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AHA/AMERICAN RED CROSS GUIDELINE

2024 American Heart Association and American Red Cross Guidelines for First Aid

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ABSTRACT: Codeveloped by the American Heart Association and the American Red Cross, these guidelines represent the first comprehensive update of first aid treatment recommendations since 2010. Incorporating the results of structured evidence reviews from the International Liaison Committee on Resuscitation, these guidelines cover first aid treatment for critical and common medical, traumatic, environmental, and toxicological conditions. This update emphasizes the continuous evolution of evidence evaluation and the necessity of adapting educational strategies to local needs and diverse community demographics. Existing guidelines remain relevant unless specifically updated in this publication. Key topics that are new, are substantially revised, or have significant new literature include opioid overdose, bleeding control, open chest wounds, spinal motion restriction, hypothermia, frostbite, presyncope, anaphylaxis, snakebite, oxygen administration, and the use of pulse oximetry in first aid, with the inclusion of pediatric-specific guidance as warranted.

Key Words: AHA Scientific Statements ■ American Heart Association ■ emergencies ■ first aid ■ Red Cross ■ wounds and injuries

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TOP 10 TAKE-HOME MESSAGES FOR FIRST AID

1. General care and safety: The first aid provider should provide care within their skill and knowledge set, seeking further medical care as needed, and be mindful of their own safety.
2. First aid for bleeding: When faced with life-threatening bleeding, the first aid provider should apply direct pressure followed by application of a tourniquet or wound packing if the location of the wound is amenable.
3. First aid for chest pain: In adults with acute chest pain, it is recommended that emergency medical services be activated to initiate transport to the closest emergency department. While awaiting the arrival of emergency medical services, first aid providers may encourage alert adults experiencing nontraumatic chest pain to chew and swallow aspirin (162–325 mg) unless the person experiencing pain has a known aspirin allergy or has been advised by a health care professional not to take aspirin.
4. First aid for stroke: The use of a stroke recognition scale such as Face, Arms, Speech, Time is recommended to aid in the recognition of acute stroke in adults and may also be used as an adjunct in pediatrics, although it is not validated in that setting and should not solely be used to identify the broad presentation of stroke in children.
5. First aid for opioid overdose: A first aid provider who encounters a person with suspected opioid overdose who is unresponsive and not breathing normally should activate the emergency response system, provide high-quality cardiopulmonary resuscitation (compressions plus ventilation), and administer naloxone.

*Co–first author and co-chair.
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Nonstandard Abbreviations and Acronyms

AHA	American Heart Association
COR	Class of Recommendation
CPR	cardiopulmonary resuscitation
ED	emergency department
EMS	emergency medical services
FAST	Face, Arm, Speech, Time
ILCOR	International Liaison Committee on Resuscitation
LOE	Level of Evidence
NSAID	nonsteroidal anti-inflammatory drug
PCM	physical counterpressure maneuver
PPE	personal protective equipment
RCT	randomized controlled trial

6. Assistance with administration of prescribed medications: The first aid provider should help a person self-administer prescribed lifesaving medications as needed such as inhaled bronchodilators for asthma and intramuscular epinephrine for anaphylaxis.
7. First aid for open chest wounds: In the first aid setting, it is reasonable to leave an open chest wound exposed to ambient air; to place a clean, nonocclusive, dry dressing such as gauze or a clean piece of cloth; or to place a specialized dressing such as a vented chest seal.
8. First aid for tick bites: First aid providers should remove an attached tick as soon as possible by grasping the head of the tick as close to the skin as possible with tweezers or a commercial tick removal device and pulling upward with steady, even pressure.
9. First aid for seizure: First aid providers should activate emergency medical services for first-time seizures; seizures lasting >5 minutes; multiple seizures without return to normal; seizures in water; seizures with injuries, breathing difficulty, or choking; seizures in infants <6 months of age; and seizures in pregnant individuals or if the person does not return to baseline mental status within 5 to 10 minutes after seizure activity stops.
10. Oxygen and pulse oximetry use in first aid: It is reasonable for first aid providers to use pulse oximetry results as part of a complete assessment of an ill or injured person and in consideration of the many limitations of pulse oximeters. First aid providers should be aware of the potential harms of administration of supplemental oxygen in individuals with known chronic obstructive pulmonary disease and should not provide oxygen over an oxygen saturation of 92%.

INTRODUCTION

Although battlefield first aid training has been documented for centuries, the concept of training members of the lay public is more recent.[1] In 1878, 2 British army officers, Surgeon-Major Peter Shepherd and Colonel Francis Duncan, established the concept of teaching first aid skills to civilians by using a comprehensive first aid curriculum.[2] In the United States, organized training in first aid started in 1903, when Clara Barton, president of the American Red Cross (Red Cross), formed a committee to establish instruction in first aid among industrial workers.[1] In 1911, Red Cross first aid training was expanded to include home nursing and first aid instruction taught by physicians.[3] The first Red Cross textbook on first aid for the general public was published in 1913.[4]

Working in partnership with the International Liaison Committee on Resuscitation (ILCOR), the American Heart Association (AHA) and the Red Cross regularly provide evidence-based treatment recommendations for first aid topics. The last comprehensive review of AHA/Red Cross first aid recommendations was published in 2010,[2] with updates focused on specific topics published in 2015,[1] 2019,[5] and 2020.[6] The recommendations in this document are derived from that work, evidence evaluations from the ILCOR First Aid Task Force,[7–11] and structured evidence evaluations performed by the writing group.

Scope of the Guidelines

First aid is defined as "helping behaviors and initial care provided for an acute illness or injury."[1] First aid can be provided by anyone, including the ill or injured person (self-care), nearby individuals, and trained rescuers with a duty to respond (eg, lifeguards). The scope of first aid provided is based on the first aid provider's level of training, available equipment and resources, overall scenario, and need. First aid competencies include, at any level of training, the following:

- Recognizing, assessing, and prioritizing the need for first aid;
- Providing care by using appropriate knowledge, skills, and behaviors; and
- Recognizing limitations and seeking additional care when needed.[1]

These guidelines are intended to apply to common residential, workplace, and recreational settings. In general, first aid care begins when the first aid provider begins to assess and assist the ill or injured person and continues until the condition no longer requires urgent intervention, emergency medical services (EMS) professionals arrive, or the person arrives at definitive health care (eg, a hospital, urgent care facility, or doctor's office).

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Organization of the Writing Group

The writing group included a diverse group of experts with backgrounds in critical care nursing, emergency medicine, pediatrics, pediatric emergency medicine, critical care, medical toxicology, pharmacology, critical care, trauma, EMS, wilderness medicine, education, research, and nursing. Group members were appointed by the AHA Emergency Cardiovascular Care Science Subcommittee and the Red Cross Scientific Advisory Council, and evidence reviews and knowledge syntheses were reviewed and approved by the AHA Emergency Cardiovascular Care Science Subcommittee and the Red Cross Scientific Advisory Council.

The AHA and the Red Cross have rigorous conflict-of-interest policies and procedures to minimize the risk of bias or improper influence during the development of guidelines. Before appointment, writing group members disclosed all relevant commercial relationships and other potential (including intellectual) conflicts. These procedures are described more fully in "Part 2: Evidence Evaluation and Guidelines Development" in the "2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care."[12] The Writing Group Disclosure Table in this document lists the writing group members' relevant relationships with industry.

METHODOLOGY AND EVIDENCE REVIEW

The writing group members first created and approved a list of first aid topics, drawing on the scope of prior guidelines and new topics that have gained prominence since the 2015 publication. A population, intervention, comparison, and outcome question was created for each topic. Guided by the chairs and with assistance from a professional medical librarian as needed, the writing group performed a structured evidence evaluation for each topic, which was internally peer reviewed. These searches were executed in Medline and the Excerpta Medica Database (Embase) using the Ovid search interface and the Cochrane Central Register of Controlled Trials. ILCOR evidence reviews published since 2015 were reviewed, and the dates of updated searches were harmonized with these reviews to avoid search overlap. Search results were not limited by language or year as long as an English language abstract was available. Final searches were executed in February through December 2023. Structured searches were supplemented by bibliography review and ad hoc searches when needed. Search results were imported into Covidence (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia; https://covidence.org). At least 2 writing group members performed dual screening of the titles and abstracts of all articles identified from each search and identified articles for full-text review. Screening conflicts were resolved between the 2 writing group members and writing group leadership before full-text review. Two writing group members reviewed the full text of all selected articles and applied the information contained to develop treatment recommendations appropriate for each clinical question.

The opioid overdose first aid recommendations are based on guidelines provided by the AHA in 2020,[13,14] which were reaffirmed with additional evidence in 2023,[15] adapted for the first aid provider and setting.

Each draft recommendation was created by a group of 2 writing group members and then reviewed and refined by all writing group members during regular virtual meetings and 2 in-person meetings. Completed draft recommendations were reviewed by organizational leaders in the AHA and the Red Cross, with recommendations incorporated as draft revisions. Final draft recommendations were then externally peer reviewed.

Class of Recommendation and Level of Evidence

Each recommendation was assigned a Class of Recommendation (COR) based on the strength and consistency of the evidence, alternative treatment options, and impact on patients and society (Table 1). Recommendation wording flows in a structured manner based on the COR determination. The Level of Evidence (LOE) is based on the quality, quantity, relevance, and consistency of the available evidence. For each recommendation, the writing group discussed and approved specific recommendation wording and the COR and LOE assignments. In determining the COR, the writing group considered the LOE and other factors, including systems issues, economic factors, and ethical factors such as equity, acceptability, feasibility, and risk of harm. These evidence-review methods, including specific criteria used to determine COR and LOE, are described more fully in "Part 2: Evidence Evaluation and Guidelines Development" of the 2020 guidelines.[12] The writing group members had final authority over and formally approved these recommendations.

Unfortunately, despite improvements in the design and funding support for emergency care research, the overall certainty of the evidence base for first aid science is low. None of the 179 recommendations in these guidelines are supported by Level A evidence (high-quality evidence from >1 randomized controlled trial [RCT] or ≥1 RCTs corroborated by high-quality registry studies). Thirteen recommendations are supported by Level B randomized evidence (moderate evidence from ≥1 RCTs) and 23 by

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Table 1. Applying COR and LOE to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care* (Updated May 2019)

CLASS (STRENGTH) OF RECOMMENDATION	LEVEL (QUALITY) OF EVIDENCE‡
CLASS 1 (STRONG) — **Benefit >>> Risk** **Suggested phrases for writing recommendations:** • Is recommended • Is indicated/useful/effective/beneficial • Should be performed/administered/other • Comparative-Effectiveness Phrases†: – Treatment/strategy A is recommended/indicated in preference to treatment B – Treatment A should be chosen over treatment B	**LEVEL A** • High-quality evidence‡ from more than 1 RCT • Meta-analyses of high-quality RCTs • One or more RCTs corroborated by high-quality registry studies
CLASS 2a (MODERATE) — **Benefit >> Risk** **Suggested phrases for writing recommendations:** • Is reasonable • Can be useful/effective/beneficial • Comparative-Effectiveness Phrases†: – Treatment/strategy A is probably recommended/indicated in preference to treatment B – It is reasonable to choose treatment A over treatment B	**LEVEL B-R (Randomized)** • Moderate-quality evidence‡ from 1 or more RCTs • Meta-analyses of moderate-quality RCTs
CLASS 2b (WEAK) — **Benefit ≥ Risk** **Suggested phrases for writing recommendations:** • May/might be reasonable • May/might be considered • Usefulness/effectiveness is unknown/unclear/uncertain or not well-established	**LEVEL B-NR (Nonrandomized)** • Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies • Meta-analyses of such studies
CLASS 3: No Benefit (MODERATE) (Generally, LOE A or B use only) — **Benefit = Risk** **Suggested phrases for writing recommendations:** • Is not recommended • Is not indicated/useful/effective/beneficial • Should not be performed/administered/other	**LEVEL C-LD (Limited Data)** • Randomized or nonrandomized observational or registry studies with limitations of design or execution • Meta-analyses of such studies • Physiological or mechanistic studies in human subjects
Class 3: Harm (STRONG) — **Risk > Benefit** **Suggested phrases for writing recommendations:** • Potentially harmful • Causes harm • Associated with excess morbidity/mortality • Should not be performed/administered/other	**LEVEL C-EO (Expert Opinion)** • Consensus of expert opinion based on clinical experience

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

Level B nonrandomized evidence. The majority of recommendations are based on Level C evidence, including those based on limited data (65 recommendations) and expert opinion (78 recommendations). Accordingly, the strength of recommendations is weaker than optimal: 82 recommendations are Class 1 (strong) recommendations; many of these are about calling for help. Forty-five Class 2a (moderate) recommendations and 31 Class 2b (weak) recommendations are included in these guidelines. In addition, 8 recommendations are designated Class 3: No Benefit, and 13 recommendations are Class 3: Harm. Clinical trials, thoughtfully designed intervention studies with real-world applicability, and well-controlled observational studies in first aid science are clearly needed.

Guideline Structure

These guidelines are organized into modular knowledge chunks, grouped into discrete modules of information on specific topics or management issues.[16] Each modular knowledge chunk includes a table of recommendations that uses standard AHA nomenclature of COR and LOE. A brief introduction is provided to put the recommendations into context with important background information and overarching management or treatment concepts.

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Recommendation-specific supportive text clarifies the rationale and key study data supporting the recommendations. When appropriate, flow diagrams or additional tables are included. Hyperlinked references facilitate quick access and review.

Document Review and Approval

These guidelines were submitted for blinded peer review to subject-matter experts nominated by the AHA and the Red Cross. Before appointment, all peer reviewers were required to disclose relationships with industry and any other conflicts of interest, and all disclosures were reviewed by AHA journal staff. Peer reviewer feedback was provided for guidelines in draft format and again in final format. All guidelines were reviewed and approved for publication by the AHA Emergency Cardiovascular Care Science Advisory Committee, the Red Cross Scientific Advisory Council, the AHA Scientific Advisory and Coordinating Committee, and the AHA Executive Committee. Comprehensive disclosure information for peer reviewers is listed in the Reviewer Disclosure Table.

These recommendations supersede the last full set of AHA/Red Cross first aid guidelines, published in 2015, and recommendations in the 2019 and 2020 focused updates.

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MAJOR CONCEPTS

Overview

First aid scenarios vary widely, from minor illness and injuries to immediately life-threatening conditions such as heart attack, stroke, major trauma, or overdose. People may require first aid care for a few minutes or many hours, and not all scenes are safe. First aid providers vary in age, physical ability, level of acquired and retained skill, and willingness and ability to act. No single set of guidelines can encompass all scenarios. The philosophical principles

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of beneficence, nonmaleficence, and autonomy are applicable: The first aid provider should assist the ill or injured person as much as possible, avoid causing harm, and respect the right of a person who is alert and capable of decision-making to accept or refuse care.[1]

First aid recommendations do not include actions that legally can be performed only by a health care professional or those actions that require specialized training or equipment. In some cases, a first aid provider may have specialized training and a duty to respond; common examples include lifeguards and members of industrial emergency response teams. Local and institutional protocols and the tenets of advanced training supersede general first aid recommendations.

These guidelines assume that a first aid provider has access to common household items and nonprescription medications but does not have access to specialized medical equipment or monitoring tools. In addition, they are assumed to apply to settings where access to EMS and higher levels of medical care are readily available. Recommendations may need to be altered or amended in rural, wilderness, and other low-resource settings.

General Approach

The first aid provider can improve and empower their response through training and preparation, including maintaining a first aid kit and preparing for setting and activity-related responses such as in the home, at the beach, or while backcountry skiing. The Red Cross' recommended first aid kit content list is detailed in Tables 2 and 3. The first step in the first aid response is to assess the scene for hazards and threats and to take actions to protect oneself, such as using personal protective equipment (PPE). There can be ambiguity in emergencies, and it can be difficult to determine whether help is needed. Deciding to act is the most important first step in the provision of first aid.

The person who may be ill or injured should be assessed with the standard systematic approach taught in a first aid course. First aid providers should assess the ill or injured person by checking for responsiveness, breathing, and potential injuries. Any abnormalities in responsiveness or breathing and any major injuries should be viewed as an emergency and should prompt activation of EMS.

