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# Part 13: First Aid : 2010 American Heart Association and American Red Cross International Consensus on First Aid Science With Treatment Recommendations

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# Part 13: First Aid

## 2010 American Heart Association and American Red Cross International Consensus on First Aid Science With Treatment Recommendations

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***Note From the Writing Group:*** *Throughout this article, the reader will notice combinations of superscripted letters and numbers (eg, "Dilution with Milk or Water[FA-202A]"). These callouts are hyperlinked to evidence-based worksheets, which were used in the development of this article. An appendix of worksheets, applicable to this article, is located at the end of the text. The worksheets, co-copyrighted by the American Heart Association and American Red Cross, are available in PDF format and are open access.*

The American Heart Association (AHA) and the American Red Cross cofounded the National First Aid Science Advisory Board in order to review and evaluate the scientific literature on first aid in preparation for the 2005 Consensus on Science and Treatment Recommendation document.[1] In preparation for the 2010 process, the National First Aid Science Advisory Board was broadened into an International First Aid Science Advisory Board with inclusion of representatives from a number of international first aid organizations (Table).

## The Process

The International First Aid Science Advisory Board identified 38 questions in first aid practice that had not been subjected to an evidence review process or that needed to be updated since the 2005 process. Two or more members of the International First Aid Science Advisory Board volunteered to independently review the scientific literature and complete an evidence-based review worksheet summarizing the literature (see Part 2 of this supplement for additional information). After the evidence was presented to the full board, a draft consensus summary of the scientific evidence and a draft consensus treatment recommendation were developed and represented at a subsequent meeting. Thus, each question, evidence-based review, draft summary of science, and draft treatment recommendation was presented and discussed on 2 separate occasions, and a Consensus on Science and Treatment Recommendation was reached by the Board. This document is a report of the group's consensus.

As in 2005, the worksheets revealed the continuing paucity of scientific evidence to support specific first aid interventions. Very little research is being conducted in first aid, and most of the recommendations are extrapolations from research and experience in other medical venues, animal studies, and case series. It is hoped that this document will be a stimulus to future research in first aid.

## First Aid for Medical Emergencies

### Summary

The medical questions addressed include poisoning, anaphylaxis, oxygen administration, and aspirin administration for a suspected coronary event.

No changes were recommended for first aid management of acute poisoning.

In reviewing epinephrine administration for anaphylaxis, evidence was found that laypeople and some medical and prehospital professionals are unable to recognize the signs and symptoms of anaphylaxis and therefore cannot, without training, make an independent decision to administer epinephrine with an auto-injector or to administer a second dose if the first is not effective. This issue takes on added importance in view of legislation in some jurisdictions that permits these actions.

No evidence was found, except in decompression injuries, to support the routine administration of oxygen by first aid providers.

The administration of aspirin to a victim experiencing chest discomfort is problematic. The literature is clear on the benefit of early administration of aspirin in an acute coronary event, except when there is a clear contraindication, such as aspirin allergy or a bleeding disorder. Less clear, however, is whether first aid providers can recognize the signs and symptoms of an acute

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*Co-chairs and equal first co-authors.

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**Table. International First Aid Science Advisory Board Member Organizations**

| |
|---|
| American Academy of Pediatrics |
| American Burn Association |
| American College of Emergency Physicians |
| American College of Occupational and Environmental Medicine |
| American College of Surgeons |
| American Heart Association |
| American Pediatric Surgical Association |
| American Red Cross |
| American Red Cross Advisory Council on First Aid, Aquatics, Safety and Preparedness |
| American Safety and Health Institute |
| Austrian Red Cross |
| Canadian Red Cross |
| Divers Alert Network |
| Egyptian Red Crescent |
| European Reference Center for First Aid Education |
| French Red Cross |
| Grenada Red Cross |
| Hong Kong Red Cross |
| Hungarian Red Cross |
| International Federation of Red Cross and Red Crescent Societies |
| Medic First Aid |
| National Association of EMS Educators |
| National Association of EMS Physicians |
| National Athletic Trainers' Association |
| National Safety Council |
| Norwegian Red Cross |
| Occupational Safety and Health Administration |
| Red Cross Society of China |
| Resuscitation Council of Asia |
| St. John Ambulance, United Kingdom |

coronary event or identify the contraindications to aspirin. Aspirin administration should never delay EMS activation.

## Poisoning

### *Dilution With Milk or Water*[FA-202A]

*Consensus on Science*
There are no human studies on the effect of treating oral caustic exposure with dilution therapy. One in vitro LOE 5 chemistry study[2] demonstrated no benefit from the addition of large volumes of diluent to either a strong base or a strong acid. Five LOE 5 animal studies[3–7] demonstrated histological benefit to the esophagus when a diluent was administered following exposure to an alkali or acid.

*Treatment Recommendation*
There is insufficient evidence for or against the administration of a diluent as a first aid measure for ingestion of a caustic substance.

*Knowledge Gaps*
Does the early administration of milk or water as compared to nothing by mouth improve outcome in patients with poisoning with caustic substances?

### *Syrup of Ipecac*[FA-203B]

*Consensus on Science*
Two LOE 2 studies[8,9] and 1 LOE 4 study[10] demonstrated no benefit to administering syrup of ipecac to a suspected poisoning victim. Two LOE 2 studies[11,12] demonstrated untoward effects, such as intractable emesis and delayed charcoal administration, when syrup of ipecac was given. One LOE 2 epidemiological study[13] showed that the administration of syrup of ipecac is not associated with decreased healthcare utilization.

*Treatment Recommendations*
Ipecac syrup should not be used by the lay public as a first aid treatment of acute poisoning.

*Knowledge Gaps*
What is the role of gastric emptying in poisoning treatment? How does the treatment outcome differ with and without stomach emptying?

### *Activated Charcoal*[FA-201B]

*Consensus on Science*
No evidence was found to suggest that activated charcoal is efficacious as a component of first aid for acute poisoning, although 2 small LOE 5 studies[14,15] suggest that it may be safe to administer. One LOE 3 study[16] demonstrated that the majority of children will not take the recommended dose of activated charcoal.

*Treatment Recommendation*
There is insufficient evidence to recommend for or against the administration of activated charcoal in a first aid setting.

*Knowledge Gaps*
Does the prehospital administration of charcoal by lay rescuers improve outcome? Does the administration of activated charcoal by a first aid provider cause harm?

## Anaphylaxis

### *Recognition of Anaphylaxis by First Aid Providers*[FA-303B]

*Consensus on Science*
Four LOE 4[17–20] and 3 LOE 5[21–23] studies documented the difficulty that first aid providers have in assessing and recognizing signs and symptoms of anaphylaxis. Evidence from 1 LOE 4 study[24] demonstrated that parents of children with multiple anaphylactic reactions can more accurately begin to recognize the signs and symptoms indicating the need for administration of an auto-injector, but with a lack of training and experience, they are unable to provide appropriate care.

*Treatment Recommendation*
First aid providers should not be expected to recognize the signs and symptoms of anaphylaxis without repeated episodes of training and encounters with victims of anaphylaxis.

*Knowledge Gaps*
How can a first aid provider determine that a witnessed allergic reaction needs epinephrine? Are there anaphylactic reactions that do not respond to epinephrine?

### *Second Dose of Epinephrine*[FA-302A, FA-302B]

*Consensus on Science*
One small, retrospective LOE 4 chart review,[25] 1 LOE 4 retrospective patient survey,[26] and 1 LOE 4 retrospective

chart review of children with food allergy[27] found that 12% to 36% of patients with anaphylactic reactions received a second dose of epinephrine because the first dose did not relieve symptoms. Two LOE 4[28,29] and 2 LOE 5 studies[30,31] documented adverse reactions, including fatalities, due to misdiagnosis of an anaphylactic reaction, inappropriate route of administration, or excessive doses of epinephrine. One LOE 3 retrospective study[32] demonstrated that 20% of anaphylactic reactions are biphasic, with a mean of 10 hours between 2 symptomatic episodes.

*Treatment Recommendation*
There is insufficient evidence for or against the routine first aid administration of a second dose of epinephrine.

