardiac arrest.

Hydrogen cyanide (HCN) is a colourless gas that can smell like bitter almonds, but often has no odour at all. It has many industrial uses and is also produced as a byproduct of combustion of certain plastics, wood, wool, silk and nylon. HCN blocks oxygen use in the mitochondria resulting in cellular hypoxia. Exposure should be suspected in anyone exposed to smoke in an enclosed space. Signs and symptoms include rapid heart and respiration rates, palpitations, chest pain/tightness, headache, dizziness, nausea/vomiting and dilated pupils. Late signs include hypoventilation, low blood pressure, altered level of consciousness, cardiac dysrhythmias, seizures and cardiac arrest.

It is important to note that carbon monoxide and cyanide poisoning can occur congruently in an enclosed space fire or combustion situation.

Inhalant abuse, also known as, ‘sniffing’, ‘huffing’ and/or ‘bagging’ is the use of legal household and industrial materials to achieve a state of euphoria and intoxication when inhaled. It is commonly used in adolescents of high school age due to its accessibility, low cost, and perception of being low risk. The following methods are most commonly used:

- Sniffing - sniffed from a container or a substance is sprayed onto a heated surface to enhance vaporization
- Huffing - inhaled from a saturated cloth held under the nose or near the mouth
- Bagging - bag placed over the mouth, nose or head

Inhalants are volatile substances that are highly lipid-soluble, readily absorbed across the pulmonary membrane and affect the central nervous system. Their effects begin within seconds and can last 15 - 45 minutes depending on how it is abused (concentration of the substance increases from sniffing to huffing to bagging).

Types of inhalants include butane, propane, air fresheners, glue, shoe polish, gasoline, lighter fluid, nitrous oxide, (propellant in whip cream canisters) and spray paint.

MFR Interventions

1. Ensure personal safety through the use of appropriate PPE.
2. Remove the patient from the source of poisoning.
3. Provide early notification to the incoming EMS crew through your dispatch, if appropriate.
4. Administer oxygen to all patients suspected of suffering a toxic inhalation regardless of their SpO_2 reading. CO bonds with hemoglobin forming carboxyhemoglobin which gives a false (high) reading on SpO_2 monitors.
5. Monitor SpCO levels (if available) in patients suspected of being exposed to CO; SpCO levels of greater than 5% are considered significant.
6. Treat the patient based on presentation, not on SpCO level.

CO ppm	Duration of exposure eExposure	Signs & Symptoms
200	2 – 3 hours	Mild headache, fatigue, nausea, dizziness
400	1 – 2 hours	Serious headache, other symptoms intensify Life-threatening if exposure greater than 3 hours
800	45 minutes	Dizziness, nausea, convulsions Unconscious within 2 hours, death within 2 – 3 hours
1600	20 minutes	Headache, dizziness, nausea Death within 1 hour
3200	5 – 10 minutes	Headache, dizziness, nausea Death within 1 hour
6400	1 – 2 minutes	Headache, dizziness, nausea Death within 25 – 30 minutes
12800	1 – 3 minutes	Death

SpCO %	Clinical Manifestations
0 – 4%	None – Normal
5 – 9%	Minor Headache
10 – 19%	Headache, Shortness of Breath
20 – 29%	Headache, Nausea, Dizziness, Fatigue
30 – 39%	Severe Headache, Vomiting, Vertigo, Altered Level of Consciousness
40 – 49%	Confusion, Syncope, Tachycardia
50 – 59%	Seizures, Shock, Apnea, Coma
60% and Up	Coma, Death

Koster LA, Rupp T. The Silent Killer, Recognizing and Treating Carbon Monoxide Poisoning. JEMS. October 2005

Patient Safety Considerations

- Torsades de pointes and other lethal dysrhythmias may initially present with generalized seizure activity
- Frequent reassessment of patients with known or suspected TCA overdose is essential, as their level of consciousness can change quickly

Important History Questions

It may help to gather some pertinent history about the patient. For example:

- What was the patient doing prior to feeling ill? Were they at work? Did they handle chemicals?
- If poisoning is suspected, what was the substance and route? How long was the patient exposed? Was anyone else exposed?
- There may be reluctance by bystanders or patients to speak about prescription misuse or illicit drug use. When asking for sensitive history, reassure the patient and bystanders that you are there to help, not to judge or create trouble.