Signs of a first aid emergency requiring professional assistance include (but are not limited to) the following:

- Unresponsiveness or new confusion
- Breathing that is absent, abnormal sounding, too fast, or too slow
- Severe or life-threatening bleeding
- Persistent vomiting or diarrhea
- Pallor, weakness, lethargy, diaphoresis, weak or absent peripheral pulses
- Evidence of allergic reaction such as hives, facial swelling, difficulty breathing, or vomiting
- Loss of vision, hearing, speech, movement, or balance
- Severe pain, including chest and abdominal pain
- Unusual behavior, especially actions that may cause harm (eg, walking into traffic)
- Bites and stings from venomous snakes, scorpions, spiders, and certain insects
- Exposure to toxins and poisons
- Broken and dislocated limbs and joints

Whenever possible, first aid providers should approach from the direction that the person who needs help is facing, so as not to surprise or startle them and cause unnecessary movement. First aid providers should always begin by introducing themselves and their intention and obtaining

Table 2. Minimum Contents for American Red Cross First Aid Kit

Item*	Quantity†	Minimum size
Medical examination gloves	2 pairs	
Adhesive bandage	3 each (4 each [16 total])	1×3 in ¾×3 in Large fingertip Knuckle
Adhesive tape	1	3/8 in×2.5 yd
Topical wound gel or ointment (topical antibiotic)	10	1/57 oz (0.5 g) application
Alcohol-based hand sanitizer	10	1/32 oz
Eye/skin wash, saline solution	1	1 oz
First aid guidebook	1	NA
Supplies to secure dressing, roller bandage	4	2, 3, or 4 in×4 yd
Utility shears/scissors	1	7 in
Splint (compact, moldable splitting device with securing mechanism; eg, roller bandage, elastic bandage, triangular bandage, tape)	1	4.0×24 in
Supplies to control bleeding, sterile pad	8	4×4 in
Tourniquet, manufactured, windless	1	NA
Triangular bandages	2	40×40×56 in
Plastic bag, application of ice, storage of amputations or waste (or instant cold pack)	2	1 qt or 1 gal (4×5 in)
Aspirin	81 mg×4 or 325 mg×1	Low-dose tablet or adult aspirin, chewable
Oral glucose tablet	1 tablet	20 g
Splinter forceps/tweezers	1	NA

Quantities and sizes in red differ from American Red Cross Advisory Council recommendations but are needed if the kit is to meet current American National Standards Institute compliance. Items in red are new additions based on the American National Standards Institute standards for Class A first aid kits or language tidying to maintain consistency with the institute's 2021 standards. NA indicates not applicable.

*All items should be latex free.

†Because of the high probability of specific injuries and illnesses based on occupational data, first aid kits should be provided for a single individual.

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Table 3. Optional Items for American Red Cross First Aid Kit

Item*	Quantity	Minimum size
Breathing barrier, latex-free face shield	1	NA
Foil blanket	1	52×84 in
Antiseptic	10	1/57 oz (0.5 g)
Trauma pad	2	5×9 in
Topical antibiotic application	10	1/57 oz (0.5 g)
Eye covering with means of attachment	1 (2)	2×9 sq in
Burn dressing (gel soaked)	1	4×4 in
Burn treatment	10	1/32 oz (0.9 g)
Hemostatic agent	1	NA
Epinephrine autoinjector	Minimum 1, recommended 2 doses	NA
Hanks Balanced Salt Solution	1	1 fl oz

The table lists optional items to be considered for a first aid kit. Red type indicates the optional items that will allow the kit to meet the 2021 recommendations for an American National Standards Institute Class A first aid kit. NA indicates not applicable.

*All items should be latex free.

the consent of the person or their parent or guardian. If the person is unresponsive or the parent or guardian of a minor is not present, consent to treatment is implied. A calm voice and approach can reduce the person's fear and anxiety. This also allows the first aid provider to determine whether the person is awake and responsive to voice and verbal commands. If the ill or injured person can talk or cry normally, it may be assumed that their airway is open and their breathing is adequate. The first aid provider should communicate with the ill or injured person, explaining what they are doing to help and acting with respect and empathy. Many people with underlying health conditions will wear medical alert jewelry (typically a bracelet or pendant). The first aid provider should quickly look for this to help guide initial evaluation and treatment.

In many cases, an ill or injured person with a normal alertness and responsiveness may be left in the position in which they are most comfortable (usually the position in which they are found) unless there is a need to move them to a different location or position for safety reasons or to facilitate treatment. First aid providers may assess an ill or injured person by asking them questions to determine their mental status or medical history or by more closely examining part of their body (after obtaining consent). The first aid provider should activate EMS as soon as they determine that help is needed. Emergency telecommunicators (911 dispatchers or 911 call takers) can be a valuable source of help in directing first aid actions. If first aid provider is using a mobile phone, they should provide care to the ill or injured person while talking to the emergency dispatcher by activating the phone's speaker function.

Not having first aid equipment is not a barrier to providing first aid. First aid providers may use whatever resources are available to them, and improvised equipment such as dressings and splints may be found among common items. Moreover, the simple act of attending to a frightened person is a compassionate act of first aid in and of itself.

Calling for Help

A crucial early step of first aid intervention is to recognize when help is needed and how to get it. First aid providers should know how to activate an on-site emergency response plan, how and when to access the EMS system, and how to contact the regional poison center (Table 4).

Providing care for someone who is ill or injured should not delay calling for more advanced care if it is needed. However, if the first aid provider is alone with an injured or ill person and there are imminent threats to life involving the ABCs (airway, breathing, circulation), it may be necessary to perform lifesaving emergency interventions such as opening the airway or controlling life-threatening hemorrhage before leaving the person to activate the emergency response system.

Hand Hygiene and PPE

Proper hand hygiene prevents the spread of infections to the first aid provider and the ill or injured person. Hands should be cleaned with soap and water before and after first aid is provided and after contact with bodily fluids and surfaces around the person and handling medical equipment. An alcohol-based hand sanitizer may be used if soap and water are unavailable and the hands are not visibly soiled. If using soap and water, the first aid provider should wash hands for at least 20 seconds, scrubbing all surfaces of the fingers, hands, and wrists. Alcohol-based sanitizers should contain at least 60% ethanol or isopropyl alcohol and should be rubbed over all surfaces of the fingers, hands, and wrists until the sanitizer has dried, ≈30 seconds.

Provider Safety

First aid should not be delayed or deferred because of concerns about disease transmission. However, the use

Table 4. Universal Emergency Telephone Numbers in the United States and Canada

Location	EMS	Poison center
United States	911	1-800-222-1222
Canada	911	1-844-764-7669 (1-844-POISON-X)

EMS indicates emergency medical services.

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of PPE may help protect the first aid provider, the ill or injured person, and any bystanders. PPE minimizes exposure to hazards that cause injuries or illnesses and includes items such as gloves, masks, eye shields, gowns, and aprons. Education on and demonstration of how to perform hand hygiene and to safely put on, take off, and dispose of PPE are integral parts of risk reduction and should be included in all first aid education programs.

Special Populations

Providing first aid requires special consideration of the unique cultures, experiences, and characteristics of people and communities. Special consideration may be beneficial for the following groups.

Various Age Groups

Neonates (<30 days of age) and infants (between 30 days and 1 year of age): Care must be gentle and specialized, with attention to the fragility of their small size. Techniques such as infant cardiopulmonary resuscitation (CPR) require specific knowledge and handling.

Children (1 year of age–beginning of puberty): Communication might be challenging; attempt to calm them and possibly engage their caregiver. Age-appropriate techniques and equipment are essential. Beginning of puberty is defined by appearance of breast buds in girls and axillary hair in boys.

Adolescents: Consider their privacy and emotional concerns, and be sensitive to their potential fear or embarrassment.

Adults: Approach with standard procedures, adjusting for any preexisting conditions or other special needs.

Older people: Be aware of possible preexisting medical conditions, medications, or frailty. Ensure comfort, and take extra time if needed to communicate effectively.

Gender Identity

Respectful language: Use the person's preferred pronouns and name if known.

Consider privacy and sensitivities: Recognize and respect potential sensitivities related to the person's gender identity, especially if their clothing needs to be removed for treatment.

Different Cultures, Religions, and Languages

Cultural sensitivity: Recognize that cultural beliefs and practices may influence how a person reacts to illness or injury.

Religious considerations: Respect religious restrictions or requirements such as modesty, and seek guidance from family or community members if needed.

Language considerations: With appropriate privacy considerations, use translation assistance from bystanders or technology as appropriate.

People Experiencing Homelessness and People Who Use Drugs

Nonjudgmental approach: Approach with compassion and without judgment, focusing on the immediate medical needs.

Cognitively Diverse People

Respect for personal space: Maintain a respectful distance whenever possible because some individuals may have sensory sensitivities. Work with caregivers if possible.

Clear communication: Use simple, clear language and be patient, allowing extra time for responses.

Engage caregivers: If present, caregivers or family members may help with communication or care.

People Who Have Physical Disabilities

Understanding the differences and limitations: Be aware of the specific disability if possible, and adjust your approach accordingly.

Communication aids: Use aids or assistance from caregivers if needed for effective communication.

Victims of Physical or Sexual Violence

Injury and treatment may cause or exacerbate psychological trauma. A sensitive approach using the principles of trauma-informed care may be helpful.[2–4]

First Aid Education

The primary goal of first aid education is to enhance layperson response to emergencies, aiming to increase both the quantity and quality of engagement in treating ill or injured people. This increase in layperson intervention is essential for reducing morbidity and saving lives.[5] Universal access to first aid education is strongly recommended, and its integration into everyday activities is advocated to achieve this goal.[5]

Teaching Methodology

Although there is a lack of extensive RCTs, the combination of health science educational best practices and observational and quasi-experimental studies in first aid education provides a solid foundation for these recommendations. The teaching methodology of first aid is crucial. The "Learn, See, Practice, Prove, Do, Maintain" framework proposed by Sawyer et al[6] incorporates various educational concepts from procedural learning,[6] simulation,[7] and resuscitation science.[8] This model begins with learning, ideally through multimedia resources, followed by real-life demonstrations (seeing). These steps represent a "flipped classroom" model, enhancing advanced learning tasks in the presence of a teacher and peers.[9] Deliberate practice combines appropriate training frequency,[10] low-risk practice environments,[11] and direct observation for feedback.[12,13] Proving involves using valid and reliable assessments to ensure effective learning outcomes.[14] For instance, a first aid provider certificate

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should indicate a learner's ability to positively affect patient outcomes.[15] Maintaining the ability to perform first aid skill sets independently requires intermittent skill refreshers, also called spaced learning.[16,17,18] No educational effort perfectly integrates all aspects of the Learn, See, Practice, Prove, Do, Maintain framework, but it serves as a comprehensive guide for educators planning first aid training, covering content, teaching methods, and evaluation strategies.[19,20]

Local Context

A crucial aspect of education delivery is understanding local needs before implementing an intervention.[20] Community engagement helps tailor the content such as prioritizing anaphylaxis education in schools that have a history of related emergencies or focusing on naloxone administration training for people who are most likely to witness an opioid emergency.[21–25] Programs like Stop the Bleed have gained traction partly because of their relevance to societal issues like mass shootings in America.[26] First aid educators should also focus on communities with historically poor medical outcomes attributable to lack of prior efforts for dedicated first aid education.[5]

After the appropriate first aid topics are selected, decisions on the target audience, educators, additional teaching strategies, and evaluation methods are made.[20] Schools and other community institutions are key venues for universal first aid education. Even young children in schools should be included because they are capable of performing essential first aid tasks.[27] A collaborative approach in which first aid experts and community leaders work together in a train-the-trainer model is ideal.[28] This approach not only facilitates initial learning but also supports ongoing training refreshers.[17] Various methods, including discussions, simulations, and technological innovations such as CPR feedback devices[29] and potential future use of virtual/augmented reality platforms,[30] enhance the learning experience.

Evaluation

Evaluating the impact of first aid education involves aligning learning objectives with appropriate evaluation techniques, considering the constraints of time and resources.[20,31] Educational evaluations should focus on the effects of a course on first aid providers' willingness and ability to provide appropriate first aid rather than just on course enjoyment.[19] Integrating educational efforts with implementation science, quality improvement science, and human factors principles can further enhance education and lead to better patient and provider outcomes.[32]

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GENERAL FIRST AID

Positioning of the Ill or Injured Person

Background

The positioning of the ill or injured person is an important first aid intervention that may affect their safety, airway patency, and sustained injuries. The recovery position, also described as semiprone, lateral recumbent, side lying, and three-quarters prone (Figure 1), has long been recommended for individuals with decreased level of consciousness. Although the recovery position has been the subject of little formal study, its anticipated benefits are to maintain an open airway, prevent aspiration, and provide stability and comfort.[1] However, the recovery position may not be ideal if there are injuries to the spine, hip, or pelvis; if breathing is abnormal; or if CPR is needed.

This topic was the subject of a 2022 ILCOR systematic review.[1] An updated literature search was performed by the writing group in 2023.

Positioning of the Ill or Injured Person for First Aid		
COR	**LOE**	**Recommendations**
1	C-LD	1. If a person requires CPR or rescue breathing (ie, is unresponsive with absent or abnormal breathing), the first aid provider should position the person supine and follow the CPR algorithm.
1	C-EO	2. A first aid provider who is assisting a person with a potentially serious illness or injury should immediately activate the emergency response system.
1	C-EO	3. A first aid provider who is assisting a person with a potentially serious illness or injury should remain with the person until trained rescuers arrive as long as it is safe to do so.
1	C-EO	4. If the area is unsafe, the first aid provider should move an ill or injured person to a safe location if possible and safe for the first aid provider to do so.
1	C-EO	5. If a person has been injured, is responsive, and is breathing normally and the nature of the injury suggests a neck, back, hip, or pelvic injury, the person should be left in the position in which they were found to avoid potential further injury unless the area is unsafe.
1	C-EO	6. An awake and alert person who is having difficulty breathing should be allowed to assume a position most comfortable for breathing, which will be sitting up in most situations.
1	C-EO	7. Individuals who are ill or injured should be protected from hyperthermia or hypothermia due to exposure.
2a	C-LD	8. It is reasonable to position a person with decreased alertness of nontraumatic cause who is breathing normally in a recovery (side-lying) position.

Recommendation-Specific Supportive Text

1. The AHA and the Red Cross provide basic life support algorithms for lay rescuers and health care professionals to perform the initial steps of resuscitation for adults and children, with single rescuer and multiple rescuer procedures.[2,3] These algorithms include checking for responsiveness, shouting for nearby help, activating the emergency response system, assessing respirations, applying an automatic external defibrillator, and initiating

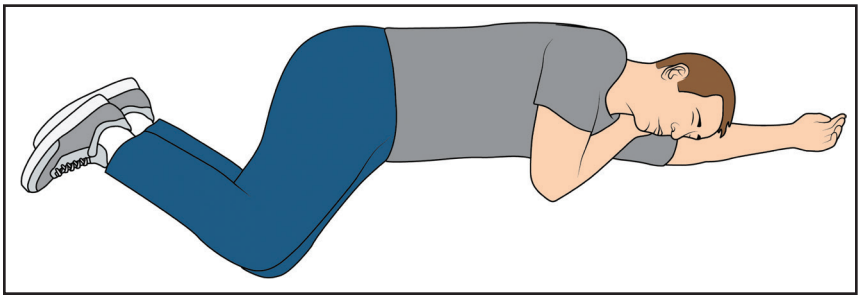

Figure 1. The recovery position.

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CPR or rescue breathing as appropriate. Chest compressions and rescue breathing are performed with the person being assisted in the supine position.

2. Activation of the emergency response system leads to the arrival of rescuers who are trained and equipped to manage medical emergencies, facilitates rapid transport to a health care facility, and may shorten time to definitive treatment.[4–7]
3. Remaining with an ill or injured person enables the first aid provider to assist the person, provide reassurance, and monitor for changes in the person's condition.[1] In some cases, it may be necessary to leave the person briefly to summon help, including activating the emergency response system.
4. To provide effective first aid care, a provider needs to recognize whether the setting is safe to assess or deliver medical assistance.[3]
5. Although studies about moving an injured person in the first aid setting could not be identified, prior first aid guidelines have recommended that a person with suspected injuries to the neck, back, hip, or pelvis remain in their original position to avoid worsening the injury (eg, worsening hemorrhage or neurological injury).[8,9]
6. It is presumed that a person who is alert will choose a position that optimizes their ability to breathe and avoids airway obstruction. No studies were identified that directly address this. A systematic review evaluated the effect of lateral position compared with other body positions on mortality, morbidity, and clinical adverse events in critically ill adults. The review authors could not identify one best position because of the lack of evidence in the included studies.[10] Encouraging individuals with difficulty breathing to assume a position of comfort is widely recommended.[11–15] Studies of adults with heart failure or chronic obstructive pulmonary disease found improved respiratory mechanics when patients were allowed to assume a sitting-up position.[16,17] A systematic review on the influence of body position on lung function in healthy individuals and specific patient groups found that in healthy individuals and patients with lung, heart, or neuromuscular diseases or obesity, lung function parameters such as forced expiratory volume and vital capacity were generally higher in more erect positions.[18]
7. There is a well-documented association between both hyperthermia and hypothermia and adverse outcomes in patients who are ill or injured. In environments that are warm or hot, it is crucial to implement measures to prevent overheating. This can be achieved through the use of shade and promoting evaporative and convective heat loss. Conversely, in cold settings, it is essential to prevent the loss of body heat to the environment and the ground. This can be accomplished by using insulating materials such as blankets and foam pads to maintain the patient's normal body temperature.[19–23]
8. The recovery position may reduce the risk for airway obstruction, facilitate drainage of airway secretions, and reduce the risk of aspiration in a person with a decreased level of responsiveness, particularly if the airway cannot be closely monitored by a first aid provider. In addition, a side-lying position may be preferred for comfort over the supine position by individuals in certain circumstances such as pregnant individuals, those with respiratory difficulties, or those with a greater or smaller body habitus.[1] A left-side lying position improves blood circulation for people in the later stages of pregnancy.[24,25] However, the recovery position is associated with delayed recognition of respiratory arrest and delayed initiation of chest compressions.[26]

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Position for Shock

Background

A person presenting with shock, including cardiogenic, hypovolemic, or hemorrhagic shock, may experience dizziness, difficulty breathing, chest pain, or skin mottling. While waiting for EMS, the first aid provider can position the person in a way to optimize circulation to vital organs such as the brain and to avoid decompensation. Various studies have evaluated how body positioning such as standing, being supine, or elevating the legs potentially affects vital signs and cardiac function.