*Knowledge Gaps*
How can a first aid provider determine that a victim needs additional epinephrine? What should the time interval be between doses of epinephrine? How often does someone with an anaphylactic reaction respond to a second dose of epinephrine if they did not respond to the first? Are anaphylactic reactions biphasic, and if so, how does that influence first aid measures?

## Oxygen[FA-701A]

*Consensus on Science*
There is no study that directly addresses the first aid use of oxygen for breathing difficulty or complaints of chest pain. In 1 large LOE 3 retrospective case study,[33] underwater divers experiencing decompression injury required fewer decompressions and had a greater likelihood of complete recovery if first aid included normobaric oxygen. One small LOE 4 case series[34] reported less ST-segment elevation in patients who received oxygen by face mask at 15 L/min and who were admitted to the CCU for acute transmural myocardial infarction than in those who did not receive oxygen. In 1 LOE 2 randomized controlled trial conducted before the introduction of reperfusion therapy[35] in 200 patients admitted to the hospital with a suspected acute myocardial infarction, there was no reduction in frequency of ventricular tachycardia or in mortality when oxygen was provided at 6 L/min for 24 hours. One LOE 2 systematic review[36] found no controlled trials (and only inpatient use) to support the routine use of oxygen for acute myocardial infarction patients. One LOE 2 systematic review[37] found no randomized controlled trials evaluating the benefit of oxygen therapy for acute exacerbation of chronic obstructive pulmonary disease (COPD) patients in the out-of-hospital setting.

*Treatment Recommendations*
There is no evidence for or against the routine use of oxygen as a first aid measure for victims experiencing shortness of breath or chest pain. Oxygen may be beneficial for first aid in divers with a decompression injury.

*Knowledge Gaps*
What is the risk to the victim of providing oxygen (ie, delay in EMS activation)? How does the outcome differ if oxygen is given by first aid providers to patients with chest pain, breathing difficulty, or other conditions?

## Chest Discomfort – Aspirin Administration[FA-1204A, FA-1204B]

*Consensus on Science*
Evidence from 2 large, randomized LOE 1 trials[38,39] clearly demonstrated that administration of aspirin within the first 24 hours of onset of chest discomfort in patients with acute coronary syndromes reduced mortality. Evidence from an LOE 3 retrospective registry[40] showed an association between early prehospital administration of aspirin and lower mortality in patients with acute myocardial infarction. There is evidence from an LOE 4 retrospective study[41] that prehospital administration of aspirin is safe. This study suggested that prehospital aspirin might facilitate early reperfusion and demonstrated the value of early aspirin administration during acute myocardial infarction.

*Treatment Recommendation*
Administration of aspirin is recommended for chest discomfort if the victim does not have an allergy, a recent episode of bleeding, or other contraindications to aspirin, but administration of aspirin should never delay activation of EMS.

*Knowledge Gaps*
Does administration of aspirin by first aid providers delay EMS involvement? Can first aid providers recognize contraindications to aspirin? What are the clinical results with treatment versus nontreatment with aspirin by first aid providers of patients with subsequently proven coronary events?

## Positioning of Breathing but Unresponsive Victim[FA-2001A]

*Consensus on Science*
There is no evidence that positioning an unresponsive, breathing victim in a recovery position (ie, lateral recumbent or **H**igh **A**rm **IN** **E**ndangered **S**pine [HAINES] position) as compared to a supine position decreases complications. Most evidence comes from LOE 5 studies performed on responsive volunteers that compare the types of lateral positioning only. One LOE 5[42] and 1 LOE 4[43] study recommended the HAINES position for unresponsive persons with potential spinal cord trauma. Two LOE 5 studies[44,45] in healthy volunteers showed decreased dependent forearm perfusion and therefore a greater potential for nerve damage with the HAINES position. Four LOE 5 studies[46–49] supported the lateral recumbent recovery position because it was easier for the rescuer and more comfortable for the victim. One LOE 4[50] and 1 LOE 5[51] study compared the supine to a lateral position and concluded that there was no difference in heart rate variability or in risk for aspiration pneumonia.

*Treatment Recommendations*
There is no evidence that turning an unresponsive, spontaneously breathing victim into any side-lying versus a supine position is beneficial. If a person with a suspected cervical spine injury is turned to the side, the HAINES position appears to be safer than the lateral recumbent position.

*Knowledge Gaps*
What are the risks of any position for patients who are not responsive but breathing?

# Injury Emergencies

## Summary

Since the 2005 scientific review, new data have become available about the effect of tourniquets to control bleeding. This experience comes primarily from the battlefields of Iraq and Afghanistan. There is no question that tourniquets do control bleeding, but when tourniquets remain in place too long, reported complications include gangrene distal to the application, shock, and death. Protocols for the proper use of tourniquets to control bleeding exist, but there is no experience with civilian use or how to teach the proper application of tourniquets to first aid providers. Studies have shown that not all tourniquets are the same, and some manufactured tourniquets perform better than others and better than improvised ones. This issue will take on increasing importance in this age of terrorism and the possibility of mass casualties during disasters.

Because of its importance, the issue of spinal stabilization was once again reviewed. Unfortunately, very few new data are available, and it is still not clear whether and how often secondary spinal cord injury occurs and whether the methods that have been recommended for spinal stabilization or movement restriction are effective.

The literature on first aid for snake bites was once again reviewed. Previously, evidence supported pressure immobilization for neurotoxic snake bites, but it now appears that there is a benefit to application of pressure even for nonneurotoxic snake bites. The challenge is that the range of pressure used appears to be critical and may be difficult to estimate in the field.

A new section on jellyfish stings has been added, and new recommendations for treatment have been made.

## Optimal Position in Shock[FA-1601A, FA-1601C]

*Consensus on Science*

Evidence from 2 LOE 4[52,53] and 3 LOE 5[54–56] studies demonstrated that use of passive leg raising or the modified Trendelenburg position does not significantly increase mean arterial pressure or cardiac output over a period of 7 minutes.[52] Evidence from 2 LOE 4[57,58] and 2 LOE 5[59,60] studies demonstrated that passive leg raising can increase cardiac output and volume responsiveness. No studies demonstrated improved patient outcome, but 1 LOE 4 study[53] noted potential harm with the Trendelenburg position.

*Treatment Recommendation*

There is insufficient evidence for or against raising the legs as a first aid intervention for shock.

*Knowledge Gaps*

What are the relative benefits and risks of supine positioning with passive leg raising and modified Trendelenburg positioning in victims with shock? Is there potential harm of passive leg elevation in victims with pelvic, abdominal, chest, and head trauma?

## When to Suspect Cervical Spine Trauma[FA-502E]

*Consensus on Science*

The LOE 5 National X-Radiography Utilization Study (NEXUS) identified midline cervical neck tenderness, focal neurological deficit, altered mental status, intoxication, and distracting injury as the 5 key clinical criteria predicting high risk for spine injury in adults,[61] children,[62] and the elderly[63] and demonstrated that elimination of any of these factors weakened the predictive value.[64] The LOE 5 Canadian C-Spine Rule (CCR) study[65] identified age ≥65 years, dangerous injury mechanism, and paresthesia as conditions that should create a high level of suspicion for cervical spine injury. A large LOE 5 study of children younger than 3 years of age[66] identified a Glasgow Coma Scale (GCS) score <14, a GCS Eye Opening score of 1, motor vehicle crash, and age ≥2 years as signs that should create a high level of suspicion for cervical spine trauma in young children. One LOE 5 study[67] has validated these risk factors with the possible exception of injury mechanism, and 11 LOE 5 studies have shown that emergency medical technicians can identify the risk factors in most patients with possible cervical spinal injury[68–70] with excellent reliability[71,72] when applied in selective spinal immobilization protocols.[73–78]

*Treatment Recommendations*

Cervical spine injury should be suspected in traumatic injury if the victim:

- Is ≥65 years of age
- Is involved as driver, passenger, or pedestrian in a motor vehicle, motorized cycle, or bicycle crash
- Falls from a greater than standing height
- Has tingling in the extremities
- Complains of pain or tenderness in the neck or back
- Has sensory deficit or muscle weakness involving the torso or upper extremities
- Is not fully alert or is intoxicated
- Has other painful injuries, especially of the head and neck
- Is a child ≥2 years of age, has a GCS score <14, or has a GCS Eye Opening score of 1

## Benefit of Spinal Immobilization[FA-501A, FA-501D]

*Consensus on Science*

There are no published studies that support or refute the benefit of spinal immobilization by first aid providers. One retrospective, nonrandomized, and probably underpowered LOE 5 study[79] of spinal immobilization by emergency medical technicians using immobilization devices failed to show any neurological benefit compared with no spinal immobilization. Two LOE 4 studies[80,81] examined data from before the era of routine spinal immobilization and compared them to the era after the introduction of routine spinal immobilization and determined that secondary spinal injury occurred in 3% to 25% of patients suffering a spinal injury. An LOE 5 review of the literature[82] estimated that 0.03% to 0.16% of patients may be helped by spinal restriction.

