

Part 5: New Guidelines for First Aid

Background

Since their initial publication in 1974,¹ the Guidelines on Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC) have earned the reputation of an authoritative document. The reputation of the guidelines has been enhanced by the gradual move toward evidence-based recommendations, which provide information about the strength of the scientific evidence behind each recommendation. If the scientific basis for a recommendation is weak and based mainly on accepted practice, it is hoped that the clear indication of a paucity of scientific evidence will stimulate research.

The initial impetus for the ECC Guidelines was resuscitation of the victim of a cardiac event. It immediately became evident that in emergency situations it was not always clear which events were cardiac in origin. Furthermore, many emergency events, if left unattended, would eventually become cardiac events. Recommendations for the immediate care of the choking victim, the so-called “café coronary,” were added, as were sections on special situations, such as lightning strike and near-drowning, in which CPR recommendations were applicable. Tentatively in 1980² and more definitively in 1986,³ guidelines were developed for resuscitation of infants, children, and neonates in the delivery room. The development of pediatric guidelines necessitated expanding the scope of the guidelines into such areas as injury prevention, asphyxia, shock, and respiratory failure.

As early as the 1960s⁴ and as recently as 1999,⁵ Peter Safar called for extending ECC educational programs into what he calls “life-supporting first aid,” the few simple measures that are crucial for making a difference in the patient’s immediate survival while awaiting professional help.

In 1999 the American Heart Association introduced the Heartsaver FACTS Course, which combined a first aid course developed by the National Safety Council with the AHA course on automated external defibrillators (AEDs) and CPR.⁶ Organizations in other countries, such as St John Ambulance and the British Red Cross, have developed courses with similar goals.

A task force on first aid* was appointed in October 1999 to develop evidence-based guidelines for first aid. Its purpose is to ensure consistency with the AHA practice of offering courses developed from guidelines that are based on evidence. Since 1992 it has been the goal of various worldwide resuscitation organizations to make the guidelines international in scope. Task forces have worked to reconcile differences⁷ and have collaborated in the preparation of the

International Guidelines 2000, including these first aid recommendations. The goals of the first aid task force 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 will morbidity or mortality be reduced by the intervention of a trained lay rescuer?
- How strong is the scientific evidence showing that interventions performed by a lay rescuer are both safe and effective?

The task force defined first aid as assessments and interventions that can be performed by a bystander with minimal equipment until appropriate medical personnel arrive. Administration of first aid must never delay activation of the EMS system or other medical or professional assistance. The task force strongly believes that education in first aid should be universal: everyone can learn first aid and everyone should.

The task force initially addressed emergencies in adults, including those at the worksite, where the availability of personnel trained in first aid is mandated. The Occupational Safety and Health Administration^{8,9} requires that “at least one person, and preferably two or more, trained in first aid, must be available at the worksite. In areas where accidents resulting in suffocation, severe bleeding, or other life-threatening injury or illness can be expected, a 3- to 4-minute response time, from time of injury to time of administering first aid, is required. In other circumstances, ie, where a life-threatening injury is an unlikely outcome of an accident, a 15-minute response time is acceptable. If an employer can take employees to an infirmary, clinic, or hospital, or if outside emergency assistance can arrive within the allotted times, the employer is not required to train employees in first aid.” Most countries have standards of first aid for the workplace (employment legislation) and organizations that train personnel in first aid.

A number of organizations, including the American Red Cross,¹⁰ the National Safety Council,¹¹ the National Highway Traffic Safety Administration of the US Department of Transportation,¹² and St John Ambulance,¹³ have developed first aid curricula and courses. In Europe and Australia, similar organizations provide first aid training based on

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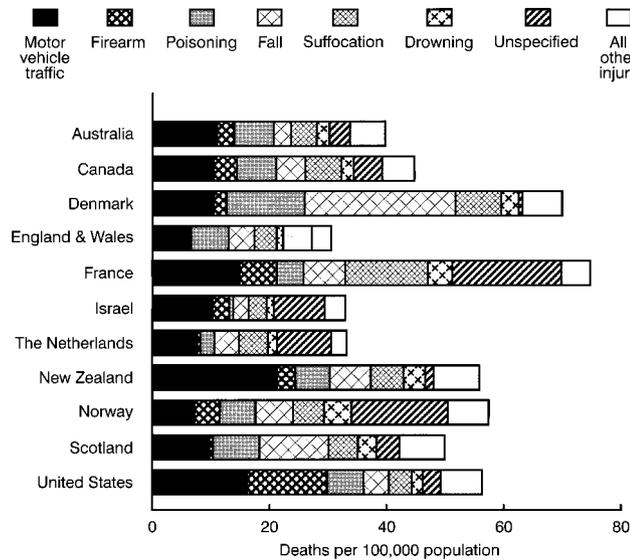