This topic was the subject of a 2022 ILCOR systematic review.[1] An updated literature search was performed by the writing group in 2023.

First Aid Positioning of the Person in Shock

COR	LOE	Recommendations
2a	C-LD	1. If a person shows evidence of shock with a normal level of alertness, it is reasonable to place or maintain the person in a supine position.
2a	C-LD	2. If a person showing signs of shock is at risk for airway obstruction (decreased alertness, active vomiting) or cannot be continuously watched, it is reasonable to place the person in the recovery position.
2b	C-LD	3. If there is no evidence of trauma or injury (eg, simple fainting, shock from nontraumatic bleeding, sepsis, dehydration), raising the feet about 6 to 12 in (≈30°–45°) from supine position may be reasonable while awaiting the arrival of EMS.
2b	C-EO	4. If a person is placed in a leg-raised position that results in pain, discomfort, or worsened symptoms, returning the person to a supine position may be considered.

Recommendation-Specific Supportive Text

1. An observational study found that in individuals undergoing phlebotomy, a supine position resulted in greater cardiac index and lower heart rate compared with a standing position.[2]
2. The recovery position may reduce the risk for airway obstruction, facilitate drainage of airway secretions, and reduce the risk of aspiration in individuals with a decreased level of responsiveness, particularly if the airway cannot be closely monitored by a first aid provider. In addition, a side-lying position may be preferred for comfort over the supine position by individuals in certain circumstances such pregnant individuals, people with respiratory difficulties, or those with a greater or smaller body habitus.[1]
3. The beneficial evidence for feet elevation is extrapolated from an RCT and observational studies performed in non–first aid settings, demonstrating an effect of the passive leg raise on vital signs and indicators of cardiac output. Observed improvements with passive leg raise compared with the supine position in hypotensive subjects were temporary, and not all studies show this effect.[3–7]
4. Complications such as arrhythmias and hypoxia have developed in hemodynamically unstable

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patients who have been moved into the elevated-feet position. Although these were detected with the use of in-hospital monitors, the development of new symptoms may indicate condition decompensation.[8]

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Administration of Oxygen

Background

The administration of oxygen for injured or ill individuals in the prehospital setting has been a mainstay of EMS care for nearly 50 years. Historical indications have included breathing problems, chest pain, traumatic injury, and stroke. Oxygen therapy plays a vital role in stabilizing patients experiencing inadequate tissue oxygenation, thereby averting or mitigating hypoxia-induced cellular damage. Although oxygen is generally safe and straightforward to administer, its use is not without controversy. Recent studies have demonstrated worse outcomes for some conditions when oxygen is administered. Moreover, the availability and suitability for lay first aid providers of oxygen therapy have been questioned.

ILCOR completed a scoping review on the use of oxygen for first aid in 2022[1] and a systematic review on the use of oxygen for acute stroke in 2020.[2] An updated literature search was performed by the writing group in 2023.

Administration of Oxygen in First Aid		
COR	**LOE**	**Recommendations**
2b	C-LD	1. The effectiveness/usefulness of oxygen administered in the first aid setting for adults or children exhibiting signs or symptoms of shortness of breath, difficulty breathing, or hypoxia is unknown.
3: No Benefit	B-R	2. It is not beneficial to administer oxygen over room air in the first aid setting for adults experiencing acute stroke.
3: Harm	C-LD	3. It is potentially harmful for first aid providers to administer supplementary oxygen to a person with known chronic obstructive pulmonary disease to an oxygen saturation >92%.

Recommendation-Specific Supportive Text

1. A 2022 ILCOR scoping review did not identify any studies on the effectiveness of oxygen therapy in the first aid setting.[1] The ILCOR First Aid Task Force concluded that there is no direct evidence to support or not support the use of oxygen by first aid providers in the first aid setting. No evidence was found about whether people with specific conditions such as drowning, carbon monoxide poisoning, decompression illness, or pneumonia would benefit from oxygen administration in the first aid setting. Although there are specific conditions for which oxygen administration by health care professionals or specially trained rescuers has been proven beneficial, particularly when guided by reliable pulse oximetry, the overarching message is that a role for oxygen administration in general first aid has not been established.
2. An ILCOR 2020 systematic review on oxygen for acute stroke did not identify a benefit of oxygen over room air for survival or neurological outcome.[2] A single observational study in the prehospital setting[3] provided direct evidence from the prehospital setting, supported by 8 RCTs from the in-hospital setting. These studies compare the use of supplementary oxygen with varying flow rates and delivery methods with no use of supplementary oxygen (ie, room air) in individuals with acute stroke. These studies failed to find a benefit for critical outcomes such as survival, favorable neurological outcomes, and quality of life.
3. One study and a Cochrane systematic review identified by the task force enrolled 214 adults with chronic obstructive pulmonary disease receiving treatment by paramedics en route to the hospital. The study observed a reduction in mortality in favor of the group in whom oxygen was titrated to maintain pulse oximetry of 92% compared with the group receiving high-flow oxygen (2 deaths in the titrated oxygen group compared with 11 deaths in the high-flow control arm; risk ratio, 0.22 [95% CI, 0.05–0.97]; 214 participants).[4,5]

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Pulse Oximetry

Background

Pulse oximetry is a simple, noninvasive test for assessing health conditions in both health care facilities and out-of-hospital settings. Recently, this technology has also found its way into home first aid kits and wearable devices such as watches and fitness bands. By using these devices, first aid providers may be able to measure the level of oxygen bound to hemoglobin in the blood. This information is valuable for evaluating both respiratory and circulatory health, particularly in urgent situations. During the COVID-19 pandemic, pulse oximetry was used by infected individuals at home as a tool to detect silent hypoxia and to determine whether they needed to present for care in a clinic or emergency department (ED).[1,2]

Table 5. Limitations of Pulse Oximeters

Patient factors	Device factors	Environmental factors
Chronic respiratory disease	Battery level/charge	Extremes of temperature
Nail thickness and nail paint or polish	Device condition such as being dusty, dirty, or damaged	Movement or vibration such as transportation
Heart rhythm and cardiac output	Size and orientation of light and sensor	Moisture and humidity
Skin thickness, perfusion, pigmentation, and temperature	Device accuracy and calibration (FDA categories): 1. Consumer product 2. Home-use medical devices 3. Medical device	Interference from direct external light sources, including sunlight

FDA indicates US Food and Drug Administration.

Patients and health care professionals highly value the use of pulse oximeters for home management of different conditions.[3] Of concern, however, are the numerous limitations pulse oximeters, including their systematic overestimation of oxygen saturation in individuals with darker skin pigmentation[4–6] (Table 5). Moreover, pulse oximeters sold over the counter may not be approved or cleared by the US Food and Drug Administration or other regulatory agencies.[7]

This topic was the subject of a 2022 ILCOR scoping review.[8] An updated literature search was performed by the writing group in 2023.

Use of Pulse Oximetry in First Aid		
COR	**LOE**	**Recommendations**
1	C-EO	1. A physical examination and history should be the primary assessment methods for first aid providers to evaluate an ill or injured person.
2a	C-EO	2. It is reasonable for first aid providers to use pulse oximetry results in the context of a complete assessment and to be aware of the limitations of pulse oximetry before acting on any results.

Recommendation-Specific Supportive Text

1. The primary survey, physical examination, and SAMPLE history (signs/symptoms, allergies, medications, past medical history, last oral intake, events leading up to present illness/injury) are essential components of the first aid assessment, which is structured to rapidly detect life-threatening conditions. Skipping these essential assessment components may result in delays in the detection and resolution of life-threatening conditions. Assessment of respiratory status includes observing for bluish discoloration of the face, lips, or nails; abnormal respiratory rate and effort; cough; a sensation of dyspnea; restlessness and discomfort; chest pain or tightness; and increased heart rate. Interpretation of any numerical value provided by a pulse oximeter must include considering these and other potential assessment findings.
2. Pulse oximeters have numerous limitations. Pulse oximeter accuracy can be affected by many patient, device, and environmental factors. In 2 large hospital-based cohort studies that compared oxygen saturation measured by pulse oximetry with the gold standard of arterial blood gas analysis, Black patients had almost 3 times the frequency of hypoxemia that was missed by pulse oximetry compared with White patients.[4] A systematic review and meta-analysis concluded that pulse oximetry may overestimate oxygen saturation in people with high levels of skin pigmentation and people whose ethnicity is reported as Black/African American compared with oxygen saturation measured from a blood sample.[5] Many environmental factors,

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including ambient lighting, temperature, and movement, can also interfere with pulse oximeter accuracy.[7] Devices that have not been approved by the US Food and Drug Administration may be even less accurate.

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MEDICAL EMERGENCIES

Bronchodilators for Asthma With Shortness of Breath

Background

There are many causes of shortness of breath. First aid providers may encounter a person with a previous diagnosis of asthma who has acute difficulty breathing or is wheezing. Many will carry prescribed inhaled medication with them to use when they are experiencing an asthma exacerbation. Some people, because of severity of illness or other factors, may require assistance to self-administer bronchodilator medication.

The ILCOR performed a scoping review on potential harms from bronchodilator administration in 2022.[1] An updated literature search was performed by the writing group in 2023.

First Aid Recommendations for Assisting a Person Experiencing an Asthma Attack With Using Their Own Inhaled Bronchodilator Medication

COR	LOE	Recommendations
1	B-R	1. First aid providers should assist a person with asthma who is having difficulty breathing with the administration of their own prescribed bronchodilators as needed.
2a	B-R	2. It is reasonable to use either an inhaler with a spacer or a nebulizer when assisting a person with asthma to use their own inhaled bronchodilator medication, in preference to using an inhaler alone.
2a	B-R	3. If a commercially available spacer is not available, it is reasonable to use an improvised spacer when assisting a person who is having an asthma attack to use their own inhaled bronchodilator medication.

Recommendation-Specific Supportive Text

1. Inhaled bronchodilators are effective in patients with asthma and acute shortness of breath.[2–12] Evidence from included studies was extrapolated from the EMS and ED settings to the first aid setting. No new studies specifically examining the first aid setting have been published since the prior guidelines in 2015.[13] Bronchodilator administration is safe; treatment with albuterol/salbutamol causes no clinically significant change in heart rate,[5–7,12] blood pressure,[5] serum potassium, tremor, headache, nervousness, weakness, palpitation, or dry mouth.[12]
2. When used with a metered dose inhaler, spacer devices improve the delivery of bronchodilator medications to the lungs.[14] Inhalers with spacer devices provide clinical effectiveness equal to that of nebulizer machines, including in community settings.[15]
3. Improvised spacers made with a 500-mL (≈16 oz) plastic cold drink bottle[16–19] or a 150-mL (≈5 oz) disposable paper cup[20] appear to provide drug delivery similar to that achieved with commercial spacer devices (Figure 2).

Figure 2. Use of an improvised spacer with a metered dose inhaler.

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Recognition of Stroke in Adults

Background

Stroke is a leading cause of death and disability worldwide. Each year, nearly 800 000 people in the United States experience a new or recurrent stroke.[1] Projections show that between 2012 and 2030, ≈3.4 million US adults, representing 3.9% of the adult population, will have had a stroke.[1,2]

Various stroke recognition instruments have been developed for both in-hospital and prehospital use. Compared with stroke scales intended for in-hospital use, stroke scales designed for the first aid setting have fewer diagnostic criteria, easily identified clinical signs, and simple implementation.

The ILCOR published a systematic review on stroke recognition in 2020.[3,4] An updated literature search was performed by the writing group in 2023.

Recognition of Stroke in the First Aid Setting—Adults

COR	LOE	Recommendations
1	B-NR	1. If stroke is suspected, the EMS system should be activated immediately.
1	B-NR	2. The use of a stroke recognition scale such as the Face, Arms, Speech, Time (FAST) or Cincinnati Prehospital Stroke Scale is recommended to aid in the recognition of acute stroke in adults.
2a	C-EO	3. It is reasonable for first aid providers to measure capillary blood glucose in adults with suspected stroke if it is available and does not delay activating EMS.

Recommendation-Specific Supportive Text

1. Stroke is a serious and time-sensitive medical emergency. Emergency interventions are most effective when delivered promptly. Use of EMS by patients with stroke has been associated with earlier ED arrival, quicker ED evaluation, more rapid treatment, and more eligible patients receiving intervention.[5,6] For the best outcomes possible, recognition and activation of the stroke care system should occur as quickly as possible.
2. A 2020 ILCOR systematic review[3] evaluated 9 different screening tools reported in 19 observational studies. The FAST,[7] which is essentially identical to the Cincinnati Prehospital Stroke Scale, was the only tool intended for administration by laypeople (Figure 3). The FAST and the Cincinnati Prehospital Stroke Scale have the same 3 physical examination items (face, arms, and speech), which the review authors identified as appropriate

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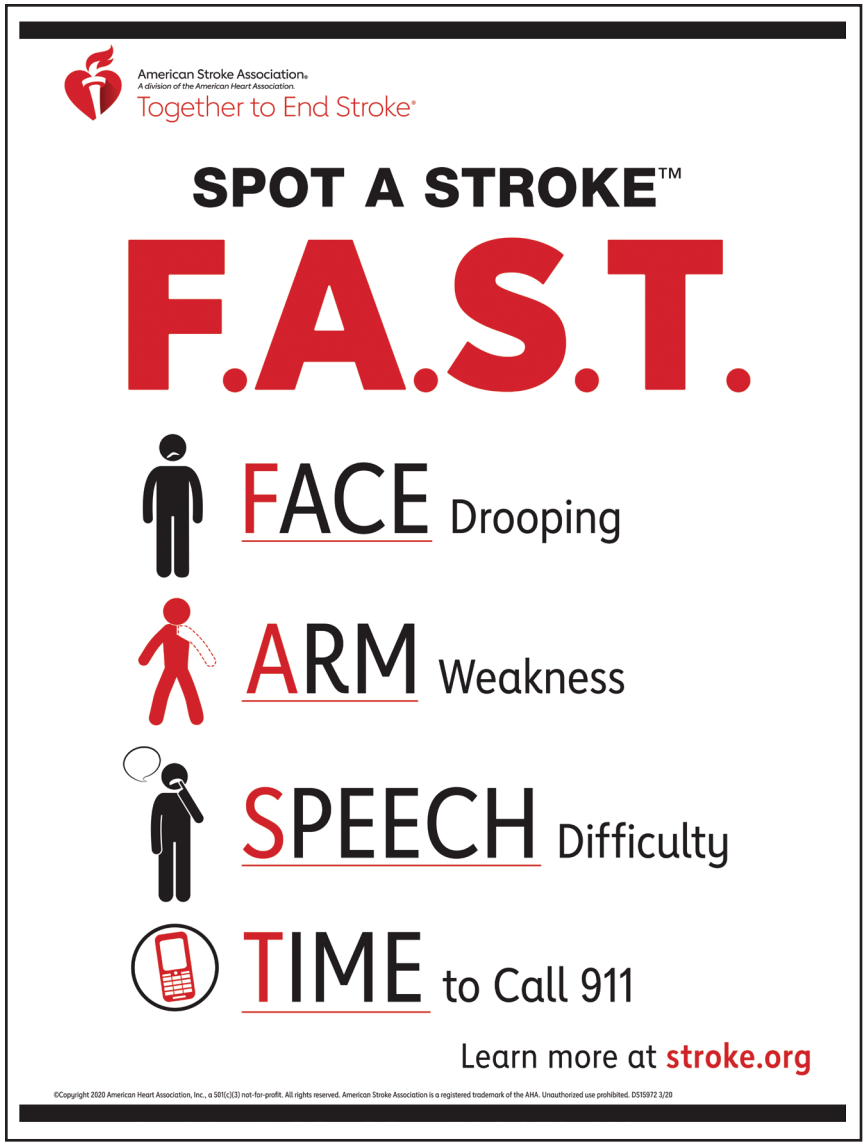

Figure 3. The FAST (Face, Arms, Speech, Time) stroke recognition tool.
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for use by first aid providers. Although data specific to first aid providers are lacking, the use of stroke scales coached by EMS dispatchers and by EMS personnel improves early recognition of stroke.[9,10]

3. If a first aid provider has the necessary knowledge and equipment to perform capillary blood glucose measurement, the measurement of blood glucose may aid in ruling out hypoglycemia, a common stroke mimic.

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Recognition of Stroke in Children

Background

Approximately 40 000 children worldwide experience stroke each year.[1] Pediatric stroke incidence peaks at 3 time points: in the perinatal period, before 5 years of age, and in adolescence. Whereas perinatal strokes typically occur when the neonate is in the hospital, strokes affecting older children and adolescents may first be noted by a first aid provider. Although pediatric stroke can present in similar ways to adult stroke, it can also present in nonspecific ways and mimic other childhood diseases. Table 6 lists the most common signs and symptoms of pediatric stroke.

The ILCOR published a systematic review on stroke recognition in 2020.[2,3] An updated literature search was performed by the writing group in 2023.