*Treatment Recommendation*

There is insufficient evidence for or against spinal immobilization. It is reasonable to recommend spinal motion restriction, in victims with risk factors for cervical spine injury.

## Method for Spinal Motion Restriction[FA-503A]

*Consensus on Science*

There are no studies that support or refute any 1 method of spinal motion restriction in victims of trauma. One LOE 5 study in healthy volunteers[83] concluded that professional rescuer application of bilateral sandbags held in place by 3-inch tape placed across the forehead was more effective than any other method, including extrication collars, in restricting spinal motion. Two LOE 5 studies, 1 in cadavers with spinal injury[84] and the other in traumatic cardiac arrest,[85] showed that manual stabilization was ineffective in protecting the spinal cord.

*Treatment Recommendation*

There is insufficient evidence for or against manual cervical spine restriction of motion. The only proven method of cervical spine immobilization is use of bilateral sandbags held together with tape over the forehead, thus restricting both lateral and anterior-posterior neck motion.

*Knowledge Gaps*

Is there a benefit to applying (as compared with not applying) spinal motion restriction to all victims of head and neck trauma? What is the risk?

## Thermal Cutaneous Burns[FA-101C]

*Consensus on Science*

Evidence from 5 LOE 3[86–90] and 4 LOE 4 retrospective[91–94] studies, as well as 28 LOE 5 animal experiments,[95–122] demonstrated that cooling of thermal burns with water at room temperature (15°C to 25°C) within 30 minutes of injury reduces pain, depth of injury, and the need for grafting. In 1 LOE 4 case series[123] and 5 LOE 5 animal studies,[111,121,124,125] cooling of burns with ice or ice water increased tissue damage.

*Treatment Recommendation*

Cooling of thermal burns with tap water is recommended as soon as possible but no later than 30 minutes after the injury. Large burns should not be cooled without the ability to monitor the victim's core temperature because that may cause hypothermia, especially in children. Cooling with ice or ice water is not recommended.

*Knowledge Gaps*

What is the role of cooling in large burns? When is a burn sufficiently large that cold application creates risk of hypothermia? Is there a benefit to use of water gel versus tap water in the cooling of a burn? How long should burns be cooled?

## Blisters[FA-103A]

*Consensus on Science*

Evidence from 1 LOE 2 human study,[126] 2 small LOE 4 clinical studies,[127,128] 1 LOE 5 human volunteer study,[129] and 4 LOE 5 animal studies[118,130–132] demonstrated that leaving burn blisters intact improves healing and reduces pain.

*Treatment Recommendation*

Burn blisters should be left intact.

*Knowledge Gaps*

Is there an outcome benefit of burn treatment with a modern occlusive dressing with and without prior blister debridement?

## Bleeding Control

### *Direct Pressure, Pressure Points, and Elevation*[FA-401C]

*Consensus on Science*

There are no studies evaluating the effectiveness of direct pressure as a first aid for bleeding. One LOE 1 randomized, prospective, but not double-blind study,[133] 1 LOE 1 meta-analysis,[134] and 5 LOE 2 studies[135–139] showed that hemostasis can be achieved by manual direct pressure over an arteriotomy site after cardiac catheterization. Three LOE 5 animal studies[140–142] showed that increasing intra-abdominal pressure by insufflation of air can control intra-abdominal bleeding. Three LOE 4[143–145] and 1 LOE 5[146] studies showed that bleeding from even large wounds can be controlled and hemostatic pressure achieved by application of an adhesive elastic bandage over gauze. One LOE 4 study[147] in 10 volunteers showed no effect on distal pulses when pressure was applied over the proximal artery.

*Treatment Recommendation*

Control of bleeding is best achieved with direct manual pressure over the bleeding area. Pressure can be maintained by applying an elastic adhesive bandage over gauze pads. There is evidence against using pressure points (indirect pressure) but no evidence for or against elevation of the bleeding part as a method of hemorrhage control.

*Knowledge Gaps*

All our knowledge about direct pressure hemostasis is extrapolated from cardiac catheterization experience and the battlefield, and studies of bleeding control in civilian settings by first aid providers are needed. Do first aid providers apply sufficient pressure? Do first aid providers apply pressure for a sufficient amount of time to control bleeding? How often does properly applied pressure fail to control bleeding, and which alternative method works?

### *Tourniquets – Routine Use*[FA-402C, FA-402D]

*Consensus on Science*

There are no studies of the use of tourniquets to control hemorrhage in a civilian setting by first aid providers. Two LOE 5 retrospective studies[148,149] and 1 LOE 5 prospective study[150] supported the use of a tourniquet to control extremity hemorrhage on the battlefield. One LOE 4 retrospective case study[145] found that direct pressure was superior to a tourniquet in controlling hemorrhage. One LOE 1 prospective study in orthopedic patients undergoing surgery that used a tourniquet to achieve a bloodless field[151] showed that metabolic markers of muscular injury were directly related to the length of time the tourniquet was in place. One LOE 3 prospective, controlled study during orthopedic surgery[152] showed enhanced transendothelial neutrophil migration with potential for muscle injury while a tourniquet was in place. One LOE 4 case report documented paralysis after surgical use of a tourniquet,[153] 1 LOE 5 retrospective review documented limb paralysis following use of a tourniquet during surgery,[154] and 1 LOE 5 animal study on muscular contraction following tourniquet use and its relationship to inflating pressure[155] demonstrated potential neurological complications of prolonged tourniquet use. Two of these studies[153,154] showed that the neurological complication was potentially reversible.

*Treatment Recommendation*
Properly applied tourniquets do control hemorrhage under surgical and battlefield conditions, but because of potential complications, there are insufficient data for or against recommending their routine use in civilian first aid.

*Knowledge Gaps*
What is the maximum time that a tourniquet can be left in place before the benefit/risk ratio reverses? Can first aid providers be taught how tightly to apply a tourniquet? Are there any advantages/disadvantages to intermittent release of an applied tourniquet?

### *Tourniquets – When Should They be Used?*[FA-403A, FA-403C]

*Consensus on Science*
There are no studies on the use of a tourniquet to control bleeding in the civilian setting by first aid providers. One LOE 4 retrospective study of 11 patients on the use of paramedic application of tourniquets in a community setting[156] showed that tourniquets are effective and can be used by trained professionals without complications. Two LOE 5 retrospective studies[148,149] and 2 LOE 5 prospective studies[150,157] documented the effectiveness of tourniquets in controlling extremity hemorrhage on the battlefield.

Two LOE 5 studies,[158,159] 1 LOE 5 study,[160] and 1 LOE 2 prospective randomized study[161] tested different tourniquets for ease of volunteer application and effectiveness and showed that commercially available devices are safer than improvised ones; in 1 study,[150] only 25% of improvised tourniquets were effective. Three commercially available tourniquets that have been found to be reliable in combat and experimental situations are the Combat Application Tourniquet (CAT®), the Special Operations Forces Tactical Tourniquet (SOFTT®), and the Emergency and Military Tourniquet (EMT®).[150,161]

One LOE 5 prospective but not randomized study[162] on prolonged tourniquet application during surgery and 2 LOE 5 animal studies[163,164] showed that local hypothermia of the extremity protected against adverse effects of ischemia.

*Treatment Recommendation*
In civilian settings, tourniquets should only be used for control of extremity hemorrhage if direct pressure is not adequate or possible (eg, multiple injuries, inaccessible wounds, multiple victims). Specifically designed tourniquets are superior to improvised ones but should only be used with proper training. There is insufficient evidence to determine how long a tourniquet can remain in place safely. Cooling of the distal limb should be considered if a tourniquet needs to remain in place for a prolonged period of time.

