Part 14: First Aid

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Part 14: First Aid

The American Heart Association (AHA) and the American Red Cross (ARC) cofounded the National First Aid Science Advisory Board (Table) to review and evaluate the scientific literature on first aid. The goals of the National First Aid Science Advisory Board were to reduce morbidity and mortality due to emergency events and to analyze the scientific evidence that answers the following questions:

- What are the most common emergency conditions that lead to significant morbidity and mortality?
- In which of these emergency conditions can morbidity or mortality be reduced by the intervention of a first aid provider?
- How strong is the scientific evidence that interventions performed by a first aid provider are safe, effective, and feasible?

This critical review of the scientific literature resulted in a Consensus on Science for First Aid With Treatment Recommendations, from which these guidelines are derived.[1] The critical review and evaluation of the literature identified areas for future scientific research.

Background

From the perspective of the 21st century, the need for first aid training seems self-evident, but the history of organized first aid spans only 120 years. There is evidence, though, that Native Americans practiced first aid and taught it. For example, Sioux medicine men of the Bear Society were noted for treating battle injuries, fixing fractures, controlling bleeding, removing arrows, and using a sharp flint to cut around wounds and inflammations.[2]

Modern first aid evolved from military experience when surgeons taught soldiers how to splint and bandage battlefield wounds. Two British officers, Peter Shepherd and Francis Duncan, are said to have been the first to expand the concept to civilians and develop the first curriculum in first aid.[3] Training in first aid began in the United States in 1903 when Clara Barton, president of the ARC, formed a committee to establish instruction in first aid among the nation's industrial workers, where, under dangerous conditions, accidents and deaths were all too frequent. In 2000 the first evidence-based guidelines in first aid were developed by the AHA in collaboration with the International Liaison Committee on Resuscitation (ILCOR).[4] Many organizations have developed training programs in first aid.

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What Really Works in First Aid?

Members of the National First Aid Science Advisory Board reviewed morbidity data from the Centers for Disease Control and Prevention and first aid texts and reviewed published studies to identify and evaluate the scientific basis for first aid recommendations. Previous studies[5–7] have noted the paucity of scientific evidence to support many interventions in prehospital emergency care. Many first aid practices rest on an equally precarious scientific foundation. The information presented here represents a consensus of evaluation of the evidence on common first aid interventions.

Definition of First Aid

The National First Aid Science Advisory Board defined first aid as assessments and interventions that can be performed by a bystander (or by the victim) with minimal or no medical equipment. A first aid provider is defined as someone with formal training in first aid, emergency care, or medicine who provides first aid. First aid assessments and interventions should be medically sound and based on scientific evidence or, in the absence of such evidence, on expert consensus. Administration of first aid must not delay activation of the emergency medical services (EMS) system or other medical assistance when required. The board recognizes that certain conditions that can be treated with first aid may not require EMS involvement or assistance by other medical professionals. The National First Aid Science Advisory Board strongly believes that education in first aid should be universal: everyone can learn first aid and everyone should.

The National First Aid Science Advisory Board recognized that the scope of first aid is not purely scientific and is related to both training and regulatory issues. The definition of scope is therefore variable, and it should be defined according to circumstances, need, and regulatory requirements.

These 2005 First Aid Guidelines differ from the recommendations in the First Aid section in the *ECC Guidelines 2000* in the increased number of topics, the inclusion of representatives from many organizations involved with First Aid education in discussions leading to the guidelines, and the cosponsorship by the AHA and ARC. An important byproduct of these discussions is to again emphasize the paucity of evidence to guide first aid interventions. Very little research is being conducted in first aid, and many of the following recommendations have had to be made by extrapolation from the experience of healthcare professionals. It is important to recognize the limitations of the evidence so that research can be undertaken and future guidelines can be based on a larger body of scientific evidence.