Recognition of Stroke in the First Aid Setting—Children		
COR	**LOE**	**Recommendations**
1	**B-NR**	1. If pediatric stroke is suspected, EMS should be activated, and the person should be transported to an ED.
2a	**C-EO**	2. It is reasonable to consider stroke when common pediatric symptoms are present in association with other neurological signs and symptoms.
3: No Benefit	**C-EO**	3. Adult stroke scores are not validated in the pediatric population and should not solely be used to identify the broad presentation of stroke in children.

Recommendation-Specific Supportive Text

1. Early identification of stroke in children is important because a shorter time to definitive therapy decreases the risk of death and permanent disability from stroke.[4–8] Shortening the time from presentation in the first aid setting to an ED, preferably with pediatric neurology and stroke expertise, is an important component of this timeline.
2. Stroke in children can present in nonspecific ways and mimic other childhood diseases. Symptoms can present suddenly or come on more gradually, making identification difficult.[9] Symptoms can be nonspecific such as sudden or severe headache, altered mental status, and sudden onset vomiting, or they can be more localized such as focal numbness or weakness, ataxia, and speech and visual disturbances.[5,7–9] Although headache and vomiting can be symptoms of other common childhood diseases, their presence in association with other neurological symptoms should raise concern for stroke. Some strokes can also present as either generalized or focal seizures, which is especially common in children <1 year of age.[5,9,10]
3. Stroke scales and recognition tools used in adult patients such as the FAST have not been validated for use in children. Pediatric stroke scales such as the Pediatric National Institutes of Health Stroke Scale are complex and have been validated only for administration by health care professionals.[8] We were unable to identify a pediatric stroke recognition rubric that is validated in the first aid setting.

Table 6. Common Signs and Symptoms of Stroke in Children

Focal signs and symptoms
Hemiparesis
Limb weakness
Facial droop
Altered sensation
Visual disturbance
Speech disturbance
General signs and symptoms
Altered mental status
Seizure
Headache
Ataxia
Vertigo/dizziness
Nausea/vomiting

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Chest Pain in Adults

Background

More than 7.8 million people are evaluated in US EDs each year for chest pain. Chest pain is a common health problem with multiple causes, ranging from minor chest wall strains to pneumonia or myocardial infarction (heart attack). It can be difficult to differentiate chest pain of cardiac origin such as a heart attack from chest pain of other origins.[1] The prevalence of myocardial infarction in patients presenting to the ED with nontraumatic chest pain varies by age, ranging from ≈1% in patients 18 to 44 years of age to 4% in patients ≥80 years of age.[2] Individuals with chest pain often delay seeking care, leading to poor outcomes.[3,4] Common signs and symptoms associated with a heart attack include chest pain or pressure, shortness of breath, nausea, sweating, or pain in the jaw, arm(s), or back.

The most important action for a person experiencing chest pain or other symptoms that might indicate a myocardial infarction is to activate EMS. Aspirin in the dose of 162 to 324 mg improves survival in patients with myocardial infarction.[5,6] A 2020 systematic review found that early or first aid administration of aspirin to adults with nontraumatic chest pain was associated with reduced mortality.[7] The rate of major complications associated with administration of a single dose of aspirin to an individual experiencing chest pain appears to be low, but certain individuals may have an allergy to aspirin or a bleeding risk, or they may have been advised by a health care professional not to take aspirin.[8]

The AHA does not recommend administration of oxygen in health care settings for people with acute coronary syndromes who are not hypoxic.[9,10]

In 2020, the ILCOR performed a systematic review on administration of aspirin for people with chest pain.[11] An updated literature search was performed by the writing group in 2023.

First Aid for Adults Experiencing Chest Pain		
COR	**LOE**	**Recommendations**
1	C-LD	1. In adults with acute chest pain, the emergency response system should be activated to initiate transport to the closest ED by EMS.
2b	B-NR	2. While awaiting the arrival of EMS, first aid providers may encourage alert adults experiencing nontraumatic chest pain to chew and swallow aspirin (162–325 mg), unless the person experiencing pain has a known aspirin allergy or has been advised by a health care professional not to take aspirin.
2b	C-EO	3. If there is any uncertainty that aspirin should be taken, it is reasonable to wait for EMS arrival without administration of aspirin.

Recommendation-Specific Supportive Text

1. Although chest pain is a common sign of a heart attack, some people such as women, people who have diabetes, and older people may experience other symptoms, including dyspnea; pain or discomfort in the back, neck, jaw, or stomach; sweating; nausea; or lightheadedness.[1,12–14] The use of EMS transportation is associated with a substantial reduction in ischemic time and treatment delays compared with transportation by personal vehicle.[15] In 1 study, ≈1 in 300 patients with chest pain transported to the ED by private vehicle had a cardiac arrest en route.[16]
2. Two observational studies with a total of 2122 patients with acute myocardial infarction demonstrated higher survival with early administration (median, 1.6 hours from pain onset) of aspirin by health care professionals compared with late administration (median, 3.5 hours from pain onset).[4,7,17] One of the observational studies with 1200 patients demonstrated higher survival at 1 year with early compared with late administration (same medians as reported previously).[4] These same studies found no significant difference in the risk of complications from early as opposed to late aspirin administration.
3. Although harm from aspirin in individuals with nontraumatic chest pain is uncommon, no study has evaluated the risks of aspirin administration in the first aid setting.[8] Therefore, if there are potential contraindications to the use of aspirin by the lay first aid provider, it is reasonable not to encourage aspirin use while awaiting the arrival of EMS.

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Anaphylaxis

Background

Anaphylaxis is a life-threatening, systemic allergic reaction that can be triggered by many exposures, including foods, drugs, and insect venom. Signs and symptoms of anaphylaxis include lip and facial swelling, a sensation of the throat closing, difficulty breathing, rash, vomiting or diarrhea, and symptoms of low blood pressure such as changes in level of consciousness, pallor, and dizziness. The mainstay of immediate treatment for anaphylaxis is intramuscular epinephrine, typically administered in the first aid setting with an epinephrine autoinjector. Epinephrine autoinjectors are often prescribed to people with a history of anaphylaxis to self-administer at the first sign of an anaphylactic reaction. First aid providers are sometimes called on to assist people experiencing anaphylaxis as they self-administer this medication. In many cases, this will significantly improve or resolve the person's symptoms, but sometimes additional epinephrine is required.

ILCOR performed scoping reviews related to anaphylaxis in 2019 and 2022.[1,2] An updated literature search was performed by the writing group in 2023.

First Aid for Anaphylaxis

COR	LOE	Recommendations
1	B-NR	1. If a person experiences anaphylaxis and an epinephrine autoinjector is available, the person should self-administer the autoinjector.
1	C-EO	2. A first aid provider should assist a person experiencing anaphylaxis to use their autoinjector if assistance is required.
1	C-EO	3. If a person experiences anaphylaxis, the emergency response system should be activated.
2b	B-NR	4. If a person with anaphylaxis does not respond to the initial dose of epinephrine and arrival of EMS will exceed 5 to 10 minutes, a repeat dose may be considered.

Recommendation-Specific Supportive Text

1. Strong international consensus, based primarily on observational data, endorses early administration of intramuscular epinephrine given in the lateral thigh as the primary treatment of anaphylaxis regardless of the triggering agent.[3–11]
2. A person experiencing anaphylaxis may be unable to access or manipulate their autoinjector because of respiratory distress, hypotension, or altered mental status. First aid providers may assist the ill person. Epinephrine is typically injected into the muscle of the lateral thigh.[3–12]
3. Approximately 500 to 1000 people die in the United States of anaphylaxis each year.[13] In addition to intramuscular epinephrine, patients with anaphylaxis may require endotracheal intubation, intravenous fluids, vasopressors, and other advanced treatments to survive.

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4. It is estimated that between 7% and 18% of people with anaphylaxis require >1 dose of epinephrine.[14,15] Most patients who required a second dose of epinephrine for anaphylaxis improved after administration.[2] One study found that patients who received a second dose of epinephrine were more likely to be admitted to the hospital than those receiving 1 dose, although this appeared to be due to severity of illness rather than an adverse effect of epinephrine.[16]

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Seizures

Background

Seizures are uncontrolled electrical discharges of the neurons in the brain. Seizures can occur as a result of infections, trauma, poisonings, lack of oxygen, metabolic abnormalities (hypoglycemia), fevers (in children), and underlying neurological conditions such as epilepsy. Febrile seizures occur in 2% to 4% of children, most commonly between 6 months and 2 years of age. Generalized tonic-clonic seizures affect large areas or both sides of the brain and manifest as full-body rhythmic jerking with alterations in consciousness. Focal seizures affect only 1 area of the brain and can present as jerking of only 1 extremity or 1 side of the body, abnormal facial movements, small repetitive movements, or staring spells (focal impaired awareness), with or without changes in consciousness. Some focal seizures will progress to generalized seizures. Urinary incontinence may also occur during a seizure. Seizure duration can be seconds to hours. Most seizures are followed by a postictal period in which the person appears tired and confused for several minutes. Seizures lasting >5 minutes and multiple seizures occurring one after the other represent a critical medical emergency, status epilepticus.[1]

A literature search was performed by the writing group in 2023.

First Aid for Seizures		
COR	**LOE**	**Recommendations**
1	C-LD	1. First aid providers should activate EMS for individuals with first-time seizure; seizures lasting >5 minutes; >1 seizure that occurs without the person returning to baseline mental status in between; seizures occurring in the water; seizures with traumatic injuries, difficulty breathing, or choking; seizure in an infant <6 months of age; seizure in pregnant individuals; or if the individual does not return to baseline within 5 to 10 minutes once seizure activity has stopped.
1	C-EO	2. First aid providers should minimize the risk of injury to the individual who is having a seizure by helping the person to the ground, placing the person on their side in the recovery position, and clearing the area around them.
1	C-EO	3. First aid providers should stay with the person having a seizure.

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First Aid for Seizures		
COR	**LOE**	**Recommendations**
3: No Benefit	**B-R**	4. For children who have experienced a febrile seizure, administration of antipyretics such as acetaminophen, ibuprofen, or paracetamol is not effective for stopping a seizure or preventing a subsequent febrile seizure.
3-Harm	**C-EO**	5. The person having the seizure should not be restrained.
3-Harm	**C-EO**	6. Nothing should be put in the mouth and no food, liquids, or oral medicines should be given to a person who is experiencing a seizure or who has decreased responsiveness after a seizure.

Recommendation-Specific Supportive Text

1. Seizures are usually self-limited and resolve spontaneously within 1 to 2 minutes. However, seizures lasting >5 minutes may not stop spontaneously and may need emergency medical intervention such as anticonvulsant medications.[1] For prolonged seizures, respiratory distress, seizures with associated traumatic injuries, seizures occurring in the water, and seizures associated with choking events, EMS should be activated to provide more definitive care[2] (Table 7).

2–3. Seizure movements often involve erratic movements of the head, body, and extremities that can result in significant traumatic injury during a fall or from the seizure movements.[2–4] The first aid provider can prevent the person who is experiencing a seizure from unintentional injury. The recovery position is intended to reduce the risk of aspiration if the person vomits during the seizure or the postictal period.

4. Febrile seizures are a common benign condition in childhood, affecting ≈2% to 4% of children.[5] Febrile seizures may be diagnosed by a health care professional after an appropriate evaluation. Two meta-analyses published in 2021 examined the effectiveness of antipyretics at preventing recurrent febrile seizures in children in both the same febrile episode and subsequent febrile illnesses. They demonstrated no benefit of seizure prevention to antipyretics in the same illness or a subsequent illness.[6,7] Fever treatment can help children feel better but will not prevent subsequent seizures.

5. Restraining a person experiencing a seizure will not abort the seizure and may lead to injury of the person or the first aid provider.[2–4]

6. People experiencing seizures will often clench their jaw, which may lead to traumatic injury within the mouth. Although swallowing the tongue will not occur, people can aspirate blood, saliva, food, or other items during a seizure and the postictal period. Attempting to place something in the mouth risks injury to the person's teeth or the rescuer's finger and is generally ineffective.[3,8] Most seizures are followed by a postictal period in which the individual is somnolent, incoherent, and unable to swallow normally and therefore is at risk of aspiration of food, liquids, or medications placed in the mouth.[2,4]

Table 7. Reasons to Activate the Emergency Response System for Seizures

First-time seizure
Seizure in an infant <6 mo of age
Seizure lasting >5 min
Seizure in a person who is pregnant
>1 Seizure that occurs without return to baseline mental status in between
Person does not return to baseline within 5–10 min after seizure has stopped
Seizure with traumatic injuries
Seizure with choking
Seizure with difficulty breathing
Seizure occurring in the water

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Hypoglycemia

Background

Blood glucose levels are tightly regulated by several hormones, mainly insulin and glucagon. Normal blood glucose range is 70 to 120 mg/dL (3.9–6.6 mmol/L). Hypoglycemia (blood glucose <70 or <2.8 mmol/L) can result from starvation, underlying metabolic disorders, deficiencies of hormones, and medications (eg, antidiabetic

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medications). Symptoms typically develop when blood glucose falls below 50 to 60 mg/dL (2.8–3.3 mmol/L) and include dizziness, fatigue, feeling shaky or jittery, tachycardia (fast heart rate), confusion, slurred speech, and diaphoresis (sweating). Significant hypoglycemia can lead to a state of unconsciousness and seizures. In the first aid setting, correction of hypoglycemia is performed through the enteral route.

The ILCOR performed a systematic review of glucose administration for hypoglycemia in 2020.[1] An updated literature search was performed by the writing group in 2023.

First Aid for Hypoglycemia		
COR	**LOE**	**Recommendations**
1	C-LD	1. For a person with suspected hypoglycemia who is awake and able to swallow, the first aid provider should encourage the person to swallow oral glucose.
1	C-EO	2. EMS should be activated for a person with hypoglycemia who is unable to swallow, has a seizure, or does not improve within 10 minutes of oral glucose administration.
2a	B-NR	3. If they are available, it is reasonable to use oral glucose tablets in preference to gel or dietary sources of glucose to treat hypoglycemia.
2a	C-LD	4. It is reasonable to use simple dietary sugars as an alternative if glucose tablets or gel is not available to treat hypoglycemia.
2b	C-LD	5. For children with suspected hypoglycemia who are awake but unwilling or unable to swallow glucose, it may be reasonable to apply a slurry of granulated sugar and water under the tongue.
3: Harm	C-EO	6. Oral glucose should not be administered to people who are not awake or not able to swallow.

Recommendation-Specific Supportive Text

1. Administration of ≥20 g oral glucose or the equivalent in glucose-containing foods can rapidly restore blood glucose levels.[2] Oral glucose is available in different forms and can be given through different routes in the first aid setting. Glucose products that are swallowed (eg, tablets or gels) result in higher blood glucose levels than buccally applied glucose (spray or gel).[3]
2. Untreated hypoglycemia can cause seizures, status epilepticus, permanent brain injury, and death. For people with hypoglycemia who are unable to swallow, intravenous dextrose can be lifesaving.

3-4. Oral glucose tablets demonstrated better resolution of symptoms 15 minutes after treatment compared with dietary sugars such as sucrose, fructose, orange juice, jellybeans, candy tablets, and milk.[4] Although data on this topic are limited, 1 study suggests that glucose tablets are superior to gel in terms of hypoglycemia correction.[5] Dietary sources of simple sugar (Table 8) have been shown to be effective in the treatment of hypoglycemia.[6,7]

5. In children who are responsive but unwilling to swallow oral glucose, applying a slurry of granulated sugar (≈1 teaspoon) and water under the tongue resolves hypoglycemia faster than oral granulated sugar.[3,8]
6. Attempting to treat severe hypoglycemia with oral glucose in a person who is not fully alert or who is unable to swallow can lead to choking and aspiration.

Table 8. Dietary Sources Containing at Least 15 g Simple Sugars

1 tablespoon table sugar
6–8 oz apple or orange juice
6–8 oz regular (nondiet) soda
1 tablespoon honey
1 tablespoon breakfast syrup
2 strips of fruit leather
15–25 jellybeans, gummy bears, or hard-shelled candies

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Presyncope

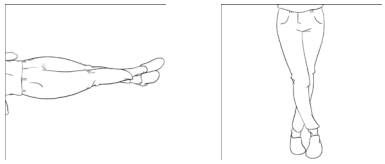
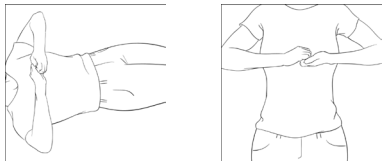
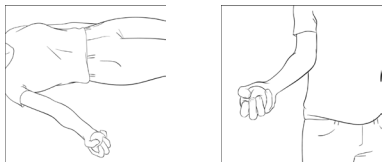
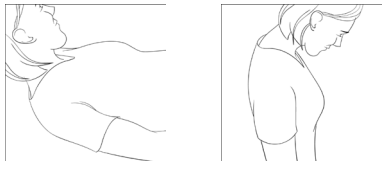
Background

Syncope, a transient loss of consciousness, results from global cerebral hypoperfusion and has an estimated lifetime prevalence of ≈35%.[1,2] Syncope leads to a loss of postural tone that may result in physical injury, which is present in 30% of patients treated in an ED after syncope.[3] Fractures, intracranial hemorrhage, or other organ damage may occur if the individual is upright at the time of the syncopal episode. Syncope causes a considerable medical and socioeconomic burden on the adult population, resulting in 2% to 6% of hospital admissions internationally and accounting for at least $2.4 billion in annual hospital costs in the United States.[3–5]

There are many causes of syncope. Vasovagal syncope and orthostatic syncope result in 21.2% and 9.4% of syncopal episodes, respectively.[6] However, syncope also may have more dangerous causes such as cardiac dysrhythmia. Vasovagal syncope is preceded by prodromal symptoms in about two-thirds of cases.[7] Presyncope is the prodrome of syncope that may last for a few seconds and may include lightheadedness or dizziness, blurry or tunnel vision, nausea, a sensation of warmth, and signs such as diaphoresis and pallor. This prodrome represents a short time in which a first aid intervention may be used to prevent syncope. Physical counterpressure maneuvers (PCMs) are a first aid intervention demonstrated to help prevent syncope.[8,9] PCMs include the contraction of muscles of the body such as those in the legs, arms, abdomen, or neck, causing a rise in blood pressure and alleviating symptoms of near syncope originating from vasovagal or orthostatic causes[8,9] (Table 9).