Figure 1. Average annual injury-related death rates by mechanism for 11 countries.²¹

locally developed national protocols. The previous first aid guidelines,¹⁴ however, were developed as a consensus document. It is hoped that this document will become the foundation on which future evidence-based guidelines for first aid are built.

The Evidence: What Really Works in First Aid?

The task force consulted first aid texts and performed a thorough review of published studies to identify, evaluate, and classify the scientific basis for first aid recommendations. Previous studies¹⁵⁻¹⁷ 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 resuscitation councils that developed the International Guidelines 2000 used a

“class of recommendations” scheme to indicate the evidence supporting each recommendation (see “Part 1: Introduction”). Most of the evidence supporting the value of first aid assessment and management was found to be in Levels 6, 7, and 8, namely, astute clinical observations, extrapolations from other data sources, and common sense.

Scope of the Problem

Unintentional injury continues to be a major cause of morbidity and mortality. It is the fifth leading cause of death (92 000 in 1998) in the United States, exceeded only by heart disease, cancer, stroke, and chronic obstructive lung disease. Injuries in the United States are responsible for approximately 2.6 million people being hospitalized, 34.9 million people being treated in hospital emergency departments, and 87.6 million visits to medical offices each year.¹⁸

In 1998 there were 5100 work-related deaths and 3 800 000 work-related disabling injuries in the United States.¹⁹ In 1997 there were 429 800 occupational illnesses, including those due to repeated trauma (276 600), skin diseases (58 000), and respiratory conditions due to toxic agents (20 000).²⁰ Figure 1 shows comparative data from 11 countries²¹ for all age groups. There is considerable variation between countries, with more than 100% variation between the country with the lowest injury death rate (England and Wales) and the country with the highest rate (France).

Many adult workers have sudden medical emergencies that are not associated with their occupation, such as heart attacks, strokes, and asthma attacks. First aid training and skills for such conditions can be lifesaving. Specific statistics are lacking, however, to estimate the frequency with which first aid maneuvers are necessary or how often their timely application is effective.

Faced with this dilemma, the task force examined the leading causes of death in the United States in persons 25 to 64 years old.²² Chronic conditions, such as malignancies, liver disease, and human immunodeficiency virus infection,

TABLE 1. Leading Causes of Death in Persons 25 to 64 Years Old: First Aid Assessments and Interventions Related to Specific Causes of Death

Rank	Cause of Death	First Aid Assessments and Interventions
1	Malignancy	Mechanism of death (cardiac arrest, shock, CNS event); may require first aid interventions
2	Heart disease	Heart attack, sudden death; CPR, AED
3	Unintentional injury	Hemorrhage, spine immobilization, ALOC, fractures, soft-tissue injury; CPR
4	Suicide	Hemorrhage, spine immobilization, ALOC, fractures, poisoning, soft-tissue injury; CPR
5	Cerebrovascular accident	Stroke, seizures, ALOC, airway protection; CPR
6	Diabetes	Hypoglycemia, seizures
7	Liver disease	Mechanism of death (cardiac arrest, shock, CNS event) may require first aid interventions
8	Human immunodeficiency virus	Mechanism of death (cardiac arrest, shock, CNS event) may require first aid interventions
9	Bronchitis, emphysema, asthma	Breathing difficulties; CPR
10	Homicide	Hemorrhage, spine immobilization, ALOC, fractures, soft-tissue injury; CPR

CNS indicates central nervous system; AED, automated external defibrillator; and ALOC, altered level of consciousness.