Calling for Help

The single most important information for a first aid provider is to know how to get help. Rescuers should learn how and when to access the EMS system, how to activate the on-site

Organizations Represented on the National First Aid Science Advisory Board

American Academy of Orthopaedic Surgeons
American Academy of Pediatrics
American Association of Poison Control Centers
American Burn Association
American College of Emergency Physicians
American College of Occupational and Environmental Medicine
American College of Surgeons
American Heart Association
The American Pediatric Surgical Association
American Red Cross
American Safety and Health Institute
Army Medical Command
Australian Resuscitation Council
Canadian Red Cross
International Association of Fire Chiefs
International Association of Fire Fighters
Medic First Aid International
Military Training Network
National Association of EMS Educators
National Association of EMS Physicians
National Association of EMTs
National Safety Council
Occupational Safety and Health Administration
Save a Life Foundation

emergency response plan (ERP), and how to contact the Poison Control Center (see below).

Positioning the Victim

As a general rule, a victim should not be moved, but there are times when you should do so:

- If the area is unsafe for you or the victim, move the victim to a safe location.
- If the victim is face down and needs CPR, turn the victim face up.
- If the victim is unresponsive, has an open airway, and is breathing spontaneously, turn the victim onto his or her side (recovery position) with the victim's hand in front (Class IIb; LOE 7[8,9]). Be aware of the potential for nerve and vessel injury if the victim lies on one arm for a prolonged period; it may be necessary to roll the victim to the other side (Class Indeterminate; LOE 7[8,9]).
- If you suspect that the victim might have a spinal injury, it is best not to move the victim. If the injured victim is unresponsive and has difficulty breathing because of copious secretions or vomiting, or if you are alone and have to leave the victim to get help, place the victim in a modified HAINES recovery position by extending one of the victim's arms above the head and rolling the body to the side so that the victim's head rests on the extended arm. Bend both legs to stabilize the victim (Class IIb; LOE 7[8,9]).

Oxygen

There is insufficient evidence to recommend for or against the use of oxygen by a first aid provider (Class Indeterminate), and concern exists that oxygen administration may delay other interventions.

Medical Emergencies

Breathing Difficulties

The incidence of acute asthma is increasing, especially in urban populations.[10] Many victims with asthma have and can self-administer bronchodilator medication.[11–14] Inhaled bronchodilator medications are safe with few untoward effects. First aid providers may assist the victim in using prescribed bronchodilator medication (Class IIb; LOE 4 studies[11–14] extrapolated to first aid = LOE 7). They are not expected to make a diagnosis, but they can assist the victim under the following conditions:

- The victim states that he or she is having an asthma attack and has medications or an inhaler.
- The victim identifies the medication and is unable to administer it without assistance.[12]

Anaphylaxis

Allergies are relatively common, but only a small proportion of people with allergies develop anaphylactic reactions. An anaphylactic reaction is characterized by swelling, especially of the face, breathing difficulty, shock, and even death. Many people with a history of anaphylaxis carry a lifesaving epinephrine auto-injector. With proper training, parents can be taught to correctly use the auto-injector to administer epinephrine to their child.[15] Unfortunately all too often neither the victim nor family members know how to use an auto-injector correctly.[16–18] First aid providers should be familiar with the epinephrine auto-injector so that they can help someone having an anaphylactic reaction self-administer the epinephrine. First aid providers should be able to administer the auto-injector if the victim is unable to do so, provided that the medication has been prescribed by a physician and state law permits (Class IIb; LOE 7[15]).

Seizures

The general principles of first aid management of seizures are to (1) prevent injury, (2) ensure an open airway, and (3) ensure that the airway remains open after the seizure has ended.

The victim of a seizure must be protected from injury. Protect the head with a pillow or other soft material. Do not restrain the victim during a seizure or place any object in the victim's mouth. Restraining the victim may cause musculoskeletal or soft-tissue injury. Placing an object in the victim's mouth is futile because most tongue biting occurs at the onset of seizure activity and attempts to insert an object may cause dental damage or aspiration or may injure the rescuer's fingers.

To prevent aspiration of secretions and maintain an open airway, place the victim in a recovery position after the seizure stops. It is not unusual for the victim to be unresponsive or confused for a short time after a seizure.

Injury Emergencies

Bleeding

Control of bleeding is one of the few actions by which you can critically influence outcome. Control external bleeding by applying pressure over the bleeding area until bleeding stops or EMS rescuers arrive (Class IIb; LOE 4[19]; 5[20]; 6[21]; 7 [extrapolated from LOE 1 and 2 in the cardiac catheterization laboratory][22–25]). The important factors in successful control of bleeding are to apply pressure firmly and for a long time. Methods of applying pressure include

- Manual pressure on gauze or other cloth placed over the bleeding source.[22–25] If bleeding continues, do not remove the gauze; add more gauze on top and apply more pressure.
- An elastic bandage firmly wrapped over gauze[20] to hold it in place with pressure.