*Knowledge Gaps*
Which specifically designed tourniquet is best and easiest to use in a civilian setting?

Do improvised tourniquets stop bleeding in a civilian setting? Does cooling of an extremity after application of a tourniquet in humans prolong the safety margin of tourniquets? In delayed-help environments, can tourniquets be loosened to reassess or stop bleeding with direct pressure when conditions warrant (eg, scene safety improves, access to wounds improves, or additional resources are available)?

### *Hemostatic Agents*[FA-404B, FA-404C, FA-404D]

*Consensus on Science*
Evidence from 4 LOE 4 studies in adults[165–168] showed a significant improvement compared with standard treatment for out-of-hospital control of life-threatening bleeding when topical hemostatic agents were used by trained individuals. This beneficial outcome was supported by 21 LOE 5 animal studies.[168–186] Effectiveness varied substantially among the agents used. Adverse effects of some agents included tissue destruction with induction of a proembolic state and potential thermal injury.

*Treatment Recommendation*
The out-of-hospital application of a topical hemostatic agent to control life-threatening bleeding not controlled by standard techniques is reasonable, but the best agent and the conditions under which it should be applied are not known.

*Knowledge Gaps*
Which hemostatic agents are most effective as a first aid measure? Which hemostatic agents have the least side effects when used by first aid providers? How do hemostatic agents compare with direct pressure and tourniquets? When should they be used?

## Straightening an Angulated Fracture[FA-602A, FA-602B]

*Consensus on Science*
One LOE 4 prehospital study[187] and 6 LOE 5 hospital studies and reviews[188–193] showed no evidence that straightening of an angulated suspected long bone fracture shortens healing time or reduces pain prior to permanent fixation. One LOE 4[194] study showed reduced pain with splinting without straightening. One LOE 5[195] study on cadavers suggested that straightening angulated fractures decreases compartment size and might increase compartment pressure. One LOE 5 study[196] showed no evidence that traction splints could have prevented any hemodynamic compromise in isolated long bone leg fractures in children.

*Treatment Recommendation*
In general, there should be no attempt to manipulate a suspected extremity fracture.

*Knowledge Gaps*
In the first aid setting, what are the benefits/risks of realigning long bones that are angulated and presumed to be fractured? Does travel time to a definitive healthcare facility make a difference? Does the application of traction reduce blood loss?

## Stabilizing Suspected Extremity Fracture[FA-605A]

*Consensus on Science*
There are no published studies that evaluate the change in pain or functional recovery when a first aid provider stabilizes a suspected extremity fracture.

*Treatment Recommendation*
There is no evidence for or against manual stabilization or splinting for a suspected extremity fracture by first aid providers.

*Knowledge Gaps*
Is there any benefit in terms of pain reduction or healing if first aid providers stabilize a suspected fracture? Is there any harm in stabilizing a suspected fracture as a first aid maneuver? Does distance from a definitive healthcare facility make a difference in effectiveness of stabilization?

## Musculoskeletal Injury and Heat Application[FA-604A, FA-604B]

*Consensus on Science*
In 1 LOE 1 study involving only 30 subjects[197] with ankle sprains, cold was more effective than heat or alternating cold and heat for reducing ankle edema within 24 hours following a musculoskeletal injury.

*Treatment Recommendation*
There is insufficient evidence for or against the application of heat to an acute musculoskeletal injury. Cold application appears to be superior in the early reduction of edema.

## Musculoskeletal Injury and Cold Application[FA-603C]

*Consensus Science*
In 2 LOE 2 studies[198,199] and 1 LOE 5 study,[200] cold application reduced pain, swelling, edema, and the duration of disability after musculoskeletal injury. Evidence from 3 LOE 5 studies[201–203] showed that a mixture of ice and water is more effective in lowering tissue temperature in the injured area than ice alone. Three LOE 5 studies[204–206] showed that the duration of cryotherapy should not exceed 20 minutes. One LOE 1 study[207] demonstrated that intermittent 10-minute applications of ice and water (melting ice water) were as effective as standard ice application for 20 minutes.

*Treatment Recommendation*
Musculoskeletal, including joint, injuries should be treated with the application of ice (crushed or cubed) with water. Cooling time should be interrupted every 20 minutes. Intermittent 10-minute cooling is also acceptable if 20 minutes of cooling causes discomfort.

## Topical Agents and Dressings[FA-801B]

*Consensus on Science*
Evidence from 2 small, nonrandomized LOE 2 trials in volunteers[208,209] and supportive evidence from 1 LOE 2 human study of other wound types[210] and 3 LOE 5 well-designed animal studies[211–213] demonstrated significantly shorter healing time of abrasions treated with any occlusive dressing or topical antibiotic versus no dressing or topical antibiotic.

*Treatment Recommendation*
After cleaning, superficial traumatic abrasions should be covered with a clean occlusive dressing and/or a topical antibiotic that keeps the wound moist and prevents drying. There are insufficient data to recommend any particular dressing or topical antibiotic.

*Knowledge Gaps*
What are the best topical agent and dressing in the home setting? When should the first aid provider seek additional care for superficial wounds?

## Irrigation of Superficial Wounds[FA-802B]

*Consensus on Science*
Evidence from 6 LOE 1 clinical trials,[214–219] 1 LOE 2 clinical trial,[220] 1 LOE 1 meta-analysis[221] of simple traumatic lacerations in the emergency department, and 6 LOE 5 animal studies[222–227] demonstrated that irrigation is better than no irrigation, that higher irrigation pressures are more effective than lower pressures, that higher volumes are better than lower volumes (within a range of 100 to 1000 mL), and that tap water is as good as (or better than) any other irrigation solution in reducing infection rates. In 1 small LOE 1 clinical study,[228] body temperature saline was more comfortable than cold saline, and in 1 LOE 5 inanimate study,[229] soap and water were more effective than irrigation with saline alone.

*Treatment Recommendation*
Irrigation of acute superficial wounds with a large volume of warm or room temperature tap water from a reliable source (with or without soap) is recommended.

*Knowledge Gaps*
What are the effectiveness and best method of wound irrigation in the home? Is there a benefit to using soap in addition to water in cleaning superficial wounds?

## Eye Injury – Irrigation[FA-1301B]

*Consensus on Science*
There are no human studies comparing irrigation of eyes with tap water and irrigation with another substance following eye exposure to a toxin. Two LOE 5 studies[230,231] support tap water over saline solution for emergency rinsing of caustic burns of the eyes. Three LOE 5 studies[230,232,233] found phosphate buffer, borate buffer eye wash, and amphoteric solutions (Diphoterine®, Previn) to be more effective than water in lowering intraocular pH in caustic burns of the eyes. In a single LOE 5 study,[234] water performed no better than normal saline or isotonic magnesium chloride ($MgCl2$) solution when rinsing eyes exposed to hydrofluoric acid. One LOE 5 study[233] found a specialized rinsing solution for hydrofluoric acid eye burns (Hexafluorine®) to be more efficient than tap water. One LOE 5 study[235] showed little difference between a single lavage of water or an amphoteric solution in removing radioactivity but also found the amphoteric solution to be significantly more effective than water in 3 successive lavages and in an eyewash device.

*Treatment Recommendation*
Immediate irrigation of eyes exposed to a toxin with large amounts of tap water is beneficial.

*Knowledge Gaps*
What is the optimal rinsing method for eyes exposed to a toxin? Does irrigation of ocular hydrofluoric acid burns with water compared with other substances improve outcome? How does the effectiveness of water compare with the effectiveness of other emergency rinsing solutions for ocular burns?

## Human and Animal Bites[FA-1801A]

*Consensus on Science*
Irrigation of bite wounds for the prevention of rabies is supported by 2 LOE 5 animal studies[236,237] and is supported for the prevention of bacterial infection by 1 LOE 3 retrospective human study.[238] Tap water, saline, and soap and water solutions were among the irrigating solutions that were beneficial, although they were not directly compared. Despite multiple recommendations in review literature and common clinical practice, no evidence was found that application of povidone-iodine is beneficial for the treatment of human or animal bites.