TABLE 2. Leading Causes of Work-Related Fatalities (1992–1997)²³: Assessments and Interventions Related to Specific Causes of Death

Rank	Cause	First Aid Assessments and Interventions
1	Transportation incidents (41%)	Hemorrhage, spine immobilization, ALOC, fractures, soft-tissue injury; CPR
2	Assaults and violence (20%)	Hemorrhage, spine immobilization, ALOC, fractures, soft-tissue injury; CPR
3	Contact with objects and equipment (16%)	Hemorrhage, spine immobilization, ALOC, fractures, soft-tissue injury, eye injury, poisoning; CPR
4	Environmental exposure (12%)	Hypothermia, hyperthermia, electrocution, caustic and allergenic substances
5	Falls (10%)	Hemorrhage, spine immobilization, ALOC, fractures, soft-tissue injury; CPR
6	Fires and explosions (3%)	Burns; CPR

ALOC indicates altered level of consciousness.

were excluded, for they are unlikely to require first aid maneuvers. These causes of death and the first aid assessments and interventions related to each cause are listed in Table 1.²³

The task force then examined the leading causes of work-related deaths in a similar manner (Table 2).

The international resuscitation councils do not intend for these first aid guidelines to be comprehensive or to cover all the first aid assessments and interventions listed in Tables 1 and 2. These guidelines are a beginning, an initial attempt to develop evidence-based guidelines that will be expanded in the future. Our goal is for these guidelines to encourage research related to first aid so that we can remedy the current paucity of scientific evidence.

Some essential first aid topics, such as basic life support, including CPR, recognition of heart attack, and use of automated external defibrillators, are covered elsewhere in these guidelines (see Parts 3 and 4).

Specific Evidence-Based Guidelines: Some Examples

Burns

In the United States, fires and burns are the fifth leading cause of unintentional death related to injury (3700 deaths per year).²⁴ A large number of burns that cause injuries ranging from discomfort to severe disability occur at work, at home, and in recreational areas. Injuries from burns may be due to chemicals, electrocution, or contact with hot objects (thermal burns).

Thermal Burns

To treat a thermal burn, remove the victim from the source of injury as soon as possible, being careful not to place yourself in danger. The degree of care needed is related to the circumstances of the burn. If the victim's clothing is on fire, have the victim "stop, drop, and roll" and soak the flames with water or smother them with a blanket. Immediately cool the burn with cold—but not ice-cold—water (Class IIa). Immediate cooling of burns with cold water is supported by a large number of observational clinical studies^{25–28} and controlled animal experiments.^{28–45} Although no results from randomly controlled trials are available, findings from a small controlled trial in volunteers support this recommendation.⁴⁶ Cooling of burns has many beneficial effects, including pain

relief,^{25–27,46,47} reduced formation of edema,* reduced infection rates,^{27,30} reduced depth of injury,^{29,30,33} more rapid healing,^{25,34} reduced need for grafting,²⁷ and reduced mortality.^{26,32,34,36,37} Although cooling should begin as soon as possible, delayed cooling may still be beneficial.^{29,31} The temperature and duration of recommended cooling for burns vary considerably among reported studies. The most comprehensive data available is from Ófeigsson's^{28–30} studies on rats. Optimal healing and the lowest mortality rates were noted with water temperatures of 20°C to 25°C (68°F to 77°F). Other studies in which the water temperature ranged from 10°C to 15°C (50°F to 59°F) have also noted beneficial results in both healing and mortality rates,^{31,32,34,36,37} even in dogs with extensive burns covering 50% of total body surface area.³² This temperature range of 10°C to 15°C (50°F to 59°F) is typical of cold water available in household taps in North America.

Excessive cooling with ice water at 0°C (32°F) resulted in hypothermia and increased mortality rates in rats with burns to 20% of total body surface area compared with noncooled controls.²⁹ Although brief exposure to ice or ice water may be beneficial,³⁵ prolonged cooling may cause additional local injury as a result of ischemia.⁴⁷ The duration of cooling is also controversial, but cooling should continue at least until pain is relieved and probably for a total duration of 15 to 30 minutes. Cooling should not delay transfer to a medical facility.

Remove all nonadhering clothing and jewelry that can be removed without force from the burn area. Leave blisters intact (Class IIb). Cover the burn area with a clean dressing if one is available. Do not apply lotions, creams, ointments, or home remedies to the burn area (Class IIb).