The effectiveness, feasibility, and safety of tourniquets to control bleeding by first aid providers are unknown, but the use of tourniquets is potentially dangerous (Class Indeterminate). Tourniquets are routinely used in the operating room under controlled conditions and have been effective in controlling bleeding from an extremity,[26] but potential undesired effects include temporary[27] or permanent[28] injury to the underlying nerves and muscles,[29] as well as systemic complications resulting from limb ischemia,[30] including acidemia, hyperkalemia, arrhythmias, shock, limb loss, and death. Complications are related to tourniquet pressure[31] and occlusion time.[32] Pressure has been found to be superior to tourniquets in controlling bleeding,[19] although tourniquets may be useful under some unique conditions (eg, the battlefield, when rapid evacuation is required and ischemic time is carefully monitored). The method of application and the best design of tourniquets are under investigation.[33]

There is insufficient evidence to recommend for or against the first aid use of pressure points or extremity elevation to control hemorrhage (Class Indeterminate). The efficacy, feasibility, and safety of pressure points to control bleeding have never been subjected to study, and there have been no published studies to determine if elevation of a bleeding extremity helps in bleeding control or causes harm. Using these unproven procedures has the potential to compromise the proven intervention of direct pressure.

Wounds and Abrasions

Irrigate wounds and abrasions with clean running tap water (Class IIa; LOE 1[34]; 2[35,36]; 7[37–39]) for ≥5 minutes or until there appears to be no foreign matter in the wound. If running water is unavailable, use any source of clean water. Wounds heal better and with less infection if an antibiotic ointment or cream is used (Class IIa; LOE 1[40,41]; and evidence extrapolated from LOE 2 studies to first aid = LOE 7[42–45]); triple antibiotic ointment appears to be superior to single antibiotic ointment or cream (Class IIb; LOE 1[41]). Apply antibiotic ointment or cream only if the victim's wound is an abrasion or is superficial.

Burns

Thermal Burns

Cool thermal burns with cold water as soon as possible[46,47] (Class IIa; LOE 3[48]; 4[49]; 5[50–52]; 6[46]) and continue at least until pain is relieved.[53] Cooling reduces the injury and relieves pain.[48–52] There is some evidence that brief cooling of small burns with ice water may be effective (LOE 5),[53,54] but direct application of ice to a burn may produce tissue ischemia,[55,56] and prolonged cold exposure even of small burns can lead to further injury.[52,55,57] Avoid cooling of burns with ice or ice water for longer than 10 minutes, especially if the burn is large (>20% of body surface area) (Class III; LOE 6[58]).

Burn Blisters

Loosely cover burn blisters with a sterile dressing but leave them intact (Class IIb; LOE 5[59]; 6[60–62]).

Electrocution and Electrical Burns

The severity of electrical injuries can vary widely, from an unpleasant tingling sensation caused by low-intensity current to thermal burns, cardiopulmonary arrest, and death. Thermal burns may result from burning clothing that is in contact with the skin or from electric current traversing a portion of the body. When current transverses the body, thermal burns may be present at the points where the current entered and exited the body and internally along its pathway. Cardiopulmonary arrest is the primary cause of immediate death from electrocution.[63] Cardiac arrhythmias, including ventricular fibrillation, ventricular asystole, and ventricular tachycardia that progresses to ventricular fibrillation, may result from exposure to low- or high-voltage current.[64] Respiratory arrest may result from electrical injury to the respiratory center in the brain or from tetanic contractions or paralysis of respiratory muscles.

Do not place yourself in danger by touching an electrocuted victim while the power is on. Turn off the power at its source; at home the switch is usually near the fuse box. In case of high-voltage electrocution, such as that caused by fallen power lines, immediately notify the appropriate authorities (ie, 911, fire department, etc). All materials will conduct electricity if the voltage is high enough, so do not enter the area around the victim or try to remove wires or other materials with any object, including wooden ones, until the power has been turned off by knowledgeable personnel.