*Treatment Recommendation*
Irrigation of human and animal bite wounds with a copious amount of fluid (water or saline) is recommended to minimize the risks of bacterial and rabies infections. There is no evidence for or against any specific irrigation fluid.

## Snake Bite

### *Pressure Immobilization*[FA-1001A]

*Consensus on Science*
One LOE 5 monkey study[239] showed that application of a pressure bandage to create ≈55 mm Hg of pressure and simultaneous immobilization of the bitten extremity with a splint are effective and safe in retarding snake venom uptake into the systemic circulation. One LOE 2 human study[240] and 1 LOE 5 animal study[241] demonstrated that lymphatic flow and "mock venom" uptake can be significantly or almost completely reduced by proper application of pressure and immobilization but that either pressure or immobilization alone was ineffective. No adverse effects were observed within certain prescribed pressure ranges (between 40 and 70 mm Hg for upper, and 55 to 70 mm Hg in lower limbs); a useful and practical field estimation for this pressure range is the application of a comfortably tight bandage that allows the insertion of a finger under it. Theoretically, if a venom produces more local tissue effects than systemic effects, damage may be increased if the venom is "trapped" in 1 place with use of pressure and immobilization. Two LOE 5 animal studies[241,242] demonstrated the effectiveness of pressure and immobilization on survival from the venom of non-neurotoxic North American snakes. Two LOE 5 studies[243,244] using volunteer first aid providers showed that retention of the ability to perform proper pressure/immobilization application is poor.

*Treatment Recommendation*
Properly performed pressure immobilization of extremities should be considered in first aid following snake envenomation.

*Knowledge Gaps*
Does first aid provider compressive wrapping of an extremity bitten by a venomous snake improve outcome? What is the best method to teach the optimal way to apply a compressive dressing? How often does this need to be refreshed for retention?

### *Suction*[FA-1002A]

*Consensus on Science*
In 1 LOE 4 case series descriptive report,[245] suction was effective in treating snake envenomation. In 1 LOE 5 controlled animal study,[246] suction provided no clinical benefit, and death occurred earlier in the animals treated with suction than in the control animals. The author concluded that "suction may be conducive to a more rapid invasion of venom." One LOE 4 retrospective case series[247] concluded that there was little support for the application of suction in the management of snake envenomation. One LOE 5 simulated-snakebite study in human volunteers[248] determined that only 0.04% of a venom load was recovered by a suction device. There was no benefit to application of a suction device for rattlesnake envenomation in an LOE 5 porcine study,[249] and the suction may have caused injury. An LOE 4 case report[250] of the application of suction to a snake envenomation victim demonstrated visual harm to tissue in the region of the application of the suction device.

*Treatment Recommendation*
Suction should not be applied to treat snake envenomation; it is ineffective and may be harmful.

*Knowledge Gaps*
No further studies on suctioning following snake bite are warranted.

## Jellyfish Stings

### *Topical Applications to Prevent Nematocyst Discharge*[FA-1806-2B]

*Consensus on Science*
In 2 LOE 5[251,252] animal studies of jellyfish stings, vinegar prevented further nematocyst discharge. One of these studies[251] supported vinegar use for Olindias sambaquiensis, and the second[252] for the Portuguese man-of-war (Physalia physalis). One LOE 5 animal study[252] supported the use of a baking soda slurry to decrease further nematocyst release. One LOE 1 study[253] and 1 LOE 2 study[254] concluded that pain cannot be diminished with use of a commercial aerosol spray, meat tenderizer, or freshwater wash and that papain, meat tenderizer, and vinegar are less effective than heat in relieving pain from acute jellyfish stings.

*Treatment Recommendation*
Jellyfish stings should be liberally washed with vinegar (4% to 6% acetic acid solution) as soon as possible for at least 30 seconds to prevent further envenomation and/or to inactivate nematocysts. If vinegar is not available, baking soda slurry may be used instead. Topical application of aluminum sulfate or meat tenderizer is not recommended for the relief of pain.

### *Heat or Cold Application*[FA-1806-1B]

*Consensus on Science*
In 2 LOE 2[254,255] and 2 LOE 3 studies,[256,257] hot-water immersion was effective for first aid treatment of pain of jellyfish stings. One LOE 2 study[258] concluded that there is a statistically significant but possibly clinically unimportant reduction in pain with application of dry hot or cold packs in comparison with dry thermo-neutral packs for box jellyfish stings. The response was greatest with hot versus cold packs. In 1 LOE 4 study,[259] cold packs reduced pain, but in 2 LOE 2 studies,[255,258] the use of cold packs produced no significant relief of pain.

*Treatment Recommendation*
After the nematocysts are removed or deactivated, the pain caused by jellyfish stings should be treated with hot-water immersion when possible. The victim should be instructed to

take a hot shower or immerse the affected part in hot water (temperature as hot as tolerated, or at 45°C if there is the capability to regulate temperature) as soon as possible. The immersion should continue for at least 20 minutes, or for as long as pain persists. If hot water is not available, dry hot packs or, as a second choice, dry cold packs may also be helpful in decreasing pain.

#### *Pressure Immobilization Bandage*[FA-1806-3B]

*Consensus on Science*
Two LOE 5 animal studies[260,261] showed fair to good evidence that the application of pressure with an immobilization bandage causes further release of venom, even from already fired nematocysts.

*Treatment Recommendation*
Pressure immobilization bandages are not recommended for the treatment of jellyfish stings.

*Knowledge Gaps*
Almost all evidence-based research on the best first aid treatment for jellyfish stings involves species of jellyfish found in Indo-Pacific waters. More research is needed on species found in other waters (eg, Atlantic Ocean). More specific research on the best first aid treatment of jellyfish stings is needed.

## Environmental Emergencies

### Summary

The literature on the first aid treatment of frostbite was reviewed. There continues to be evidence against thawing of a frozen body part if there is any chance of refreezing. The evidence is not clear at this time regarding the benefit of nonsteroidal anti-inflammatory agents as a first aid treatment for frostbite. There is evidence against the use of chemical warmers since they have been demonstrated to be capable of reaching temperatures that could damage tissues.

Oral fluid replacement has been found to be as effective as intravenous fluid in exercise- or heat-induced hypohydration. The best fluid appears to be a carbohydrate-electrolyte mixture.

### Cold Injury

#### *Rewarming Frostbite*[FA-901B]

*Consensus on Science*
Seven LOE 5 animal studies[262–268] of frostbite injury demonstrated a beneficial effect of rapid rewarming in water baths between 37°C and 42°C for 20 to 30 minutes. Beneficial outcomes included the return of venous circulation, arterial circulation, and/or microcirculation, as well as decreased tissue loss (as measured by paw volume, level of tissue necrosis, or amputation). Three LOE 4 case series of frostbite victims[269–271] treated with rewarming protocols demonstrated a trend toward improved outcome (ie, reduced tissue loss) when rewarming was rapid versus gradual or at room temperature. Two LOE 4 case series[269,270] also described severe tissue loss when frostbitten tissue was thawed and then refrozen or was rewarmed with a dry heat source. One LOE 5 bench study[272] of commercially available disposable chemical hand and foot warmers found that temperatures created by these chemical warmers reached 69°C to 74°C. In 1 LOE 4 case series[273] and 1 LOE 4 cohort study[274] of severe frostbite without perfusion after rewarming treatment with intravenous or intra-arterial tissue plasminogen activator (tPA), the amputation rate was decreased significantly when treatment was performed within 24 hours of injury.

*Treatment Recommendation*
When providing first aid to a victim of frostbite, rewarming of frozen body parts is only beneficial if there is no risk of refreezing. For severe frostbite, rewarming should be accomplished within 24 hours.

Rewarming is best achieved by immersing the affected part in water between 37°C and 40°C (ie, body temperature) for 20 to 30 minutes. Chemical warmers should not be placed directly on frostbitten tissue because they can reach temperatures that can cause burns. Following rewarming, efforts should be made to protect frostbitten parts from refreezing and to quickly evacuate the victim for further care.

*Knowledge Gaps*
At what interval from injury (eg, 24, 48, or 72 hours) is rewarming at the site of injury no longer beneficial? If a warm-water bath is not available, but chemical hand warmers are, how long should they be applied to frostbitten tissue?