Although the results of several in vitro studies have shown that the fluid in blisters contains agents that are detrimental to wound healing,^{48,49} others have demonstrated that the fluid in blisters contains agents beneficial to wound healing.^{50–52} Furthermore, a controlled volunteer experiment⁵³ and controlled animal experiments^{54–56} have shown a benefit of leaving blisters intact. Unroofing of blisters under less than sterile conditions clearly exposes the patient to significant risk of contamination.

Carefully brush powdered chemicals off the skin with a gloved hand or piece of cloth. Remove all contaminated clothing from the victim, while avoiding contaminating

*References 25, 27, 30, 31, 34, 36, 38, 40–46.

yourself. Flush chemical burns with large amounts of cool running water (Class IIa)^{57–60} and continue flushing until EMS personnel arrive.

Electrocution and Electrical Burns

Electric shock caused 482 deaths in the United States in 1997.⁶¹ The Centers for Disease Control and Prevention estimates that 52 000 trauma admissions per year are due to electrical injuries.

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 in contact with the skin or from electric current traversing a portion of the body, in which case thermal burns may be present at the points where the current entered and exited the body and internally along its pathway. Burns can result from both low-voltage (<1000 V) and high-voltage (>1000 V) injuries.⁶²

Cardiopulmonary arrest is the primary cause of immediate death in persons who have sustained an electrical injury.⁶³ Cardiac arrhythmias, including ventricular fibrillation, ventricular asystole, and ventricular tachycardia, that progress to ventricular fibrillation may occur as a result of 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 the respiratory muscles.

Factors that determine the nature and severity of injury include the magnitude of energy delivered, voltage, resistance to current flow, type of current, duration of contact, and current pathway. High-tension current causes the most serious injuries, but fatal electrocutions may also occur with low-voltage household current.⁶⁵ Skin resistance, the most important factor impeding current flow, can be reduced substantially by moisture, converting a low-voltage injury into a life-threatening one.

Do not place yourself in danger by touching the victim while the electricity 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 (the electric company and fire department). Everything will conduct electricity if the voltage is high enough, so do not enter the area around the victim or attempt 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. Appropriate precautions must be taken because musculoskeletal and spinal cord injuries (see below) may be present. All victims of electric shock require medical assessment.

Poisoning

Poisoning can be caused by solids, liquids, gases, and vapors. Gases and vapors are inhaled; solids and liquids are ingested or absorbed through the skin. Ingestion may be unintentional or self-inflicted. In 1997, in the United States, 9000 deaths

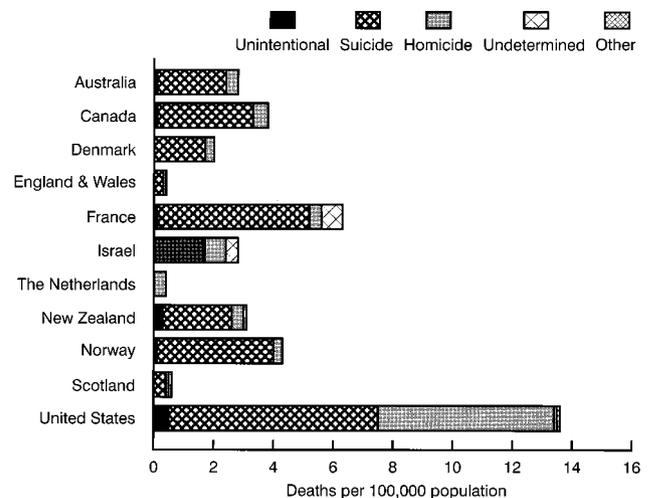


Figure 2. Average annual poisoning death rates by intent from 11 countries.²¹

were caused by poisons,⁶⁶ as were almost 4% of work-related deaths. Figure 2 shows data from 11 countries²¹; again the data shows considerable variation. The poisoning rate in the United States is more than twice that of any other country. This is due to a rate of homicidal poisoning that alone is as high as the *total* poisoning rate in any other country.

The number of poisonous substances available at work and home is very large. It is important to understand the toxic nature of chemicals in the environment, proper use of protective equipment, and emergency procedures for toxic exposure. In the United States, access to poison control centers is available to the public, but in other countries, access may be available only through the EMS system or hospital. The telephone number of the local poison control center should be prominently displayed at home and at worksites where poisonous substances are present. If poisoning occurs, contact the poison control center for advice and recommendations. In the United States, material safety data sheets should not be used to determine first aid treatment, nor should the use of these sheets take the place of a call to the poison control center. The sheets may be of value, however, in determining actual exposure, and the agents listed on them should be relayed to the specialist in poison information.