Once the power is off, assess the victim, who may need CPR, defibrillation, and treatment for shock and thermal burns. All victims of electric shock require medical assessment because the extent of injury may not be apparent.

Spine Stabilization

There is an approximately 2% risk of injury to the cervical spine after blunt trauma that is serious enough to require spinal imaging in an emergency department,[65,66] and this risk is tripled in patients with craniofacial injury[67] or a Glasgow Coma Scale score of <8.[68] Most victims with spinal injuries are males between the ages of 10 and 30 years. Motor vehicles cause approximately half of the injuries; the remainder are caused by falls (especially from a height or diving), sports, and assaults.[69] A victim with a spinal injury has an increased risk of permanent neurologic damage, including quadriplegia from a secondary spinal cord injury.[70,71] First aid rescuers may not be able to conclusively identify a victim with a spinal injury, but they should suspect spinal injury if an injured victim.[66,72–75]

- Is involved in a motor vehicle, motorized cycle, or bicycle crash as an occupant, rider, or pedestrian
- Is injured as a result of a fall from greater than a standing height
- Complains of neck or back pain, tingling in the extremities, or weakness
- Is not fully alert
- Appears to be intoxicated
- Appears frail or >65 years of age
- Has a head or neck injury

In these situations or any situation in which you suspect a possible spinal injury, manually stabilize the head so that the head, neck, and spine do not move and are kept in line (Class IIa; LOE 3[65]; 7 [extrapolated from healthcare provider literature][66,73]). Do not use any immobilization devices because their benefit in first aid has not been proven[76] and may be harmful (Class III; LOE 4[77]; 6[71]; 7[78]). Immobilization devices may be needed in special circumstances when immediate extrication (ie, rescue of drowning victim) is required. First aid providers should be trained in the proper use of these devices before using them.

Musculoskeletal Trauma: Sprains, Strains, Contusions, and Fractures

Soft-tissue injuries include joint sprains and muscle contusions. Apply cold to soft-tissue injuries (Class IIa; LOE 2[79]; 6[80]; 7[81]). Cold application decreases hemorrhage, edema, pain, and disability.[79,81–83] Cooling is best accomplished with a plastic bag or damp cloth filled with a cooling modality that undergoes a phase change (eg, ice).[84] Refreezable gel packs are not as good as ice.[80,85] To prevent cold injury, limit each application of cold to periods ≤20 minutes and place a barrier, such as a thin towel, between the cold container and the skin.[86,87]

There is insufficient evidence to recommend for or against the use of a compression bandage to reduce edema following a closed soft-tissue injury such as a joint sprain (Class Indeterminate).

Assume that any injury to an extremity includes a bone fracture. Cover open wounds with a dressing if one is available. Do not move or straighten an injured extremity. If you are far from definitive health care, you may stabilize the extremity in the position found. If an injured extremity is blue or extremely pale, activate EMS immediately because this could be a medical emergency.

A victim with an injured lower extremity should not bear weight until advised by definitive health care.

Dental Injuries

Traumatic dental injuries are common. The first aid for dental injuries:

- Handle the tooth by the crown, not the root (do not handle the part that was embedded in the gum).
- Clean bleeding wounds with saline solution or tap water.
- Stop bleeding by applying pressure with a piece of cotton for 5 minutes.
- If there is an avulsed tooth, rinse it in water (do not scrub it), place it in milk, and bring it with you and consult a dentist as quickly as possible (Class IIa).[88–91]
- If there are other dental injuries, consult a dentist.

Environmental Emergencies

Snakebite

Do not apply suction as first aid for snakebite (Class III; LOE 5[92]; 6[93,94]). Suction does remove some venom,[92,94] but the amount is very small,[95] suction has no clinical benefit, and it may aggravate the injury.[96]

In case of an elapid (eg, coral) snakebite, wrap a bandage snugly (comfortably tight but loose enough to slip or fit a finger under it) around the entire length of the bitten extremity, immobilize the extremity, and get definitive medical help as rapidly as possible (Class IIa; LOE 3[97]; 6[98–100]). Wrapping the extremity slows dissemination of venom by slowing lymph flow.[97–101] There is a paucity of studies evaluating whether pressure and immobilization bandage are effective in bites by nonelapid snakes.