The ILCOR performed a systematic review of first aid interventions for presyncope in 2020,[11] with an evidence update in 2022.[12] An updated literature search was performed by the writing group in 2023.

Table 9. Physical Counterpressure Maneuvers for Presyncope

Method	Description	Illustration
Lower-body PCMs		
Leg crossing with muscle tensing	Leg crossing with tensing of the leg, abdominal, and buttock muscles while lying down or, if necessary, while standing	
Squatting	Lowering the body into a squatting position. Adjunctive lower-body and abdomen muscle tensing can be done during the squat and then on standing once symptoms have resolved.	
Upper-body PCMs		
Arm tensing	Gripping opposing hands with fingers and pulling with arms in opposing directions with maximum force	
Isometric handgrip	Clenching fist at maximum contraction with or without an item in the hand	
Neck flexion	Touching the chin to the chest and tightening the neck musculature	

PCM indicates physical counterpressure maneuver.
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First Aid for Presyncope		
COR	**LOE**	**Recommendations**
1	C-LD	1. If a person experiences signs or symptoms of presyncope (including pallor, sweating, lightheadedness, visual changes, and weakness) of vasovagal or orthostatic origin, that person should maintain or assume a safe position such as assisted sitting or lying down.
2a	C-LD	2. Once the person with presyncope is in a safe position, it can be beneficial for that person to use physical PCMs to avoid syncope.
2b	C-LD	3. Lower-body PCMs may be preferable to upper-body and abdominal PCMs in first aid for presyncope.
2b	C-EO	4. If no improvement occurs within 1 to 2 minutes, if syncope occurs, or if symptoms worsen or reoccur, the first aid provider should activate emergency services.
3:No Benefit	C-EO	5. The use of PCMs is not recommended when symptoms of a heart attack or stroke accompany presyncope.

Recommendation-Specific Supportive Text

1. Physical injuries are frequent complications of syncope, occurring in ≈30% of patients admitted to EDs, of whom ≈5% experience severe trauma.[3] Therefore, the initial goal of presyncope treatment should be to assume a safe position to decrease the risk of trauma.
2. A meta-analysis of 11 clinical trials demonstrated an ≈50% reduction in the risk of syncope when PCMs were used compared with no intervention.[9] Although no studies directly assessed the ability of first aid providers to instruct a person with presyncope on PCMs in real time, in several studies, researchers were able to effectively instruct research participants on the use of PCMs before an intervention (eg, tilt table test) or for the treatment of presyncope in the real-world setting.[13–17]
3. An observational study enrolling 27 participants with recurrent vasovagal syncope demonstrated better improvements in heart rate and a lower likelihood of syncope with the use of lower-body PCM (squatting with leg crossing) compared with upper-body PCM (handgrip).[8,18]
4. In studies involving tilt-table testing, PCMs were able to improve cardiovascular parameters, reduce or eliminate symptoms of presyncope, and prevent syncope within seconds of implementing the PCM.[14,15,19] In a tilt table study of people with vasovagal syncope, continuously applied PCMs were beneficial for at least 2 minutes.[15]
5. Dangerous medical conditions such as myocardial infarction or stroke may cause presyncope. Although a systematic review found no reported adverse events or injuries from PCM use, the study populations included only people with known recurrent orthostatic or vasovagal syncope.[8] PCMs have not been advocated for cardiac causes of syncope and may delay definitive medical care.[20]

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ENVIRONMENTAL EMERGENCIES

Bee and Wasp Stings

Background

Stings from bees, wasps, and hornets commonly result in small local reactions consisting of pain, swelling, and itching. Larger local reactions and anaphylaxis may occur. Stinging bees, wasps, and hornets result in ≈60 deaths per year in the United States.[1] Most deaths are due to anaphylaxis, a severe reaction that may include rapid development of difficulty breathing, tongue or throat swelling, lightheadedness (a possible symptom of low blood pressure), vomiting, and disseminated hives. Death can also occur from massive envenomation, generally from at least 20 stings by large hornets or hundreds of stings from honeybees.[2–4]

The honeybee has a barbed stinger that often remains in the skin after the sting and can continue to deliver venom for up to 60 seconds.[5] Other species of bees, wasps, and hornets have smooth stingers and can sting multiple times.

Many people with a history of anaphylaxis have epinephrine autoinjectors, which they are instructed to self-administer at the first sign of anaphylaxis. First aid providers may be called on to assist people experiencing anaphylaxis to self-administer this medication.[3,6,7] Intranasal and sublingual formulations of epinephrine for the treatment of anaphylaxis were not available in the United States or Canada at the time of guideline development.

Treatment for local reactions to bee and wasp stings is intended to reduce local symptoms of pain, swelling, and itching at the site of the sting.

A literature search was performed by the writing group in 2023.

First Aid for Bee and Wasp Stings

COR	LOE	Recommendations
1	B-NR	1. If a person experiences anaphylaxis due to a bee, wasp, or hornet sting and an epinephrine autoinjector is available, the person should self-administer the autoinjector.
1	C-EO	2. A first aid provider should assist a person experiencing anaphylaxis to use the autoinjector if assistance is required.
1	C-EO	3. If a person experiences anaphylaxis due to a bee, wasp, or hornet sting, the emergency response system should be activated.
1	C-EO	4. Stings to the eye should be evaluated by a trained medical professional.
2a	B-NR	5. Removal of a stinger remaining in the skin as soon as possible by plucking or scraping can be beneficial.
2a	C-EO	6. Over-the-counter oral antihistamines can be used to alleviate local itching.
2a	C-EO	7. Topical corticosteroids can be used to alleviate local itching.
2a	C-EO	8. It is reasonable to wash the area of a bee, wasp, or hornet sting with soap and water.
2b	C-EO	9. Administration of over-the-counter acetaminophen and nonsteroidal anti-inflammatory agents may be considered to alleviate local pain.
2b	C-EO	10. Administration of ice or cold packs may be considered for local pain relief.

Recommendation-Specific Supportive Text

1–3. Strong international consensus, based primarily on observational data, endorses early administration of epinephrine as the primary treatment of anaphylaxis regardless of the triggering agent.[8–16] Few experimental data were identified pertaining specifically to the treatment of anaphylaxis from bee, wasp, or hornet stings. In 1 observational study detailing 8 cases of anaphylactic reactions to bee stings, 5 of the cases were treated with epinephrine.[7]

4. Although rare, stings to the eye itself (as opposed to stings to the eyelid or to the face near the eye) can lead to permanent vision loss and may require immediate medical attention.[17–19]

5. In an observational study evaluating honeybee stings in human volunteers, there was no significant difference in the size of wheal when the retained stinger was plucked out compared with scraping for removal.[20] The area of the wheal corresponded directly to the time the bee stinger remained in the skin. In a second observational study conducted in rabbits, the amount of honeybee venom delivered corresponded directly to the amount of time the stinger was embedded in the skin, up to ≈30 seconds.[5]

6–10. Few experimental data were identified to guide treatment of local symptoms from bee, wasp,

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or hornet stings. Clinical trials support the use of oral antihistamines and topical corticosteroid for local itching from mosquito bites,[21] but data for bee, wasp, and hornet stings are lacking. Pain can be treated with oral over-the-counter analgesic agents such as acetaminophen and ibuprofen. Pain and swelling can be treated with topical ice or cold packs.[3,6,22–25]

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Tick Bites

Background

There are many tick species in the United States, with activity dependent on the season and geographic location. Some species of tick are carriers of organisms that can cause illness such as Lyme disease or Rocky Mountain Spotted Fever if transmitted to a human host.[1] The Centers for Disease Control and Prevention reports that at least 48 000 cases of tick-borne diseases are diagnosed in the United States annually and >100 000 people seek treatment in EDs for tick bite exposure.[1]

The risk of contracting a tick-borne illness is increased if the tick is attached for >24 to 48 hours (Figure 4.) Early tick removal may prevent disease transmission.[2,3]

The Centers for Disease Control and Prevention recommends antibiotic prophylaxis for Lyme disease when a tick bite occurs in a highly endemic region and tick attachment is estimated to have been ≥36 hours (based

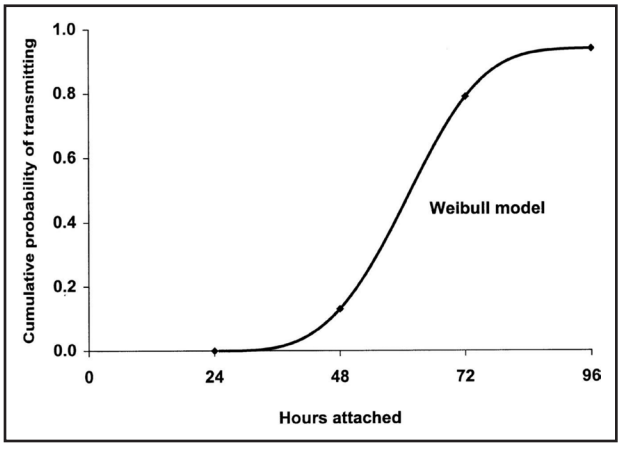

Figure 4. Risk of Lyme disease transmission based on duration of tick attachment.
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on the degree of engorgement with blood), if the tick is an *Ixodes scapularis* tick, if antibiotics can be started within 72 hours, and if there is no contraindication to doxycycline.[4] In areas where Rocky Mountain Spotted Fever is endemic, prophylactic antibiotic administration is not recommended, but doxycycline is recommended at the first sign of fever or rash.[5] Antibiotic prescribing is performed by health care practitioners.

A literature search was performed by the writing group in 2023.

First Aid for Tick Bites		
COR	**LOE**	**Recommendations**
1	B-R	1. Tick bites occurring in regions with high prevalence of Lyme disease should receive prompt consultation with a health care professional within 72 hours after removal of an engorged tick.
1	B-NR	2. We recommend removal of a tick as soon as possible.
1	C-LD	3. To remove a tick, we recommend grasping the head of the tick as close to the skin as possible with tweezers or a commercial tick removal device and pulling upward with steady, even pressure.

Recommendation-Specific Supportive Text

1. Several clinical trials found that a single dose of prophylactic doxycycline given within 72 hours after an *Ixodes scapularis* tick bite could prevent Lyme disease.[6–8] Doxycycline prescribing requires treatment by a health care professional. Although the risk is decreased, some people develop Lyme disease despite receiving prophylactic doxycycline, and additional treatment is required.
2. The risk of infection from tick-borne illness increases with the time of tick attachment (Figure 4). Although the risk of contracting a tick-borne illness appears to be more substantial if the tick is attached for >24 to 48 hours, the tick should be removed as soon as possible to minimize the risk of infection[2,9,10] (Figure 5).
3. The risk of damaging tick mouthparts appears to be lower when health care professionals remove ticks with tweezers compared with laypeople removing ticks by hand.[12] In tick removal by dermatologists, successful removal was most common when tweezers were used to grasp the tick near the mouthparts compared with lasso and traction devices, card slit devices, and freezing.[13] Other methods of removal, including application of gasoline, nail polish, methylated spirits, petroleum jelly, 70% isopropyl alcohol, or a hot kitchen match, appear to be less effective.[14] Mechanical removal is accepted by most experts.[15–17] Although squeezing the abdomen of the tick on removal has not been definitively linked to transmission of disease, some evidence links squeezing the abdomen of the tick on removal to anaphylaxis resulting from tick bites.[18] As with any injury, hand washing and wound cleansing should follow tick removal. Steps for tick removal are shown in Figure 5.

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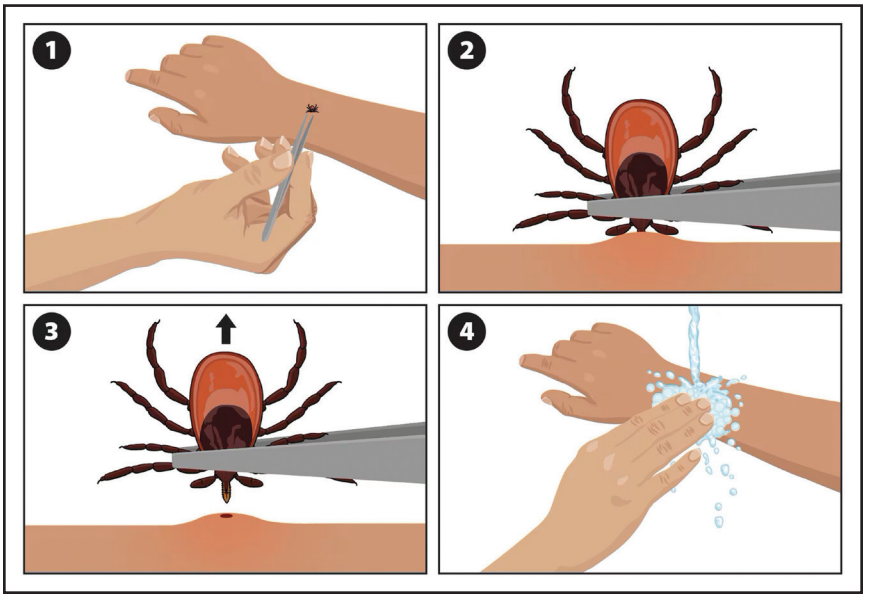

Figure 5. Tick removal.
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Rash From Poison Ivy, Poison Oak, and Poison Sumac

Background

Contact dermatitis from *Toxicodendron* species (formerly *Rhus*), including poison ivy, poison oak, and poison sumac, is a common problem that affects millions of Americans annually, resulting in millions of visits to health care facilities each year.[1,2] Approximately 50% to 75% of individuals react to urushiol, the allergic compound in *Toxicodendron*. Skin effects include redness, papules and vesicles, and itching, typically starting within days of exposure and lasting up to 3 weeks.[2] The extent and severity of symptoms are proportional to the area and duration of urushiol contact with the skin. Therefore, initial treatment is aimed at preventing or removing exposure to urushiol, and later first aid is aimed at management of symptoms. Although most affected individuals do well with home-based care, advanced medical care is sometimes needed for those with severe symptoms. Data on treatment effectiveness are limited, with few clinical trials.

A literature search was performed by the writing group in 2023.

First Aid For Rash From Poison Ivy, Poison Oak, and Poison Sumac		
COR	**LOE**	**Recommendations**
1	B-NR	1. As soon as exposure to poison ivy, oak, or sumac is recognized, the exposed area should be washed with soap and water or a commercially available decontamination product.
2b	B-NR	2. The usefulness of over-the-counter topical steroids to alleviate local symptoms from poison ivy, oak, or sumac is uncertain.
2b	C-EO	3. Cool compresses may be considered for relief of local symptoms from exposure to poison ivy, oak, or sumac.
2b	C-EO	4. Oatmeal baths may be considered for relief of local symptoms from exposure to poison ivy, oak, or sumac.
2b	C-EO	5. The usefulness of over-the-counter antihistamines to alleviate local symptoms from poison ivy, oak, or sumac is uncertain.

Recommendation-Specific Supportive Text

1. Washing with soap and water can remove up to 100% of poison ivy oils if done immediately after contact. This falls to 50% at 10 minutes, 25 % at 15 minutes, and 10% at 30 minutes.[3] In 1 study of healthy volunteers who were exposed to crushed poison ivy leaves, washing with a commercial decontamination product, commercial hand cleaner, or dishwashing soap and water produced 55% to 70% reductions in local symptoms compared with control, even when used 2 hours after urushiol application; no significant difference was found among the 3 treatments.[4]
2. Topical corticosteroids are often recommended for symptomatic treatment of local symptoms.[5,6] However, those corticosteroids that have been demonstrated to improve local symptoms are not available over the counter. In 1 randomized, blinded trial involving 92 cases of *Toxicodendron* dermatitis, 0.2% hydrocortisone lotion, 1.0% hydrocortisone ointment, 2.5% hydrocortisone ointment, and 2.5% hydrocortisone cream were not reported to improve symptoms.[7] An expert consensus panel recommended the use of midpotency or high-potency topical corticosteroids for mild and moderate symptoms of *Toxicodendron* dermatitis, respectively.[5] An observational study enrolling 89 participants

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found that the combination of systemic corticosteroids and high-potency topical corticosteroids reduced the duration of itching.[8] In this same study, the use of low-potency corticosteroids was not associated with symptom improvement.