Rescuers must protect themselves before administering first aid, especially if the poison can be inhaled or absorbed through the skin. Do not enter any area where victims are unconscious without knowledge of the agents to which the victims have been exposed and without the required protective equipment.

If the poison is a gas or vapor, remove the victim from the contaminated area as soon as possible. If the victim's skin has been exposed, thoroughly flush it with running water until EMS personnel arrive.

Evaluate victims of poisoning for adequacy of airway, breathing, and circulation and provide basic life support (see "Part 3: Adult Basic Life Support," in these guidelines) as required. Place symptomatic victims who are breathing spontaneously in a recovery position. EMS personnel will transport most poisoning victims or will recommend that you

transport them to the nearest Emergency Department. Regardless of symptoms, transport all victims who ingest a poison in a suicide attempt to the nearest Emergency Department.

Do not administer anything by mouth unless advised by a poison control center (Class IIb). The results of some animal studies^{67–69} suggest that dilution or neutralization of a caustic agent by water or milk after ingestion reduces tissue injury, but no human studies have demonstrated a clinical benefit of this practice. Administration of milk or water may be considered if a large amount of an industrial-strength caustic or a solid caustic has been ingested, but call the poison control center first.

Some controversy continues about the role of gastrointestinal decontamination by inducing vomiting with syrup of ipecac or by adsorption of the toxin by activated charcoal, gastrointestinal decontamination has not been shown to change outcome (defined as morbidity, mortality, cost, or length of hospital stay).⁷⁰

At this time there is insufficient data to support or exclude administration of ipecac to induce vomiting in poisoning victims (Class Indeterminate). The potential danger of aspiration and the lack of clear-cut evidence of a benefit support our recommendation: do not administer ipecac unless specifically directed by a poison control center or other authority (eg, local emergency department physician). If ipecac is administered, it should be given only within 30 minutes of ingestion and only to victims who are alert and responsive (Class IIb). The decontamination effects of ipecac have been extrapolated from studies performed in dogs,^{71–73} but the findings are probably not applicable to humans. Results of studies performed in human volunteers^{74–77} are not applicable to poisonings because the volunteers were given nontoxic drugs.

Administration of activated charcoal by first aid rescuers is not recommended (Class Indeterminate). Animal studies⁷⁸ suggest that administration of activated charcoal immediately after drug ingestion decreases the amount of drug absorbed, but the amount varies and decreases with time.^{79,80} Activated charcoal is unpalatable and difficult to administer, and death due to its aspiration has been reported.⁸¹

Hemorrhage

Because hemorrhage is a potential component of both intentional and unintentional injuries, it is a major health problem in terms of both morbidity and mortality. First aid responders have a responsibility to protect themselves and must understand and practice protection against blood-borne diseases. Consider all body fluids from victims to be infectious. Wear gloves and, if possible, protective shields and gowns when providing assistance in which exposure to droplets of blood, saliva, or other body fluids⁸² is likely. After the hemorrhage is controlled, wash your hands thoroughly and change blood-soaked clothing. Avoid touching your mouth, nose, or eyes or eating before you have washed your hands.

Minor bleeding such as bruises or abrasions can be treated as soft-tissue injuries (see below). To treat a nose bleed, have the victim bend forward at the waist and pinch the nasal alae

with the thumb and index finger^{83–86} (Class IIb). Continued bleeding may require medical intervention.

To control any active bleeding, apply direct pressure with the flat portion of your fingers or the palm of your hand over a sterile dressing or clean pad (Class IIb). If the bleeding does not stop, apply more pressure. If the dressing becomes saturated, apply a second dressing over the first. If a barrier is unavailable and the victim is conscious, have the victim apply pressure directly to the bleeding source.

If bleeding is from an extremity, elevate the extremity above the level of the heart (Class IIb). If severe bleeding continues despite application of firm pressure, add arterial pressure by applying pressure to the brachial artery if bleeding is from the upper extremity and over the femoral artery if bleeding is from the lower extremity (Class Indeterminate).