#### *Anti-inflammatory Agents*[FA-902B]

*Consensus on Science*
Evidence from 1 LOE 2 cohort study[275] showed a significant reduction in morbidity, a reduction in tissue loss, and a decrease in hospital stay for victims of localized cold injury treated with ibuprofen 12 mg/kg per day and topical aloe vera (n=56) versus standard treatment (n=98). Groups were not matched for size or degree of injury. Evidence from 1 LOE 3 bench study[276] demonstrated elevated levels of inflammatory mediators in blister fluid of frostbite patients. In 6 LOE 5 animal studies,[264,277–281] frostbite treatment that included administration of a nonsteroidal anti-inflammatory drug (NSAID) either before or following injury was beneficial. Two LOE 4 case series[273,282] reported healing without major tissue loss when an NSAID was included in treatment protocols, while 2 LOE 4 studies[271,283] did not clearly describe outcomes. One LOE 4 case series[273] and 1 LOE 3 cohort study[274] found dramatic reductions in amputation rates (33/174 digits at risk[273] and 10% versus 41%,[274] respectively) following use of intravenous or intra-arterial tPA plus heparin within 24 hours of injury for severe frostbite with absent pulses following rewarming.

*Treatment Recommendations*
There is insufficient evidence for or against the use of ibuprofen or other NSAIDs as a first aid measure for victims of frostbite.

*Knowledge Gaps*
Good-quality research is needed to establish whether there is a true benefit from the use of NSAIDs for frostbite in humans, both in the prethaw and postthaw phases of injury. Does the early use of NSAIDs for frostbite lead to an increase in bleeding complications in patients treated with tPA for ongoing (warm) ischemia following thawing?

### Heat Injury

#### *Fluid Treatment of Hypohydration*[FA-1705A, FA-1706A]

*Consensus on Science*
The level of evidence regarding the treatment of hypohydration is extremely low because studies have been per-

formed in volunteers and are underpowered, and the target of hypohydration is generally less than 2% dehydrated. One LOE 2[284] and 1 LOE 5[285] study showed that oral rehydration is as effective as intravenous rehydration. In a model of exercise- and heat-induced mild hypohydration, 1 LOE 1 study[286] and 8 LOE 2 studies[284,287–293] demonstrated that oral carbohydrate/electrolyte solutions were more effective than water in restoring intravascular volume. One LOE 2 study[293] showed that the volume consumed must exceed the volume lost in sweat. In 1 LOE 2 study,[287] fluids containing a mixture of glucose and fructose led to a more rapid hydration that those containing only glucose, but 1 LOE 2 study[288] showed that carbohydrate concentration above 6% compromised fluid absorption. One LOE 2 study[294] showed that milk is more effective than water for fluid replacement for hypohydration.

*Treatment Recommendations*
Exercise-related hypohydration should be treated with an oral carbohydrate/electrolyte solution. Milk is an acceptable alternative. The volume consumed should exceed the volume lost in sweat.

*Knowledge Gaps*
What is the best fluid composition for oral rehydration? Are there benefits of cooling with water immersion versus water spray?

## Education

Because education in first aid continues to be undocumented in a scholarly way, many questions remain. What is the best way to teach first aid skills? Evidence shows a deterioration of skills almost from the moment that a course is completed. How does one ensure that the skills, once learned, are retained so they are available when needed? The progress in technology has unleashed an ever-growing number of attractive simulation techniques but no data that they improve knowledge or skill competencies. An evaluation of the literature only raises more questions but does not provide any definitive answers.

### Evaluation of Progress and Performance[FA-2102A]

*Consensus on Science*
There are no data regarding the optimal method to evaluate and monitor progress in first aid education. Four LOE 1 studies[295–298] and 1 LOE 2 study[299] with well-defined populations explored evaluation during resuscitation training, but no conclusions can be drawn because a variety of methods were used.

*Treatment Recommendation*
There are no data for or against any method of evaluating or monitoring a first aid provider trainee's educational progress.

*Knowledge Gaps*
Well-designed studies are needed to evaluate the optimal evaluation strategy (method, timing, duration) of first aid courses.

### Simulation in First Aid Education[FA-2101A, FA-2101B]

*Consensus on Science*
There are no studies evaluating the effect of simulation in first aid education. In other medical educational settings, simulations have been used successfully both in education and in testing. Five LOE 1[300–304] and 10 LOE 2[305–314] studies showed the benefit of using simulations as an educational tool. One LOE 1 study[315] showed the benefit of using simulation as an evaluative tool.

One LOE 1 study,[300] 4 LOE 2 studies,[308,311,313,314] 2 LOE 3 studies,[316,317] and 1 LOE 5 study[318] showed that use of simulation in medical education improved learning outcomes.

Two LOE 2 studies[300,319] showed that ACLS training using simulation is an effective training method for initial patient management skills. In these studies, simulation tools and simulated patients produced identical or better educational outcomes than either traditional lecture-based or clinical-based learning for ACLS, advanced trauma life support, or the equivalent.

*Treatment Recommendation*
In first aid training, the use of simulation appears to improve participant learning if it is accompanied by other effective teaching methods.

*Knowledge Gaps*
Well-designed studies to compare training using simulation with didactic lectures and other pedagogic methods are needed. Well-designed studies on the efficiency of first aid providers trained using simulation versus other pedagogic methods are also needed.

### Frequency of First Aid Retraining[FA-2103A]

*Consensus on Science*
There are no data to support a recommendation for the frequency needed for first aid retraining. Four LOE 1 studies[320–323] and 1 LOE 2 study[299] demonstrated a loss of skills between 3 and 6 months following BLS training. Evidence from 1 study[299] suggested that video retraining in first aid at 1 week, 1 month, and 13 months after initial training produces better retention of skills than no retraining over this period.

*Treatment Recommendation*
There are insufficient data to recommend a specific frequency of retraining in first aid in order to retain skills and knowledge.

*Knowledge Gaps*
Well-designed studies are needed to help define the optimal retraining/update strategy (timing, duration, etc). Well-designed studies are needed to evaluate self-instruction versus a traditional first aid refresher course.

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# Disclosures

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*Modest.

†Significant.

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*Modest.

†Significant.