3–4. Although supported by little evidence, cool compresses and oatmeal baths are frequently recommended for symptomatic relief of itching from *Toxicodendron* exposure.[5,9]

5. Although oral antihistamines have been recommended as a treatment for local itching, few data support their use.[2,5,6,8,10] An expert consensus and 2 review articles suggested the use of oral antihistamines for help with sleep at night but questioned their efficacy for itching.[2,5,6] One observational study enrolling 89 participants did not find a statistically significant reduction in symptoms with the use of oral antihistamine.[8]

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Snake Bite

Background

Approximately 8000 to 10 000 people are treated for snakebite in the United States each year.[1–3] Two families of venomous snakes (*Crotalinae* and *Elapidae*) are indigenous to the United States.[4] Most snakebites occur in the warmer months and involve the extremities.[5–7]

More than 95% of venomous bites in North America are caused by crotaline snakes (*Crotalinae*, also known as pit vipers), specifically rattlesnakes, copperheads, and cottonmouths.[8] Venom from crotaline snakes causes tissue injury and may also cause low blood pressure, bleeding, and muscle fasciculations leading to paralysis. Wounds are generally red, warm, tender, and swollen.

In the United States, bites from coral snakes (*Elapidae*) occur in the Southeast (primarily Florida) and the Southwest (Texas, New Mexico, Arizona).[7] These bites do not cause tissue injury; coral snake venom is primarily neurotoxic and can cause paralysis within minutes to hours.

There is a relative paucity of literature about the most effective first aid treatments for snake envenomation. Application of tourniquets, pressure bandage immobilization, incision, suction, ice application or immersion, and application of electrical current have been advocated, with known risks and unclear benefits.[9–11]

These recommendations are specific to snakebites occurring in the United States and Canada and involving indigenous snakes. Snakes in other parts of the world have different venom effects and may require different first aid measures.

A literature search was performed by the writing group in 2023.

First Aid for Snake Bite in North America

COR	LOE	Recommendations
1	C-EO	1. Emergency services should be activated for any person bitten by a venomous or possibly venomous snake.
2a	C-LD	2. It is reasonable to rest and immobilize the bitten extremity and minimize exertion by the person who was bitten if it does not delay access to emergency medical care.
2a	C-EO	3. It is reasonable to remove rings and other constricting objects from the bitten extremity.
3: No benefit	C-LD	4. Application of ice to a snakebite wound is of unproven benefit and may be harmful in some situations.
3: Harm	C-LD	5. The use of suction to treat snake bites is potentially harmful.
3: Harm	C-LD	6. The application of electric shock to treat snake bites is potentially harmful.
3: Harm	C-LD	7. The use of tourniquets to treat snake bites is potentially harmful.
3: Harm	C-LD	8. The use of pressure immobilization bandaging to treat snake bites is potentially harmful.

Recommendation-Specific Supportive Text

1. The definitive treatment for snake bite is antivenom, which is not available for use in the first aid setting. It is not practical to treat shock, internal bleeding, or severe neurotoxicity in the first aid setting. A person bitten by a snake that is venomous or might be venomous should seek prompt medical attention. Transport by EMS allows delivery of supportive and stabilizing care before arrival at the hospital.
2. A pit viper bite typically deposits venom intradermally or into the subcutaneous space. In a human experimental study, flow of an intradermally or subcutaneously injected radiotracer increased when the subject walked for ≥10 minutes.[12] This could lead to increased systemic absorption of venom. The ideal response in each situation requires

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balancing the goals of reducing exertion with avoiding delay to care.

3. Swelling of an envenomated limb may cause rings to constrict and damage the finger. Although never studied, removal of rings and other constricting jewelry is a reasonable first aid action.
4. Ice has not been studied as a first aid treatment for snakebite,[13] and case reports show tissue injury from aggressive cryotherapy.[10] Ice application is not generally recommended for the treatment of snakebite.[4,14,15]
5. Suction, with or without incision, is not effective in venom removal[11,16] and may cause tissue injury.[17,18]
6. Systematic reviews of human experience and animal experiments suggest that electric shock therapy is ineffective and potentially harmful in snakebite.[15,19,20]
7. Tourniquet application was found to be ineffective or to worsen local tissue injury in systematic reviews of human and animal studies.[13,15,19]
8. The results of human and animal studies of pressure immobilization bandaging are mixed with regard to both intended effects (delayed onset of systemic toxicity) and to harms (worsening tissue injury).[13,19] Several studies show that medical personnel and lay rescuers had a low rate of appropriate pressure immobilization bandage placement, even under ideal conditions.[21–23] Although a properly placed pressure immobilization bandage may have a role in the management of neurotoxic snakebite, >95% of snake envenomation in North America involves snakes with cytotoxic venom. Given this uncertainty, pressure immobilization bandaging is not currently recommended for use in North America.[24]

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Jellyfish Stings

Background

Jellyfish stings are a common summertime occurrence and can cause local pain and discomfort. In North America, most people are treated at the scene of the injury, but some require more advanced medical care.[1] Allergic reactions can occur but are uncommon. Data on treatment recommendations are limited; there is a paucity of clinical trials, and it is not clear that all species of *Cnidaria* respond to available first aid treatments the same way. Within these limitations, hot water immersion appears to be the most effective for pain relief. Various topical products, including vinegar, baking soda, urea, and meat tenderizer, have

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been evaluated but have not consistently demonstrated a reduction in pain, and some increase nematocyst discharge.

A literature search was performed by the writing group in 2023.

First Aid for Jellyfish Stings		
COR	**LOE**	**Recommendations**
1	C-EO	1. A first aid provider should observe a person with a jellyfish sting for systemic reaction and call emergency services for difficulty breathing, signs of shock, or severe pain.
2a	C-LD	2. It is reasonable to remove any remaining tentacles by lifting or pulling while avoiding manual contact. Rinsing the affected area with seawater to remove the tentacle is a reasonable alternative if mechanical removal is not available.
2a	C-LD	3. After removal of tentacles, it is reasonable to use nonscalding hot water immersion/irrigation or to apply a heat source to relieve pain.
2b	C-LD	4. Topical lidocaine cream or gel may be reasonable for pain control if hot water is not available.

Recommendation-Specific Supportive Text

1. Most jellyfish stings in North America result only in local symptoms, but severe local symptoms and systemic symptoms from venom can occur.[1] The ideal period of observation is unknown, but most severe reactions occur soon after envenomation.
2. A study of model envenomation evaluated the effect of scraping or pulling *Alatina alata* (sea wasp) tentacles off simulated tissue compared with rinsing with a number of test solutions. Scraping resulted in more hemolysis than pulling off the tentacle or rinsing with seawater. Rinsing with both seawater and ethanol resulted in increased hemolysis compared with pulling tentacles with tweezers.[2]
3. Data from human studies[1–6] generally show benefit from hot water immersion or irrigation compared with alternative treatments such as cold application, papain, vinegar, meat tenderizer, or no treatment. This finding has been confirmed by systematic reviews.[7–9] The most commonly studied water temperature was 40°C (104°F).
4. Topical application of lidocaine (in either 10%–15% or 4%–5% formulations) appears to inhibit nematocyst discharge or decrease pain from stings by the tentacles of multiple jellyfish species.[6,10]

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Spider and Scorpion Envenomation

Background

Spider bites and scorpion stings are common occurrences in the United States.[1–5] Although many are benign and cause only self-limited local symptoms, some species of spider such as the black widow and brown recluse and some species of scorpion, for example, the bark scorpion, can cause more severe localized and systemic symptoms.[5,6]

Bites from black widow and related spiders (genus *Latrodectus*) cause severe crampy pain, muscle rigidity, diaphoresis, and hypertension; although a rash is sometimes observed around the bite site, widow spider bites do not cause local tissue injury. Bites from brown recluse and related spiders (genus *Loxosceles*) cause painful ulcerated wounds that progress over days to weeks, sometimes associated with hemolysis and rhabdomyolysis. Bark scorpion (*Centruroides*) stings cause severe localized pain and muscle cramping that may impair breathing in children.

First aid treatment involves localized wound care and over-the-counter analgesics for pain. Data on first aid treatment are limited, with few randomized trials of first aid interventions. Advanced medical care is sometimes needed for the more severe symptoms.

The effects of spider and scorpion envenomation vary widely around the world. These guidelines are relevant to spider bites and scorpion stings occurring in the United States and Canada.

A literature search was performed by the writing group in 2023.

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First Aid for Spider and Scorpion Envenomation		
COR	**LOE**	**Recommendations**
1	C-EO	1. Emergency services should be called if a person bitten by a spider or stung by a scorpion develops symptoms throughout the body such as difficulty breathing, muscle rigidity, dizziness, or confusion.
1	C-EO	2. A person bitten by a spider or stung by a scorpion should seek medical care if pain extends beyond the site of the bite/sting, becomes severe, and is not controlled by over-the-counter pain medications; if an open wound develops; or if the person experiences symptoms throughout the body.
2a	C-LD	3. Over-the-counter acetaminophen and nonsteroidal anti-inflammatory agents can be used to alleviate local pain from scorpion stings.
2a	C-LD	4. If the skin is intact, topical lidocaine can be useful to relieve local pain from scorpion stings.
2a	C-LD	5. Ice can be useful for local pain relief from scorpion stings.

Recommendation-Specific Supportive Text

1–2. Although many bites and stings of spiders and scorpions result only in local symptoms, severe manifestations can compromise breathing or cause muscle injury and kidney failure.[5,6] These conditions require treatment in a health care setting.

3–5. A randomized trial of 130 adults with scorpion stings occurring in Turkey showed pain improvement with application of topical 5% lidocaine, administration of intravenous acetaminophen, or topical application of ice; the greatest pain reduction was from lidocaine.[7] However, a similar study, also from Turkey, found slightly better pain relief in 106 adult patients who received intravenous acetaminophen or intravenous dexketoprofen (a nonsteroidal anti-inflammatory drug [NSAID]) compared with topical 5% lidocaine or placebo.[8] Although 5% topical lidocaine, oral acetaminophen, and oral NSAIDs are available in the United States without a prescription, intravenous formulations of acetaminophen and NSAIDs are not available in the first aid setting. Overall, these studies provide indirect evidence for the use of acetaminophen, NSAIDs, topical lidocaine, and ice for scorpion stings occurring in the United States. Although ice is commonly recommended, no studies assessing the use of these therapies for spider bites were found.

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Hypothermia

Background

Accidental hypothermia is an environmental emergency that may be encountered in urban, rural, and austere settings. The very young, the very old, and people with impaired temperature perception, regulation, and ability to communicate are at increased risk of hypothermia. In the United States, hypothermia is responsible for ≈1300 deaths annually.[1] Death rates are highest among men, the elderly, and people who live in rural areas.[2,3]

Heat loss occurs through 4 methods: conduction, convection, radiation, and evaporation (Table 10). Hypothermia occurs when the core body temperature drops below the normal temperature range near 37°C. Individuals may be "cold" or "cold stressed" with temperatures of 35°C to 37°C. Mild hypothermia begins when the core temperature falls below 35°C. Hypothermia progresses through predictable stages in a continuum to death (Table 11). First aid providers are unlikely to be able to obtain core body temperatures, so assessment and treatment decisions must be guided by signs and symptoms.

Rewarming may use passive measures (protecting from further heat loss and allowing the body to rewarm itself) or active measures (applying external sources of heat to the body).

These recommendations address mild to severe/profound hypothermia in children and adults and are not applicable to infants <60 days of age and to cardiac arrest in all age groups.

A literature search was performed by the writing group in 2023.

Table 10. The 4 Mechanisms of Heat Loss

Mechanism	Definition
Conduction	Heat transferred directly from warmer to cooler objects that are touching each other
Convection	Heat transferred to or from gas or liquid that is in motion
Radiation	Heat released into air from the body
Evaporation	Heat lost from vaporization of liquid on the skin

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Table 11. Hypothermia Signs, Symptoms, and Potential Rewarming Strategies

Hypothermia level, °C	Signs and symptoms	Rewarming strategies
Cold stress, 35–37	Alert Possibly shivering	Remove from cold environment; protect from further heat loss. Passive rewarming is often adequate in healthy people.
Mild hypothermia, 32–35	Altered level of responsiveness Shivering	Protect from harm such as falls. Passive and active rewarming methods may be used in tandem. Seek additional care.
Moderate hypothermia, 28–32	Decreased level of responsiveness ±Shivering ±Low heart rate Pale, nonblanching exposed skin Associated with frozen tissue/frostbite	Hypothermia with decreased responsiveness, such as responding only to loud voice or pain, is a medical emergency. Use all available passive and active rewarming methods, handle the patient gently, and activate the emergency response system.
Severe hypothermia, <28 Profound hypothermia, <24	Unresponsive, may appear lifeless Cessation of shivering Slow heart rate and breathing High risk for irregular heart rhythm and cardiac arrest	

First Aid for Hypothermia		
COR	**LOE**	**Recommendations**
1	B-R	1. A person with signs and symptoms of hypothermia should be protected from further heat loss by moving from the cold environment to a warm one, having saturated clothing removed, being allowed to passively rewarm with blankets, and being actively rewarmed if resources are available.
1	C-LD	2. If a person with hypothermia cannot be immediately moved from a cold environment to a warm one, they should be protected from further heat loss by insulation from the ground, covering of head and neck, and shielding from heat loss by wind using a plastic or foil layer in addition to a dry insulating layer.
1	C-LD	3. When using rewarming devices of any kind, the first aid provider should follow the manufacturer's instructions for the device used, place insulation between the heat source and skin, and frequently monitor for burns and pressure injury.
1	C-EO	4. If a person with hypothermia has a decreased level of responsiveness such as unresponsiveness, inability to remain awake, mumbling speech, confusion, or inability to participate in removal of clothing or has pallor, cyanosis, or frozen skin, the emergency response system should be activated while the person is rewarmed by any available method.
1	C-EO	5. For patients experiencing cold stress or mild hypothermia who are alert and can safely consume oral food or fluids, it is recommended to provide high-calorie foods or drinks.
2a	C-LD	6. If a person with hypothermia with a decreased level of responsiveness is wearing damp (not saturated) clothing such as polyester fleece and cannot be immediately moved into a warm environment, active rewarming through the damp clothing is reasonable to initiate with the hypothermia wrap technique, using chemical heat blankets, plastic or foil layers, and insulative blankets.
3: No Benefit	C-LD	7. It is not beneficial to use body-to-body rewarming for active rewarming over other active rewarming techniques such as chemical heat packs or forced air systems.

First Aid for Hypothermia (Continued)		
COR	**LOE**	**Recommendations**
3: No Benefit	C-EO	8. It is not effective to treat a person with hypothermia by using small glove or boot insert chemical heat packs as the sole or primary means of rewarming.
3: Harm	B-NR	9. Heat sources, rubbing, and massage should not be applied to the extremities of a person with hypothermia.
3: Harm	C-LD	10. It is potentially harmful to use a warm shower or warm water immersion for rewarming a person with hypothermia with a decreased level of responsiveness (moderate to severe hypothermia) because of the risk of core temperature after drop, hypotension, falls, and drowning.

Recommendation-Specific Supportive Text

1. In studies of active torso-warming modalities using a healthy volunteer model of induced severe hypothermia, active rewarming methods were faster than passive spontaneous rewarming methods. In 3 human volunteer studies, core rewarming rates were highest when using forced air or contact heaters with surface insulation, hot water bottles, or heating blankets (rewarming rates, 0.57°C/h–1.45°C/h) and body-to-body warming (0.52°C/h) compared with passive spontaneous warming under a blanket (0.1°C/h–0.36°C/h).[4–6] Subjects in all 3 studies received medication to suppress shivering.
2. In a small, randomized study of volunteers who were dressed in moistened clothing and exposed to a cold and windy environment, use of a vapor-tight layer and an additional dry insulating layer (the Hibler method) is the most efficient wrapping method to prevent heat loss.[7] Although exposure of the head to cold and wet conditions does not contribute disproportionately to heat loss, head exposure causes a disproportionate increase in

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core cooling rate, likely due to redistribution of blood flow to the scalp, neck, and face.[8]

3. The risk of burns from active external rewarming was described in a 3-patient case series. The authors, who are subject matter experts, concluded that first aid providers should ensure that manufacturer instructions are followed, insulation (eg, cloth) is placed between the skin and the heat source (unless manufacturer instructions direct otherwise), and regular efforts are made to observe heated skin for signs of impending burn injury (eg, redness).[9]
4. Decreased level of responsiveness, mumbling speech, confusion, the inability to participate in removal of wet clothing, pallor, cyanosis, stumbling, and frozen skin are potential signs of life-threatening hypothermia requiring immediate rewarming and advanced care.[10]
5. Shivering is a physiological response to cold exposure, capable of increasing heat production significantly, by ≈5 to 6 times the resting metabolic rate. Although it is an effective method for rewarming, shivering is also highly energy intensive, raising the core temperature of the body but at the cost of substantial calorie expenditure. Providing high-calorie nutrition supports this metabolic demand, aids in maintaining energy reserves, and supports the natural rewarming process of the body. The provided substances should be at a safe temperature to avoid any risk of burning the esophagus.[11]
6. In many freezing and windy settings, undressing a hypothermic person may further contribute to their heat loss. In a simulation study evaluating a multilayer wrap such as those used in mountain rescue, a chemical heating blanket inside a foil or plastic vapor barrier wrap was effective at transferring heat across dry and damp (but not saturated) fleece clothing. When evaluated in a simulated scenario involving saturated clothing, the excess moisture rendered the chemical heat packs inert. The researchers conclude that rescuers should cut off saturated clothing in a protected environment before wrapping wet, hypothermic people, but damp clothing need not be removed.[12]
7. A simulation study of mildly hypothermic healthy volunteers found that rewarming with an external heat source was more effective than body-to-body heat donation by sharing an insulated bag with an euthermic individual (2.46±1 °C/h compared with 2.55±1.09 °C/h).[13] Another similarly designed simulation study found that core rewarming rates were highest when using an 850-W heater and rigid cover (1.45 °C/h), charcoal heating and 600-W rigid heater (0.7 °C/h), or 600-W heater and blanket (0.57 °C/h) compared with body-to-body warming (0.52 °C/h).[5]
8. Chemical heat packs used in studies rewarming hypothermic volunteers are large and are often built into panels in blankets and cover the torso. For example, a recent simulation study used a blanket with 6 heating panels with a combined mass of 397 g.[12] In contrast, small chemical heat packs marketed as glove and boot liners are between 15 and 60 g, and their ability to provide heat is highly variable.[14] The mass and heat generation of glove and boot liners are too low to facilitate the active rewarming of a person with hypothermia.
9. A simulation study describing the role of extremity circulation in relation to core temperature found that heating the extremities and promoting the venous return of cold blood from the extremities may result in cooling of the central circulation.[15] Core temperature drop after external rewarming has been confirmed in small human volunteer studies.[13,16]
10. Although people with simple cold stress (cold and shivering with normal mental status) were generally able to safely rewarm in a warm shower or warm water immersion in a single-patient experimental study of mild hypothermia (core temperature ≈36° C), warm bath rewarming was associated with transient core temperature drop, decreases in mean arterial pressure, and increases in heart rate and cardiac output.[16] These effects can lead to decreased perfusion to the vital organs and, in severe cases, cause arrhythmia. In addition, attempting to manage a person with hypothermia who is confused or has a decreased level of alertness in a shower or bathtub is potentially dangerous for the person with hypothermia and the first aid provider.