The use of tourniquets is controversial. Tourniquets are widely used in operating rooms under controlled conditions and have been studied for safety, effectiveness, and related complications under those conditions.^{87–94} Arterial tourniquets, however, cause injury as a result of ischemia after 90 minutes of compression. Complications include bleeding, injury to soft tissues, nerve and vascular injury, and paralysis.^{95–97} Tourniquets applied by first aid providers usually cause venous rather than arterial occlusion and often increase rather than decrease hemorrhage.^{98–100} Because of these potentially serious complications, tourniquets should be used only as a last resort for massive hemorrhage that is not controlled by other methods and only by persons skilled in their use.

Every precaution must be taken to maintain normal body temperature in the bleeding victim. Remove wet clothing and use blankets or other material to protect the victim from hypothermia.

Altered Mental States

An altered mental state may be due to trauma or a medical condition such as diabetes or stroke. Signs and symptoms of an altered mental state include loss of consciousness, confusion, combativeness, disorientation, headache, inability to move a body part, dizziness, problems with balance, and double vision. Any sudden change in level of consciousness requires medical evaluation. First aid measures include removing the victim from a potentially dangerous environment; evaluating airway, breathing, and circulation; maintaining body temperature; and placing the victim in a recovery position. If the victim is known to have diabetes and is able to swallow, give him or her a drink containing glucose. Note that drinks with artificial sweeteners (diet drinks) do not contain glucose.

Fainting is a momentary loss of consciousness. Minor pain, sudden fright, or standing in one position for prolonged periods, especially in a hot environment, are precipitating factors in susceptible persons. First aid measures include protecting the victim from injury, placing the victim in a supine position, and checking airway, breathing, and circulation. If airway and breathing are adequate and the victim is not injured, you may place the victim in a recovery position. The victim usually regains consciousness within a few

seconds and has no alteration in mental status once consciousness is regained.

Head Trauma

In the United States the head, neck, and spine are the parts of the body most commonly involved in unintentional injuries. Injuries to the head, neck, and spine are most frequently associated with falls (21%), violence (13%), and sports (13%). Many of these injuries are preventable, and many states have regulations that require workers to use head and neck protection at specific worksites.

Head injury should be suspected when any of the following has occurred:

- The victim fell from a height greater than his or her own.
- When found, the victim was unconscious.
- The victim sustained a blunt force injury (eg, from impact with or ejection from a car).
- The victim's injury was caused by diving, lightning strike, or electrocution, or the victim's head protection or helmet was broken or insufficient.
- The victim sustained a high-impact sports injury.

First aid responders should gather information on the mechanism of injury, whether an alteration in mental status has occurred, and the presence and duration of unconsciousness. This information is important for early treatment of the victim and is used in several protocols to classify the severity of the injury and the risk of progressive brain injury and to guide treatment during the first 24 hours. A concussion is an alteration in mental status, especially confusion and amnesia, and may or may not include a loss of consciousness. Because the signs and symptoms may be transient, the first aid responder's observations at the scene provide EMS personnel with important information for subsequent treatment. Information about whether to obtain a head CT or cervical spine radiographs is beyond the scope of first aid actions. The interested reader should consult 2 important new studies.^{100a,100b}

If head injury is suspected

- Determine whether the victim's location poses a danger to the victim or you, and remove the victim from the site if it does.
- Assess and provide CPR to an unconscious, nonbreathing, pulseless victim.
- Assess the victim's risk of vomiting and ability to protect the airway.
- Assess and control bleeding.
- Maintain the victim's body temperature.
- Stabilize the cervical spine in high-risk situations (see next section).

Spinal Cord Injuries and Cervical Spine Immobilization

In the United States approximately 11 000 people sustain spinal cord injuries each year.¹⁰¹ Motor vehicle crashes are the cause of 40% of such injuries; violence, 25%; falls, 21%; diving accidents, 10%; and work- or sports-related accidents, 4%.

An overwhelming majority of spinal cord injuries occur during the primary traumatic event. Some evidence indicates

that spinal cord injuries may occur after the primary trauma. Some injuries are presumably due to extension of the original damage from edema, swelling, and hemorrhage. Some are caused by additional injury to the spinal cord from movement of the spinal column after the original trauma. Movement of the spinal column relative to the spinal cord may occur during initial stabilization, movement, or transport of the victim.