# Appendix

## CoSTR Part 13: Worksheet Appendix

| Task Force | WS ID | PICO Title | Short Title | Authors | URL |
|---|---|---|---|---|---|
| First Aid | FA-1001A | In victims of a venomous snakebite (P) does pressure immobilization (I) of an extremity, when compared to no therapy (C), improve outcome (O)? | Compression wrapping in snakebites | Christopher P. Holstege | http://circ.ahajournals.org/site/C2010/FA-1001A.pdf |
| First Aid | FA-1002A | In victims of a venomous snakebite (P) does application of suction (I) to the envenomation site, when compared to no therapy (C), improve outcome (O)? | Suction for snake bite | Christopher P. Holstege | http://circ.ahajournals.org/site/C2010/FA-1002A.pdf |
| First Aid | FA-101C | Does the use of cooling (I) improve healing and pain control (O) in patients after thermal injuries (P)? | Cooling of thermal burn | Adam J. Singer, Jeff Guy | http://circ.ahajournals.org/site/C2010/FA-101C.pdf |
| First Aid | FA-103A | In patients with burns (P), does leaving the burn blister intact (I), compared with removing the blister (C), improve healing and pain control (O)? | Burn blister treatment | Adam J. Singer | http://circ.ahajournals.org/site/C2010/FA-103A.pdf |
| First Aid | FA-104C | Does the use of wet dressings (I) compared with dry dressings (C) improve healing and pain control (O) in patients after thermal injuries (P)? | Application of dressing for thermal burn | Adam J. Singer, Jeff Guy | http://circ.ahajournals.org/site/C2010/FA-104C.pdf |
| First Aid | FA-1201A | In a patient (P) experiencing difficulty breathing, does administration of a bronchodilator (I) compared with not administration (C) improve outcome (O)? | Bronchodilator administration | Rita Herrington, Jeff Woodin | http://circ.ahajournals.org/site/C2010/FA-1201A.pdf |
| First Aid | FA-1204A | In patients with chest pain (P), does helping administer aspirin (I), compared with not administering aspirin (C), improve outcomes (O)? | Lay rescuer medication administration | Rita Herrington | http://circ.ahajournals.org/site/C2010/FA-1204A.pdf |
| First Aid | FA-1204B | In patients with chest pain (P), does helping administer aspirin (I), compared with not administering aspirin (C), improve outcomes (O)? | Lay rescuer medication administration | Adam J. Singer | http://circ.ahajournals.org/site/C2010/FA-1204B.pdf |
| First Aid | FA-1301B | Does irrigation of eyes exposed to a toxin with water compared to other substances improve outcome? | Irrigation of eyes | Ralph Shenefelt | http://circ.ahajournals.org/site/C2010/FA-1301B.pdf |
| First Aid | FA-1401B | In persons with acute skin exposure to potentially toxic substances, does irrigation with ambient temperature, not specifically sterilized water compared with no irrigation lead to less morbidity and/or mortality? | Irrigation of skin for toxic substance exposure | Kristian L. Arnold | http://circ.ahajournals.org/site/C2010/FA-1401B.pdf |
| First Aid | FA-1601A | What is the optimal position for a person in shock? Does elevating the legs improve outcome? | Optimal position for shock victim | Jonathan L. Epstein | http://circ.ahajournals.org/site/C2010/FA-1601A.pdf |
| First Aid | FA-1601C | What is the optimal position for a person in shock? Does elevating the legs improve outcome? | Optimal position for shock victim | Susanne Schunder-Tatzber | http://circ.ahajournals.org/site/C2010/FA-1601C.pdf |
| First Aid | FA-1705A | In hypohydrated individuals (P) does providing fluids (I) as compared to providing no fluids (C) decrease symptoms (O)? In hypohydrated individuals (P) does a carbohydrate-electrolyte beverage (I) compared to water (C) rehydrate individuals (O)? | Carbohydrate-electrolyte vs water in dehydration | Susan W. Yeargin | http://circ.ahajournals.org/site/C2010/FA-1705A.pdf |
| First Aid | FA-1706A | In victims with heat exhaustion or heat syncope (P) what treatment (I) as opposed to no treatment (C) decreases/resolves symptoms (O)? | Best fluid for oral rehydration | Susan W. Yeargin | http://circ.ahajournals.org/site/C2010/FA-1706A.pdf |
| First Aid | FA-1801A | Is there a treatment for human or animal bites that improves outcome? | First aid for human and animal bites | Jeffrey D. Ferguson | http://circ.ahajournals.org/site/C2010/FA-1801A.pdf |
| First Aid | FA-1806-1B | In individuals who have received a jellyfish sting (P), does the application of heat or cold (I) decrease pain or prevent worsening (O) as compared to not applying heat or cold (C)? | Temperature treatment for jellyfish sting | Neal Pollock, Jeanette Previdi, Karyl Reid, Rick Caissie | http://circ.ahajournals.org/site/C2010/FA-1806-1B.pdf |
| First Aid | FA-1806-2B | In individuals who have received a jellyfish sting (P), does the application of a topical (i.e. vinegar, baking soda, meat tenderizer, or commercial product) (I) decrease pain or prevent worsening (O) as compared to not applying a topical (C)? | Topical application for jellyfish sting | Neal Pollock, Jeanette Previdi, Karyl Reid, Rick Caissie | http://circ.ahajournals.org/site/C2010/FA-1806-2B.pdf |
| First Aid | FA-1806-3B | In individuals who have received a jellyfish sting (P), does the application of a pressure immobilization bandage (I) decrease pain or prevent worsening (O) as compared to not applying a pressure immobilization bandage (C)? | Pressure immobilzation bandage for jellyfish sting | Neal Pollock, Jeanette Previdi, Karyl Reid, Rick Caissie | http://circ.ahajournals.org/site/C2010/FA-1806-3B.pdf |
| First Aid | FA-2001A | In breathing but unresponsive victims (P), does positioning the victim in a lateral, side-lying, recovery position (i.e. lateral recumbent or modified HAINES) (I) decrease complications (O) as compared to leaving them in a supine position (C)? | Positioning breathing but unresponsive victim | Jeanette Previdi, Karyl Reid | http://circ.ahajournals.org/site/C2010/FA-2001A.pdf |
| First Aid | FA-201B | In a patient who ingests a potentially poisonous substance (P), does the administration of activated charcoal (I), when compared to no administration (C), improve that patient's outcome (O)? | | Christopher P. Holstege, Jeffrey D. Ferguson | http://circ.ahajournals.org/site/C2010/FA-201B.pdf |

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CoSTR Part 13: Worksheet Appendix, *Continued*

| Task Force | WS ID | PICO Title | Short Title | Authors | URL |
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| First Aid | FA-202A | In victims with oral caustic substance poisoning, does the early administration of milk or water as compared to nothing by mouth, improve outcome? | Use of milk or water for oral caustic poisoning | Christopher P. Holstege | http://circ.ahajournals.org/site/C2010/FA-202A.pdf |
| First Aid | FA-203B | In victims with oral poisoning does the administration of syrup of ipecac by lay public improve outcome? | Early ipecac administration in oral poisoning | Sue O. Kell, Christopher P. Holstege | http://circ.ahajournals.org/site/C2010/FA-203B.pdf |
| First Aid | FA-2101A | In First Aid Training (P), does the use of simulation (I) when compared with not using simulation (C) improve the participant effectiveness (O)? | Simulated patients in First Aid training | Pascal Cassan, Sue O. Kell, Daniel Meyran, Vincent Hubert, Cara B. Doughty | http://circ.ahajournals.org/site/C2010/FA-2101A.pdf |
| First Aid | FA-2101B | In First Aid Training (P), does the use of simulation (I) when compared with not using simulation (C) improve the participant effectiveness (O)? | Simulated patients in First Aid training | Sue O. Kell | http://circ.ahajournals.org/site/C2010/FA-2101B.pdf |
| First Aid | FA-2102A | In First Aid Training, which techniques of monitoring and evaluation of progress and performance is able to show the improvement of the participant skills? | Monitoring and evaluation of First Aid performance | Pascal Cassan, Daniel Meyran, Vincent Hubert | http://circ.ahajournals.org/site/C2010/FA-2102A.pdf |
| First Aid | FA-2103A | In First Aid Training (P) how frequently are retraining/ update sessions required (I) in order to maintain the participant's skills (O). | First Aid retraining | Pascal Cassan, Daniel Meyran, Vincent Hubert | http://circ.ahajournals.org/site/C2010/FA-2103A.pdf |
| First Aid | FA-2201A | Helmet removal after motorcycle accident–When? How? One–helper/ two helper techniques? | Motorcycle helmet removal | David Berry | http://circ.ahajournals.org/site/C2010/FA-2201A.pdf |
| First Aid | FA-2301B | Which position might be the best for victims of possible head injury if they are unconsciousness? | Positioning possible head injury | Hong Shen | http://circ.ahajournals.org/site/C2010/FA-2301B.pdf |
| First Aid | FA-2401A | What is the best first aid treatment of an open chest wound? | First aid treatment for open chest wound | Hong Shen | http://circ.ahajournals.org/site/C2010/FA-2401A.pdf |
| First Aid | FA-302A | Does the administration of a second dose of injectable epinephrine improve outcome from a severe allergic reaction? | Second dose of injectable epinephrine | Kristian L. Arnold | http://circ.ahajournals.org/site/C2010/FA-302A.pdf |
| First Aid | FA-302B | Does the administration of a second dose of injectable epinephrine improve outcome from a severe allergic reaction? | Second dose of injectable epinephrine | Brad Yeargin | http://circ.ahajournals.org/site/C2010/FA-302B.pdf |
| First Aid | FA-303B | Can the first aid provider appropriately recognize the signs and symptoms of anaphylaxis? | Recognition of anaphylaxis | Jonathan L. Epstein, Norda Ratcliff | http://circ.ahajournals.org/site/C2010/FA-303B.pdf |
| First Aid | FA-401C | In a bleeding victim do direct pressure, indirect pressure (pressure points), or elevation of the bleeding part help control bleeding as compared to doing nothing? | Control of bleeding | Leon Chameides, Jeff Guy, Jeffrey L. Pellegrino | http://circ.ahajournals.org/site/C2010/FA-401C.pdf |
| First Aid | FA-402C | When direct pressure fails to stop bleeding does the administration of a tourniquet improve outcome? | Tourniquet if direct pressure fails | Leon Chameides, Jeff Guy, Jeffrey L. Pellegrino | http://circ.ahajournals.org/site/C2010/FA-402C.pdf |
| First Aid | FA-402D | When direct pressure fails to stop bleeding does the administration of a tourniquet improve outcome? | Tourniquet if direct pressure fails | Susanne Schunder-Tatzber | http://circ.ahajournals.org/site/C2010/FA-402D.pdf |
| First Aid | FA-403A | In which circumstances are the application of a tourniquet appropriate? | Appropriate circumstances for tourniquet | Jeffrey S. Guy, Jeffrey L. Pellegrino | http://circ.ahajournals.org/site/C2010/FA-403A.pdf |
| First Aid | FA-403C | In which circumstances are the application of a tourniquet appropriate? | Appropriate circumstances for tourniquet | Leon Chameides | http://circ.ahajournals.org/site/C2010/FA-403C.pdf |
| First Aid | FA-404B | In patients with severe external bleeding (P), does the application of topical haemostatic agents (I) when compared with usual care (C) improve outcome? (O). | Topical hemostatic agents if direct pressure fails | Barbara Caracci | http://circ.ahajournals.org/site/C2010/FA-404B.pdf |
| First Aid | FA-404C | In patients with severe external bleeding (P), does the application of topical haemostatic agents (I) when compared with usual care (C) improve outcome? (O). | Topical hemostatic agents if direct pressure fails | Richard N. Bradley | http://circ.ahajournals.org/site/C2010/FA-404C.pdf |
| First Aid | FA-404D | In patients with severe external bleeding (P), does the application of topical haemostatic agents (I) when compared with usual care (C) improve outcome? (O). | Topical hemostatic agents if direct pressure fails | Pascal Cassan | http://circ.ahajournals.org/site/C2010/FA-404D.pdf |
| First Aid | FA-501A | In victims with suspected cervical spinal injury does spinal immobilization benefit the patient over doing nothing in outcome? | Spine immobilization | William Smith, Juan Acosta, Arthur Cooper, Paul Satterlee | http://circ.ahajournals.org/site/C2010/FA-501A.pdf |
| First Aid | FA-501D | In victims with suspected cervical spinal injury does spinal immobilization benefit the patient over doing nothing in outcome? | Spine immobilization | Paul Satterlee, William Smith, Arthur Cooper, Juan Acosta | http://circ.ahajournals.org/site/C2010/FA-501D.pdf |
| First Aid | FA-502E | In victims with trauma, when should one suspect cervical spinal injury? | Cervical spine injury prognostication | Jonathan I. Groner, William Smith | http://circ.ahajournals.org/site/C2010/FA-502E.pdf |