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Frostbite

Background

Frostbite is a condition that results from the freezing of skin and, in severe cases, underlying tissues. The formation of ice crystals within the cells causes cellular and tissue damage. The extremities—fingers, toes, nose, and ears—are particularly susceptible to frostbite. The severity of frostbite varies from mild cases in which only the outer layers of the skin are affected (superficial frostbite) to more severe cases involving deeper tissues. Symptoms include numbness, tingling, pain, and changes in skin color (from pale to hardened and dark). In extreme cases, frostbite can cause tissue necrosis leading to digit or limb loss.

A literature search was performed by the writing group in 2023.

First Aid for Frostbite

COR	LOE	Recommendations
1	C-LD	1. The preferred method for warming frostbitten tissue is clean lukewarm water immersion at 37°C to 40°C (99°F–104°F).
1	C-LD	2. Frostbitten tissue should be rewarmed at the earliest opportunity, as long as there is no risk of refreezing.
1	C-LD	3. If clean lukewarm water immersion is not feasible, frostbitten tissue should be allowed to rewarm spontaneously in warm room air or next to the person's own warm skin.

First Aid for Frostbite (Continued)

COR	LOE	Recommendations
1	C-LD	4. A person with frostbite should seek prompt medical attention.
1	C-EO	5. Jewelry or other constricting materials should be removed from a frostbitten extremity as soon as possible.
1	C-EO	6. A person with moderate to severe hypothermia should receive core rewarming before frostbite is treated.
1	C-EO	7. If possible, a person should protect frostbitten tissue from further injury and avoid walking on frozen feet and toes.
1	C-EO	8. For frozen and thawed tissue and between the toes and fingers, bulky, clean, dry gauze or sterile cotton dressings should be applied. Circumferential dressings should be wrapped loosely to allow for swelling without placing pressure on the underlying tissue.
2b	C-EO	9. It may be reasonable to give ibuprofen to a person with frostbite to prevent further tissue damage and to treat pain.
3: No Benefit	C-EO	10. It is not recommended for first aid providers to debride blisters associated with frostbite.

Recommendation-Specific Supportive Text

1. Several animal model studies have demonstrated that water temperature slightly above normal body temperature (37–40°C [99–104°F]) is best for rapid rewarming with a warm-water immersion technique.[1,2] In one of these studies, rapid rewarming with warm water (45°C [113°F]) was harmful.[2] More recent human patient case series have demonstrated the safety and efficacy of rewarming frostbitten tissue in the range of 37°C to 40°C for between 20 and 30 minutes.[3,4] Five recent systematic reviews and clinical practice guidelines also endorse lukewarm water immersion at or near this temperature range.[5–9] If a thermometer is not available, water temperature can be tested against one's wrist, where it should feel slightly warmer than body temperature.
2. The mechanism of tissue damage in frostbite is the development of ice crystals in cells, which can destroy cell membrane integrity. As a result, it is widely recommended that tissue refreezing be strictly avoided and first aid in-field rewarming be considered only if the risk of refreezing is negligible.[6–8,10]
3. Animal studies have demonstrated that use of a warm water immersion technique at a temperature of 37°C to 40°C (98.6°F–104.0°F) is best for rapid rewarming of frozen tissue. Limbs left to thaw spontaneously at 27°C to 29°C (81°F–84°F) also had good outcomes. Air rewarming can be used as an alternative rewarming method when warm water immersion is not possible.[2]

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4. Frostbite is a potentially tissue-threatening injury, and estimating the size and severity of frostbitten tissue can be challenging, especially in the first aid setting. Advanced treatment for frostbite such as thrombolytic medication can be administered only in a health care setting and is most effective when given soon after injury.[11,12] Frostbite involving deeper tissue depths may require care at a burn center.[6]
5. Tissue of the frozen extremities will swell, so it is recommended to remove constricting items such as jewelry and tight clothing.
6. Frostbite is a common finding in hypothermic individuals. However, rewarming the core of the person with hypothermia is the treatment priority, and rewarming the extremities first can cause the core temperature to decrease.[13,14]
7. A characteristic of acute frostbite and frozen tissue is the inability to sense touch, including ongoing mechanical tissue damage. A person with frostbitten fingers and hands or toes and feet may not be aware of ongoing damage caused by movement, especially walking. Experts recommend that frostbitten tissues be protected and that frostbitten hands and feet not be used for climbing or walking whenever it is avoidable.[8]
8. Frozen and thawed tissues are extremely vulnerable to further injury and infection. Applying bulky dressings provides a protective layer that insulates the tissue, maintaining an optimal healing environment while shielding the area from external contaminants and physical trauma. After thawing, tissues can become wet, increasing the risk of infection and delayed healing. Clean and dry dressings absorb excess moisture, keeping the area dry and reducing the likelihood of bacterial growth. Edema, or swelling, is a common response in tissues damaged by freezing and thawing attributable to increased fluid accumulation and inflammatory processes. Loose, circumferential wrapping allows expansion as swelling increases, which prevents the constriction of blood flow and further tissue damage. Frozen and thawed tissues are susceptible to pressure sores and necrosis. Bulky dressings distribute pressure more evenly, reducing the risk of localized pressure points that can compromise blood flow and tissue viability.[8]
9. NSAIDs decrease the production of prostaglandins and thromboxanes that can cause vasoconstriction, dermal ischemia, and further tissue damage in frostbite. Ibuprofen is recommended by many experts and included in many treatment guidelines, although direct clinical evidence is lacking.[5,8,15]
10. Intact skin is an essential barrier for infection. Whenever possible, intact epidermal layers should be left intact.

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Heatstroke and Exertional Hyperthermia

Background

Exertional hyperthermia occurs when a person performs strenuous exercise in a warm environment or is not adequately able to thermoregulate by sweating. Heatstroke is an emergency condition characterized by severe hyperthermia and organ dysfunction, typically with mental status alteration. The growing incidence of heat-reported illness is of increasing concern because of global urbanization and climate change.

The current heat emergency data have several limitations. Most studies were small and involved inducing hyperthermia in asymptomatic, healthy adult volunteers, resulting in indirect evidence for treating adults with heatstroke. Studies involving people with heatstroke are generally observational and use rapidity of temperature reduction as the end point. Few studies are available on

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the impact of first aid interventions on crucial clinical outcomes such as mortality, organ damage, and adverse events. No comparative studies of cooling techniques in children were identified.

This topic was the subject of a 2020 ILCOR systematic review,[1] a 2020 AHA/Red Cross focused update,[2] and a 2022 ILCOR evidence update.[3] An updated literature search was performed by the writing group in 2023.

First Aid for Exertional Hyperthermia and Heatstroke		
COR	**LOE**	**Recommendations**
1	C-EO	1. For people with exertional hyperthermia or heatstroke, first aid providers should move the individual from the hot environment, remove excess clothing, limit exertion, and provide cool liquids if the person is able to swallow.
1	C-EO	2. For people with heatstroke (heat illness with altered mental status), first aid providers should activate emergency services.
2a	C-LD	3. For adults with heatstroke, it is reasonable to initiate immediate active cooling by using whole-body (neck-down) cool- to cold-water immersion for 15 minutes or until neurological symptoms resolve (whichever occurs first).
2a	C-LD	4. For adults with heatstroke, it is reasonable to initiate other forms of active cooling, including commercial ice packs, cold showers, ice sheets and towels, cooling vests and jackets, and evaporative, fanning, or a combination of techniques when water immersion is not available.
2a	C-EO	5. For children with heatstroke, it is reasonable to initiate immediate active cooling by using whole-body (neck-down) cool- to cold-water immersion for 15 minutes or until neurological symptoms resolve (whichever occurs first).
2a	C-EO	6. For children with heatstroke, it is reasonable to initiate other forms of active cooling, including commercial ice packs, cold showers, ice sheets and towels, cooling vests and jackets, and evaporative, fanning, or a combination of techniques when water immersion is not available.
2b	C-EO	7. It may be reasonable for first aid providers, who are trained and willing, to measure core temperature during active cooling for heatstroke. The target core temperature to cool until is 39°C (102.2°F).

Recommendation-Specific Supportive Text

1. Although not formally studied, these safe, readily available measures are commonly included in standard recommendations of heat exhaustion or heatstroke.[4–6]
2. Heatstroke (heat stress accompanied by altered mental status) can lead to muscle injury, coagulopathy, organ failure, cardiovascular collapse, and death.[7,8] Heatstroke is a medical emergency that requires rapid cooling, intravenous fluids, and intensive monitoring and support in a hospital setting.
3. Survival from heatstroke is related to the speed at which temperature reduction is achieved; faster cooling is associated with better survival.[9–11] An ILCOR systematic review of 63 studies of cooling techniques for exertional heat exhaustion and heatstroke found faster cooling rates with water immersion compared with passive cooling.[1] There was no significant difference in the rate of body temperature reduction across water temperatures of 2 to 26°C (36°F–79°F), indicating that the act of immersion, rather than water temperature, is most important.
4. The listed cooling methods reduce temperature more slowly than immersion methods but more quickly than passive body cooling or application of ice packs to the axilla and groin.[12–14]

5–6. Although much of the hyperthermia literature includes adolescent athletes and military recruits in the studied population, studies enrolling younger children have not been completed.[15] In the absence of pediatric-specific studies, pediatric recommendations mirror recommendations for adolescents and adults.[15–18]

7. The primary outcome of active cooling for heatstroke is core temperature reduction. Although core temperature measurement is typically outside the scope of lay first aid providers, it may be appropriate in some settings and circumstances.[4,15,18]

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Oral Rehydration for Exertional Dehydration

Background

Dehydration associated with exertion is a health concern frequently encountered in the first aid setting, particularly in sporting events. The condition continues to pose significant risks to athletes and participants involved in physically demanding activities. It is characterized by reduced total body water content, often exacerbated by increased perspiration, respiratory water loss, high ambient temperatures, and inadequate fluid intake. This imbalance in fluid homeostasis can lead to diminished physical performance, cognitive impairments, and in severe cases, life-threatening complications such as heatstroke or acute kidney injury. Although various hydration strategies have been used to prevent or mitigate these outcomes, there has been a lack of consistency in past treatment recommendations.

This topic was the subject of a 2-part ILCOR systematic review in 2023.[1,2]

Oral Rehydration for Exertional Dehydration		
COR	**LOE**	**Recommendations**
1	C-LD	1. In the absence of shock, confusion, or inability to swallow, first aid providers should assist or encourage individuals with exertional dehydration to orally rehydrate with any available rehydration drink or potable water.
2a	B-R	2. It is reasonable to choose 4% to 9% carbohydrate-electrolyte drink over potable water, 0% to 3.9% carbohydrate-electrolyte drinks, coconut water, or low-fat cow's milk, if each is readily available.

Recommendation-Specific Supportive Text

1–2. A pair of 2023 ILCOR systematic reviews[1,2] identified 22 studies comparing carbohydrate-electrolyte drinks and other beverages with water for effective oral rehydration. These studies used surrogate markers of rehydration, typically urine output. The authors of these studies considered low urine output to represent retention of the administered fluids, an indirect measure of rehydration effectiveness. Although there was variability between studies, the review authors concluded that carbohydrate-electrolyte drinks (4%–9% glucose concentration) were overall associated with the highest net fluid balance. No beverage was superior for all end points studied, and all beverages except beer were equal or superior to potable water for some end points in some studies.

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TOXICOLOGY EMERGENCIES

Opioid Overdose

Background

Opioid overdose is a leading cause of death in the United States and worldwide. More than 80 000 people in the United States died of opioid overdose in 2021, with a 14% increase in the age-adjusted death rate from opioid overdose in a single year.[1] In the same year, 1.06 million people were treated in US EDs for nonfatal opioid overdose.[2] Most overdoses are unintentional.

Opioid overdose causes central nervous system depression (sleepiness, unresponsiveness) and respiratory depression (slowed and stopped breathing), which, if untreated, progresses to cardiac arrest.

Naloxone is an antidote that reverses the effect of opioid overdose, restoring consciousness and breathing. Naloxone can be administered by multiple routes, and naloxone nasal spray is available in the United States without a prescription.

Because it can be difficult to reliably ascertain the presence or absence of a pulse in the first aid setting, these guidelines follow the Opioid-Associated Emergency for Lay Responders Algorithm (Figure 6). This

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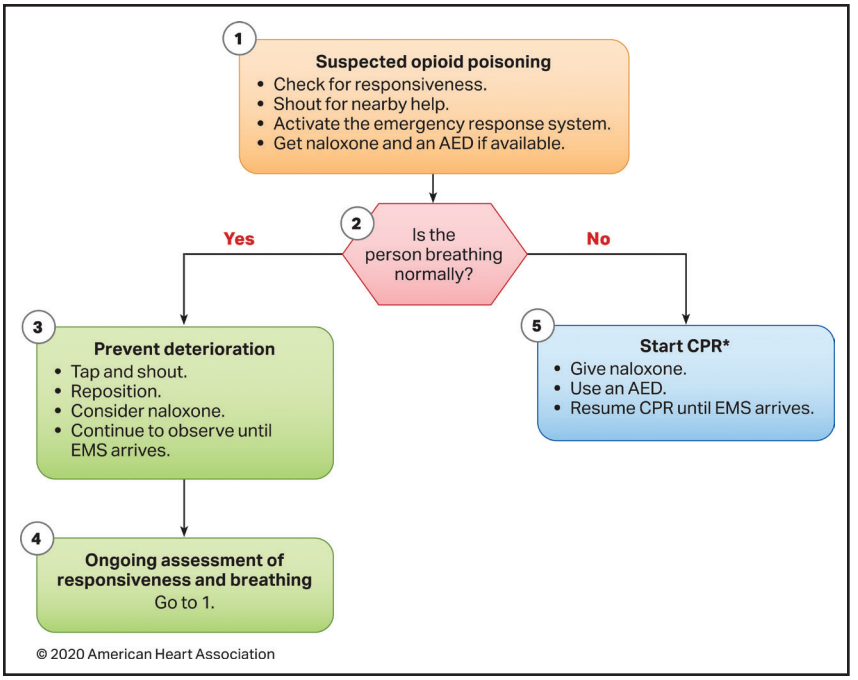

Figure 6. Opioid-Associated Emergency for Lay Responders Algorithm.
AED indicates automated external defibrillator; CPR, cardiopulmonary resuscitation; and EMS, emergency medical services. *For adult and adolescent victims, responders should perform compressions and rescue breaths for opioid-associated emergencies if they are trained and perform hands-only CPR if not trained to perform rescue breaths. For infants and children, CPR should include compressions with rescue breaths.

does not preclude people with appropriate training from using the Opioid-Associated Emergency for Health Care Providers Algorithm.

Nothing in these guidelines is intended to preclude the use of other opioid antagonists (eg, nalmefene), which are available by prescription only in the United States at the time of this writing.

These recommendations adapt those found in the 2020 AHA adult basic and advanced life support and pediatric basic and advanced life support guidelines and the "2023 American Heart Association Focused Update on the Management of Patients With Cardiac Arrest or Life-Threatening Toxicity Due to Poisoning" for the first aid setting.[3–5] An updated literature search was performed by the writing group in 2023.

First Aid for Opioid Overdose		
COR	**LOE**	**Recommendations**
1	B-R	1. It is beneficial for first aid providers to receive training in responding to opioid overdose, including the provision of naloxone.
1	B-NR	2. A first aid provider who encounters a person with suspected opioid overdose who is unresponsive and not breathing or not breathing normally should activate the emergency response system, provide high-quality CPR (compressions plus ventilation), and administer naloxone.