Even minimal degrees of force can injure the spinal cord. At the time of injury it is difficult to identify victims with an unstable spine, who are at risk for spinal cord injury. In the past, emergency personnel considered the mechanism of injury, independent of subjective complaints and physical findings, to be the best predictor of spine and spinal cord injury. They have since abandoned their reliance on mechanism of injury alone.¹⁰² Current practice incorporates evaluation of specific pain, distribution of tenderness, neurological deficits, and mechanisms of injury to assess the risk of spine and spinal cord injuries.¹⁰³ Most first aid providers lack the training and experience to conduct these more sophisticated evaluations. Furthermore, extensive physical examination may be inappropriate or inaccurate when carried out in the prehospital environment.

First aid responders should suspect an unstable spine or spinal cord injury with any of the following (all Class Indeterminate):

- Injury was caused by force sufficient to result in loss of consciousness.
- Injury occurred on the upper part of the body, especially the head and neck.¹⁰⁴
- Injury resulted in altered mental status.
- There is evidence of drug or alcohol intoxication.¹⁰³

If spinal cord injury is suspected, do not allow the victim to move in any direction. Immobilize the victim's head, neck, and trunk. If CPR is required, open the airway with jaw thrust (see "Part 3: Adult BLS") rather than head extension. If the victim is stable and does not require CPR or lifesaving first aid, such as hemorrhage control, do not move him or her until EMS personnel arrive. If movement is necessary (to provide CPR or lifesaving first aid or because of potential danger), support the victim's head, neck, and trunk securely so that the head and neck do not move in any direction. (See previous section and References 100a and 100b regarding diagnostic studies.)

Seizures

Approximately 10% of all people will have a seizure during their lifetime, and 1% to 2% will have recurrent seizures.¹⁰⁵ Although seizures are rarely fatal,^{106,107} injuries related to seizures are relatively common.^{108–110} Severe injuries include fractures, dislocations, burns, brain concussion, subdural hematoma, and intracerebral hemorrhage. Dental injuries are also fairly common.¹¹¹

The general principles of first aid management of seizures are (1) prevention of injury, (2) assurance of an open airway, and (3) reassurance of an open airway after the seizure has ended.

The person having a seizure must be protected from injuring himself or herself. Try to keep the victim from falling. Protect the head with a pillow or other soft material. Do not restrain the victim during a seizure or place an 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; doing so is also dangerous because it may result in dental damage or aspiration.

To prevent aspiration of secretions, place the seizure victim in a recovery position as soon as possible after the seizure has stopped.¹¹²

After a seizure it is not unusual for the victim to be unresponsive or confused for a short time. Activate the EMS system if (1) a seizure lasts more than 5 minutes or is recurrent, (2) the victim exhibits any respiratory problems, (3) the victim has sustained an injury, or (4) unresponsiveness or confusion lasts more than 5 minutes after the seizure has stopped.

When able to do so, the victim should be allowed to decide whether to seek additional medical assistance.

Musculoskeletal Trauma: Soft-Tissue Sprains and Contusions, Ligament and Tendon Strains, and Fractures

Closed soft-tissue injuries include joint sprains and muscle contusions. The basic principle in first aid for soft-tissue injuries is to decrease hemorrhage, edema, and pain. Numerous human studies have shown that the application of ice is effective for reducing pain and duration of disability (Class IIa).^{113–118} The best way to apply ice is to use a plastic bag. Refreezable packs of gelled solutions are inefficient.^{119,120} To prevent cold injury to the skin, it is best to limit application of ice to 20 minutes at a time. In contrast to cold therapy, application of heat leads to an increase in blood flow, hemorrhage, and inflammatory response.¹¹⁵

Compression of closed soft-tissue injury with a circumferential elastic bandage appears to decrease the amount of edema formation (Class Indeterminate).

Assume that any injury to an extremity includes a bone fracture. Cover open wounds with a sterile dressing if one is available. Stabilize the extremity, but do not straighten it if it is deformed. If a deformed (injured) extremity appears blue and there is no distal pulse, this is a critical emergency. Report such findings to medical control or responders with a higher skill level and follow their instructions. The victim should not bear any weight on the extremity and preferably should rest in a supine or recovery position. Maintain body temperature to prevent shock.

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