Finding out any other pertinent medical history is important.

- Does the patient have any underlying medical conditions? Cardiovascular history may be very important to these patients.
- Has anything like this ever happened before?
- Some poisoning signs and symptoms can overlap with the signs and symptoms of anaphylaxis. Ensure history is taken regarding any severe allergies or possible allergenic exposures.

What to expect when the EMS crew arrives

The incoming crew will likely be very interested in history regarding the source and exposure route of the poisoning, as well as any trends in vital signs. If there has been significant change in vital signs, providing those signs with the time interval they were taken is helpful. Ensuring safety information is conveyed and received is paramount in any poisoning situation that has the potential to contaminate first responders.

If safe to do so, provide the crew with the poisoning source, such as the empty bottle of pills, or a photo of the chemical container.

Depending on the patient presentation and condition, advanced airway management and/or medications may be initiated or administered on scene before departure.

Alberta Poison and Drug Information Service (PADIS)

If the victim is breathing and conscious call the Poison Centre for additional directions at 1-800-332-1414.

The following information is taken from the Alberta Poison and Drug Information Service (PADIS) ©2015:

For poisons that are swallowed

Chemicals or household products
Have the container or label of the poison with you
Call the Poison Centre at 1-800-332-1414 and follow their instructions
DO NOT follow the treatment instructions on the container until you have checked with the Poison Centre.
DO NOT give salt water or mustard.
DO NOT put your finger down the throat of a poisoned person or make them vomit.

Medications
DO NOT give anything by mouth.
Have the container or label of the medication with you.
Call the Poison Centre at 1-800-332-1414.

Plants that are swallowed
Choking is the immediate concern when a child places a plant part in his/her mouth. If the child is gagging or choking, finger-sweep his/her mouth if you can see the object and remove any remaining parts of the plant.
Perform appropriate intervention if choking – refer to Obstructed Airway Protocol.
Gently wipe mouth and surrounding area with a wet cloth.
Check for irritation, swelling, discoloration, or difficulty in swallowing.
If the child has no difficulty swallowing, give half a glass of water or milk.
Call the Poison Centre at 1-800-332-1414.

DO NOT make the child vomit.
DO NOT wait for symptoms to appear. Symptoms can be delayed.

For poisons that are spilled on the skin
Ensure appropriate safety precautions and PPE.
Remove all soiled clothing.
Avoid getting poison on yourself.
Rinse the skin under running water for 15 minutes, then wash gently with soap and water and rinse again.

For poisons that are breathed in
Ensure appropriate safety precautions and PPE.
Consider breathing protection for the responder, i.e. self-contained breathing apparatus (SCBA) or a supplied air respirator (SAR).
Remember to consider the possibility of a poisonous gas if a person has collapsed in an enclosed space.
Move the victim into fresh air if you can do so without putting yourself in danger.
Open all doors and windows.
DO NOT breathe the fumes.
Call the Poison Centre at 1-800-332-1414.
If the person is not breathing, start artificial respiration.

For poisons that are splashed in the eye
Rinse the eye with lukewarm water for 15 minutes by pouring lukewarm water from a large glass 2 to 3 inches above the eye, or by standing in the shower. Avoid contaminating unaffected eye.
Have the person blink as often as possible while rinsing the eyes.
Call the Poison Centre at 1-800-332-1414.
DO NOT force the eyelids open.

For poisons that are injected (puncture or injection)
Apply gentle direct pressure if bleeding.
Clean the wound with soap and water.
Soak in warm water for 15 minutes.
Bandage.
Apply ice to reduce pain and swelling.
Call the Poison Centre at 1-800-332-1414.
Watch for signs of an allergic reaction or anaphylactic shock.