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**CoSTR Part 13: Worksheet Appendix, *Continued***

| Task Force | WS ID | PICO Title | Short Title | Authors | URL |
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| First Aid | FA-503A | In victims suspected to have spinal injury, what method(s) should be used for spinal motion restriction by the first aid provider? Which are effective methods of spinal motion restriction in persons with suspected cervical spinal injury? | Spinal motion restriction methods in suspected cervical spine injury | William Smith, William Raynovich, Juan Acosta, Arthur Cooper | http://circ.ahajournals.org/site/C2010/FA-503A.pdf |
| First Aid | FA-601A | In a patient with a closed joint injury (P), does the application of a compression bandage by a lay rescuer (I) decrease pain and swelling as compared to not applying a compression bandage (O)? | Compression bandage | Rick Caissie | http://circ.ahajournals.org/site/C2010/FA-601A.pdf |
| First Aid | FA-601B | In a patient with a closed joint injury (P), does the application of a compression bandage by a lay rescuer (I) decrease pain and swelling as compared to not applying a compression bandage (O)? | Compression bandage | Rita Herrington | http://circ.ahajournals.org/site/C2010/FA-601B.pdf |
| First Aid | FA-602A | Does straightening angulated suspected long bone fractures when compared with immobilizing in found position, improve the (management of pain; safer transport; prognosis)? | Suspected long bone fracture | Jeffrey L. Pellegrino | http://circ.ahajournals.org/site/C2010/FA-602A.pdf |
| First Aid | FA-602B | Does straightening angulated suspected long bone fractures when compared with immobilizing in found position, improve the (management of pain; safer transport; prognosis)? | Suspected long bone fracture | Kristian L. Arnold | http://circ.ahajournals.org/site/C2010/FA-602B.pdf |
| First Aid | FA-603C | Does cooling of a musculoskeletal injury improve outcome? And if so, what is the optimal method of cooling? | Cooling musculoskeletal injury | Keiichi Ikegami, Cara B. Doughty | http://circ.ahajournals.org/site/C2010/FA-603C.pdf |
| First Aid | FA-604A | In individuals with musculoskeletal injury (P) does heat application (I) as opposed to no treatment (C) improve tissue healing? In individuals with musculoskeletal injury (P) which type of heat application (I) compared to other methods is more effective (C) and improves healing better (O)? | Heating musculoskeletal injury | Blaine C. Long | http://circ.ahajournals.org/site/C2010/FA-604A.pdf |
| First Aid | FA-604B | In individuals with musculoskeletal injury (P) does heat application (I) as opposed to no treatment (C) improve tissue healing? In individuals with musculoskeletal injury (P) which type of heat application (I) compared to other methods is more effective (C) and improves healing better (O)? | Heating musculoskeletal injury | Lisa S. Jutte | http://circ.ahajournals.org/site/C2010/FA-604B.pdf |
| First Aid | FA-605A | In patients with suspected extremity fractures (P), does stabilization (I) compared to no stabilization (C) reduce pain and lead to better functional recovery (O)? | Stabilizing extremity | Richard N. Bradley | http://circ.ahajournals.org/site/C2010/FA-605A.pdf |
| First Aid | FA-606B | What is the appropriate method of preservation of the amputated part? | Preservation of amputated body part | Andrew MacPherson | http://circ.ahajournals.org/site/C2010/FA-606B.pdf |
| First Aid | FA-701A | In patients with difficulty breathing or complaints of chest pain, does administration of oxygen improve outcome? | Oxygen administration | Louis Gonzales | http://circ.ahajournals.org/site/C2010/FA-701A.pdf |
| First Aid | FA-801B | Does the use of a topical agent and/or dressing (I) for superficial wounds (I) improve healing (O) when compared to no topical therapy (C)? | Topical agent or dressing | Adam J. Singer, Cara B. Doughty, Samantha Roberts | http://circ.ahajournals.org/site/C2010/FA-801B.pdf |
| First Aid | FA-802B | Does the use of irrigation (I) compared with no irrigation (C) improve healing (O) in patients with superficial wounds (P)? | Irrigation of a superficial wound | Adam J. Singer | http://circ.ahajournals.org/site/C2010/FA-802B.pdf |
| First Aid | FA-901B | Does rewarming of a localized cold injury (frostbite) improve outcome? | Rewarming frostbite | Eunice M. Singletary, Olav Aasland | http://circ.ahajournals.org/site/C2010/FA-901B.pdf |
| First Aid | FA-902B | In patients with frostbite, does the use of an anti-inflammatory, when compared with usual care, improve outcome? | Anti-inflammatory and frostbite | Eunice M. Singletary, Olav Aasland | http://circ.ahajournals.org/site/C2010/FA-902B.pdf |

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KEY WORDS: arrhythmia ■ cardiac arrest ■ cardiopulmonary resuscitation ■ resuscitation

# Correction

In the article by Markenson et al, "Part 13: First Aid: 2010 American Heart Association and American Red Cross International Consensus on First Aid Science With Treatment Recommendations," which published online October 18, 2010, and appeared with the October 19, 2010, issue of the journal (*Circulation.* 2010;122(suppl 2):S582–S605), several corrections were needed.

On page S583, in the Table, the American Safety and Health Institute and Medic First Aid should be listed as members of the International First Aid Science Advisory Board Member Organizations. The word "(Observer)" has been deleted from both entries.

The American Heart Association and the American Red Cross regret listing these organizations as observers.

These corrections have been made to the current online version of the article, which is available at http://circ.ahajournals.org/cgi/reprint/122/16_suppl_2/S582.

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