Cold Emergencies

Hypothermia

Hypothermia is caused by exposure to cold. The urgency of treatment depends on the length of exposure and the victim's body temperature. Immediately begin rewarming a victim of hypothermia (Class IIa; LOE 2[102,103]; 5[104–108]; 8[109,110]). Move the victim to a warm environment, remove wet clothing, and wrap all exposed body surfaces with anything at hand, including blankets, clothing, newspapers, etc. If you are far from definitive health care, you may begin active rewarming for a victim of hypothermia (Class IIb; LOE 2[102,103]; 8[109,110]). For example, active rewarming may be achieved by placing the victim near a heat source and placing containers of warm, but not hot, water in contact with the skin. Active rewarming should not delay definitive care.

Frostbite

Frostbite usually affects an exposed extremity. In case of frostbite, remove wet clothing and make sure the victim does not develop hypothermia. Get the victim to a medical facility as rapidly as possible. Do not try to rewarm the frostbite if there is any chance that it might refreeze or if you are close to a medical facility. If you are in a remote area far from a medical facility, you may slowly rewarm the frostbite using warm water (100°F to 105°F) (Class Indeterminate).

Drowning

Drowning is a major cause of unintentional death. It can be prevented with isolation fencing around swimming pools (gates should be self-closing and self-latching),[111] wearing personal flotation devices (life jackets) while in, around, or on water, and never swimming alone.

Outcome following drowning depends on the duration of the submersion, the water temperature, and how promptly CPR is started.[112,113] Case reports have documented intact neurologic survival in small children following prolonged submersion in icy waters.[114,115] Remove the victim rapidly and safely from the water, but do not place yourself in danger.

If you have special training, you can start rescue breathing while the victim is still in the water[116] if it does not delay removing the victim from the water. There is no evidence that water acts as an obstructive foreign body, so don't waste time trying to remove it. Start CPR with 2 effective ventilations and continue with 5 cycles (about 2 minutes) of chest compressions and ventilations before activating EMS. If 2 rescuers are present, send the second rescuer to activate EMS immediately.

Poison Emergencies

Poison Control Centers

There are a large number of poisonous substances in the home and worksite. It is important to understand the toxic nature of the chemical substances in your environment and the proper protective equipment and emergency procedures in case of toxic exposure. The Poison Control Center (800-222-1222) is an excellent resource for treating ingestion of, or exposure to, a potential poison. Inform the Poison Control Center of the nature of the exposure, the time of exposure, and the name of the product or toxic substance.

Chemical Burns

Brush powdered chemicals off the skin with a gloved hand or piece of cloth. Remove all contaminated clothing and make sure not to contaminate yourself in the process. In case of an acid or alkali exposure to the skin[117–123] or eye,[124–129] immediately irrigate the affected area with copious amounts of water (Class I; LOE 4[117]; 6[124–127]).

Ingested Poisons

Milk or Water

Do not administer anything by mouth unless advised to do so by a poison control center (Class IIb).

Animal studies[130,131] suggest that dilution or neutralization of a caustic agent by water or milk reduces tissue injury, but no human studies have shown a clinical benefit, and the possibility of emesis with aspiration must be considered (Class Indeterminate).

Activated Charcoal

There is insufficient evidence to recommend for or against the use of activated charcoal as first aid for ingestions (Class Indeterminate). Until more definitive evidence becomes available, do not administer activated charcoal unless you have been advised to do so by a poison control center.[132] Activated charcoal is effective for adsorbing toxins, but there is no evidence that charcoal administered by a first aid provider improves outcome.[133] Many children will not take the recommended dose (LOE 3[134]) and there are reports of harm.[135–137]

Ipecac

Do not administer syrup of ipecac for ingestions (Class III; LOE 2[138–141]; 4[142]; 7[132,143]). There are several problems with ipecac. These include questions about the amount of poison removed,[144–147] longer lengths of stay in the emergency department,[138] and lack of evidence that it improves outcome.[139,140,142] Side effects include lethargy[138,148] and the potential hazard of aspiration during emesis.[141] Syrup of ipecac is contraindicated in hydrocarbon or corrosive substance ingestion.

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