Recommendation-Specific Supportive Text

1. Ten controlled studies assessed the impact of opioid overdose training on the ability of individuals with opioid use disorder to recognize opioid-associated resuscitation emergencies or their willingness to administer naloxone.[6–15] One study[13] found that the rate of naloxone administration was higher in those who had received opioid training compared with those who had not (32% versus 0%), although another study found no difference in the provision of aid between trained and untrained responders.[14] Interventions that included skills practice (ie, naloxone administration) were more likely to lead to improved clinical performance compared with interventions without skills practice,[7,16–21] and an RCT showed that people who use opioids and their significant others were more likely to administer naloxone if they received hands-on training compared with watching a video.[10] Opioid education and naloxone distribution programs are widely accepted by first aid providers in various settings.[22–33]
2. More than 20 studies[34–62] demonstrate that naloxone is a safe and effective treatment for central nervous system and respiratory depression due to opioid overdose when given in various settings. Major complications are rare and dose related. No studies compared naloxone administration with standard resuscitation or ventilatory support alone. In addition to circumstantial evidence of opioid exposure, miosis is strongly correlated with response to naloxone administration,[63,64] although many factors affect pupil size,[65] and it is not established whether first aid providers can reliably identify miosis. Naloxone has an excellent safety profile and is unlikely to be harmful if given to a person with respiratory depression who does not have an opioid overdose.[66,67] A person who is breathing normally does not require naloxone.

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Early activation of the emergency response system is critical for people with suspected opioid overdose. Rescuers cannot be certain that the person's clinical condition is due to opioid-induced respiratory depression alone. This is particularly true in first aid settings, where determination of the presence of a pulse is unreliable,[68,69] but even trained first responders have difficulty rapidly determining pulselessness.[70] Intranasal naloxone takes several minutes to restore adequate respirations,[39,55,56,58–60,62] and ventilatory support is crucial during this time. Naloxone is not effective in other medical conditions, including overdose involving nonopioids and cardiac arrest resulting from any cause. People who respond to naloxone administration are at risk of recurrent central nervous system or respiratory depression and require a period of observation before safe discharge from a health care setting.[71–74] The risk of providing CPR to a person who is not in cardiac arrest is low.[75] Therefore, the safest course for a first aid provider is to immediately activate the emergency response system, delivering high-quality CPR that includes both compressions and ventilation, and administer naloxone. A health care professional who is able to reliably assess for the presence of a pulse can use the appropriate health care professional algorithm.

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Chemical Exposure to the Skin

Background

Exposure to caustic chemicals is a danger both at home and in the workplace. Although caustic injuries make up only ≈3% of burns, they can lead to significant morbidity and mortality.[1] There are many different types of caustic products, but they fall primarily in the categories of acids and alkalis. The extent of the injury from caustic materials is related to the mechanism and concentration of the chemical, its depth of penetration, the volume of chemical that the victim is exposed to, the body site involved, and how long the exposure lasts.[2,3]

Rapid removal of the caustic agent is the key to first aid. When first aid is provided for caustic injury, it is important not to contaminate other individuals or areas with the substance. Personal protective equipment should be worn when exposure to the caustic agent is possible. Although some caustic liquids may be more easily removed or treated with specialized agents, running water is a readily available resource that can be used as a decontamination agent.[4] Poison centers can provide further information on additional treatment recommendations, including duration of irrigation or other decontamination strategies.

A literature search was performed by the writing group in 2023.

First Aid for Chemical Exposure to the Skin

COR	LOE	Recommendations
1	B-NR	1. Immediate skin decontamination is recommended after a chemical exposure.
1	B-NR	2. Unless otherwise recommended by local guidelines or chemical-specific information, skin exposed to caustic chemical should be irrigated with running water for at least 15 minutes.
1	C-LD	3. It can be beneficial to follow local guidelines, follow chemical-specific procedures, or consult a regional poison center when assisting a person with chemical exposures.
1	C-EO	4. Contaminated clothing, jewelry, and other surrounding material should be removed from the area of a chemical exposure.
1	C-EO	5. EMS should be called when a person with chemical exposure has respiratory symptoms, systemic symptoms, or large chemical exposures.
2a	C-LD	6. It is reasonable to brush off any dry chemical before irrigation with water.

Recommendation-Specific Supportive Text

1–2, 4. An observational study reported outcomes for 35 patients with caustic dermal injury from various agents.[5] Patients who received immediate irrigation within 10 minutes and with a "large volume" of water for at least 15 minutes had decreased degree of full-thickness burns, number of full-thickness burns, and mean length of hospital stay compared with those who did not receive immediate irrigation. A second observational study evaluated the effect of immediate first aid, defined as copious water irrigation within 3 minutes of the exposure, compared with delayed irrigation in 83 patients.[6] The number of full-thickness burns, mean hospital days, and delayed complications were all lower in patients with immediate irrigation compared with those with delayed irrigation. Removal of contaminated clothing and jewelry avoids trapping chemicals against the skin during decontamination.[7]

3. Exposures to some chemicals such as those in the home may result from low concentrations and amounts of the chemical that, if appropriately irrigated, may not result in burns to the skin and do not need more advanced medical care. However, in the industrial setting or with more

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concentrated or potent chemicals, significant injury may occur and, even with immediate irrigation, needs advanced medical care. Sources of chemical-specific treatment recommendations include Safety Data Sheets and poison centers.

5. Some chemicals such as hydrofluoric acid[8] and phenol[9] are best decontaminated with substances other than water and may require treatment other than simple decontamination. Washing with a commercial decontamination solution if available may be more effective than water for some exposures.[10–12] Some poisons can be absorbed through the skin or mucus membranes, leading to systemic toxicity. Recommendations for decontamination in specific circumstances can be obtained from local protocols, hazardous materials references, and regional poison centers.
6. Some dry chemicals such as sodium hydroxide, elemental sodium, or elemental potassium may react with water to cause caustic or thermal injury. Dry decontamination (brushing off as much chemical powder as possible while avoiding spreading the contaminant to other areas) before irrigation of the area with water may reduce this effect.[1,13]

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Chemical Exposure to the Eye

Background

Caustic chemical exposure to the eyes is a danger both at home and in the workplace.[1] Chemical injury to the eye represents between 10% to 22% of all eye injuries.[2,3] The extent of the eye injury from caustic materials is related to the chemical involved and how long the exposure lasts.[3] Therefore, rapid removal of the caustic agent is the key to first aid. Although some chemicals may have specific decontamination techniques, running water is a readily available resource that has been demonstrated to be an effective decontamination agent.[4] Regional poison centers or local protocols can provide further information on additional treatment recommendations, including duration of irrigation or other decontamination strategies.

A literature search was performed by the writing group in 2023.

First Aid for Chemical Exposure to the Eye

COR	LOE	Recommendations
1	B-NR	1. Decontamination by irrigation should be performed immediately after chemical exposure to the eyes.
1	C-LD	2. Unless otherwise recommended by local guidelines, irrigation with a copious amount of tap water for 15 minutes should be performed.
1	C-EO	3. When providing first aid for chemical eye injury, first aid providers should avoid contaminating other individuals, areas, or the other eye with the caustic substance.
2a	B-NR	4. Eye irrigation with normal saline, Ringer's lactate solution, or a commercial eye wash solution if immediately available is reasonable.
2a	C-LD	5. It is reasonable for individuals with ocular exposure to industrial chemicals to adhere to local guidelines or recommendations from a poison center.

Recommendation-Specific Supportive Text

1–3. Early eye irrigation is associated with reduced eye damage in human observational and animal experimental studies.[5–9] Cross-contamination of the contralateral eye, the injured person's skin, or other people's skin risks additional injury. Although studies comparing different durations of eye irrigation are not available, 15 minutes of continuous irrigation appeared to be effective in an observational study and an animal experiment.[4,5] Some people may need assistance maintaining open eyelids during irrigation. Although many reviews recommend irrigation until the eye pH is normal, pH test paper is not routinely available in the first aid setting.

4. A prospective observational study enrolling 1495 patients with 2194 corrosive eye injuries

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demonstrated that patients irrigated with a commercial eye irrigation solution had significantly less severe-grade eye injury compared with those treated with isotonic phosphate buffer, Ringer's lactate, or 0.9% saline solution.[4] Irrigation with a balanced salt solution may be more comfortable than irrigation with other irrigation fluids.[8]

5. Approximately 8% of chemical eye injuries in working-aged people occur in the occupational setting. These settings may use chemicals that require specific decontamination techniques for ideal treatment. US poison centers assist in management of >80 000 ocular chemical exposures per year.[10]

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TRAUMA

External Bleeding Control

Background

Trauma is a leading cause of morbidity and mortality throughout the world, resulting in millions of deaths and hospitalizations each year. Uncontrolled bleeding is the most important preventable cause of death in 35% of trauma patients and can occur before the arrival of emergency services.[1–3] Life-threatening bleeding can be recognized by pooling of blood on the ground, blood that is rapidly flowing or spurting from the wound, bleeding that continues despite direct manual pressure, or bleeding that results in systemic symptoms such as drowsiness, dizziness, chest pain, or loss of consciousness. Because death can occur within minutes, first aid providers are essential in providing immediate care. Control of bleeding is a foundational first aid skill, and applying direct pressure is the mainstay of treatment. For extremity bleeding that is not effectively controlled with direct pressure, tourniquet application can be an appropriate intervention.

Direct manual pressure is the hallmark of hemorrhage control. If available, hemostatic dressings (which contain materials that help promote blood clotting), pressure dressings, mechanical pressure devices, and tourniquets may augment the effectiveness of direct manual pressure or avoid the need for ongoing direct manual pressure. These devices may also be useful in a mass casualty event, when there are not adequate resources to provide direct pressure to all victims. Tourniquets are beneficial for extremity hemorrhage only when they can be applied proximal to the wound. Both commercial and improvised tourniquets can be used. No human studies have assessed the effectiveness of manual pressure points in individuals with life-threatening bleeding.

These guidelines are intended for use in the civilian first aid setting. The management of life-threatening bleeding in tactical rescue situations, mass casualty events, and military conflict is outside the scope of these guidelines.

This topic was the subject of several 2020 ILCOR systematic reviews.[4] An updated literature search was performed by the writing group in 2023.

First Aid for Severe External Bleeding

COR	LOE	Recommendations
1	C-LD	1. Direct manual pressure should be applied to achieve initial control of external bleeding.
2a	C-LD	2. A hemostatic dressing can be useful as adjunctive therapy to improve the effectiveness of direct manual pressure.
2b	C-LD	3. Once bleeding has been controlled, it may be reasonable to apply a pressure dressing to maintain bleeding cessation.
2b	C-LD	4. The utility of indirect manual pressure (ie, pressure points) for bleeding control is uncertain.
2b	C-EO	5. Mechanical pressure such as pressure bandages or devices might be considered in some situations when direct manual pressure is not feasible.

Recommendation-Specific Supportive Text

1, 5. In 3 different RCTs conducted in hospitalized participants undergoing endovascular procedures, there was a shorter time to bleeding cessation for bleeding arterial wounds with the use of direct manual pressure than with the use of at least some mechanical compression devices.[5–7] No studies on mechanical pressure

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for traumatic injuries or in the first aid setting were identified.

2. In an RCT of 160 patients in the ED with stab wounds to the limbs, the proportion with cessation of bleeding in <5 minutes was higher for participants who received a hemostatic dressing plus direct pressure (51.2%) compared with participants who received direct pressure alone (32.5%).[8] There are currently no data addressing which type of dressing may be more effective in the first aid setting, but 3 in-hospital RCTs suggest no difference between dressing types in time to cessation of bleeding or complications.[9–11]
3. Commercial pressure dressings and elastic adhesive dressings may be effective in maintaining hemorrhage control or even as the primary means of hemorrhage control when applied by people who have received bleeding control training, including by non–health care personnel.[12–14]
4. No studies were identified evaluating the effectiveness of manual compression of the femoral or brachial artery (also known as pressure points) to control distal hemorrhage. Data on the use of pressure points for life-threatening bleeding come from manikin studies and studies using healthy human volunteers, with no human studies evaluating pressure points in individuals with life-threatening external bleeding.[4,15] In a volunteer study, manual digital occlusion of the brachial or femoral artery eliminated distal blood flow in most subjects, but the effect was not sustained; distal pulses returned in a median of 40 seconds after brachial artery occlusion and 20 seconds of femoral artery occlusion.[16]

First Aid for Life-Threatening Extremity Bleeding That Is Not Controlled by Direct Pressure

COR	LOE	Recommendations
1	B-NR	1. For life-threatening extremity bleeding, a tourniquet should be applied and tightened until the bleeding stops.
2a	C-LD	2. A commercial tourniquet is probably superior to an improvised tourniquet.
2a	C-EO	3. If an improvised tourniquet is used, it is reasonable for the tourniquet to be at least 2 in width.

Recommendation-Specific Supportive Text

1. Observational studies of patients with life-threatening extremity bleeding report lower mortality when a tourniquet is placed in the prehospital setting as opposed to only after hospital arrival.[4,16–18] Tourniquet application by health care professionals and laypeople appears to be safe: In 2 observational studies including 255 people with prehospital tourniquet application by police, EMS personnel, and laypeople, no person had decreased limb function attributed to tourniquet use.[19,20] A recent systematic review found no sign that tourniquet use was associated with increased amputation rates, and nerve palsy rates were low.[4] Commercial windlass tourniquets appear to be appropriate for use in children as young as 2 years of age[4,21] and to successfully occlude distal extremity pulses in school-aged child volunteers (6–16 years of age).[22]
2. Simulation studies with healthy adult volunteers[23–25] and manikins[26] reported a higher rate of distal pulse ablation or simulated arterial compression with commercial tourniquets compared with improvised tourniquets. No pediatric studies comparing commercial with improvised tourniquets in children were identified. Some training may be required for successful application of commercial tourniquets by laypeople.[27–29]
3. Narrow tourniquets cause more pain and tissue damage and are less effective than wider tourniquets.[16,30,31] Wider cuff tourniquets require less pressure to occlude arterial blood flow than narrow tourniquets.[30,32] High tourniquet pressure is associated with an increased risk of nerve compression injury.[33]

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Open Chest Wounds

Background

An open chest wound (a wound through the chest wall into the lung cavity) is immediately life-threatening. Management of an open chest wound in an out-of-hospital setting while awaiting the arrival of EMS is a challenging scenario for a first aid provider. In patients with chest trauma who are breathing spontaneously, air can enter the pleural space through the chest wall defect or through a lung wound during the inspiratory (negative intrathoracic pressure) phase of the respiratory cycle (a "sucking chest wound"). The goal of a chest seal is to prevent air entry through the wound. Air can exit through the chest wall defect when intrathoracic pressure exceeds ambient pressure such as during the expiratory phase of spontaneous respirations, during positive-pressure ventilation (eg, rescue breathing, bag-mask ventilation), or if a tension pneumothorax is developing. The goal of a chest seal is to prevent air entry into the pleural space. The greatest concern is the improper use of an occlusive dressing or device that could lead to fatal tension pneumothorax by preventing air from exiting through the chest wound. It may be difficult for first aid providers to monitor for signs of tension pneumothorax such as decreased air movement on the affected side and low blood pressure.

A literature search was performed by the writing group in 2023.

Recommendation for the Care of Open Chest Wounds

COR	LOE	Recommendations
1	C-EO	1. An open chest wound is a medical emergency requiring immediate activation of the emergency response system.
1	C-EO	2. If a dressing is placed, the first aid provider should monitor the person for worsening of breathing/symptoms and loosen or remove the dressing if breathing worsens.
2a	C-LD	3. In the first aid situation, it is reasonable to leave an open chest wound exposed to ambient air; place a clean, nonocclusive, dry dressing (eg, gauze dressing, part of a tee shirt); or place a specialized dressing such as a vented chest seal.

Recommendation-Specific Supportive Text

1. Open chest wounds, whether from penetrating trauma or massive blunt trauma, are a medical emergency.

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2. One possible cause of worsening breathing is the creation of a tension pneumothorax because air is no longer able to leave the pleural cavity after placement of a dressing. Loosening or removing the dressing may relieve tension pneumothorax.
3. The goal of sealing an open chest wound is to increase the airflow resistance through the chest wall defect so that it is greater than resistance through the trachea, allowing proper lung ventilation. This is balanced against the risk of causing tension pneumothorax.

   For stab wounds, most handgun wounds, and many rifle wounds, a small wound does not lead to enough air leak to impair respirations. For larger chest wall defects such as those caused by high-velocity rifle wounds, shotgun wounds, and blast injuries, first aid interventions designed to reduce air entry through the wound are theoretically beneficial. Placement of a nonocclusive specialized dressing such as a vented chest seal may achieve this goal.

   There are no human studies of chest seals to inform our treatment recommendations. The skill required to apply these devices correctly is unknown. The effect of these devices on patient-important outcomes (morbidity and mortality) is unknown. The available evidence comes from porcine models and studies on healthy human volunteers. Reported outcomes across the available evidence are disparate, including device adhesion on soiled porcine chest walls,[1] adhesion of new design for a vented chest seal on healthy volunteers and vent function,[2] and valve malfunction and labored breathing in a porcine model of tension pneumothorax and hemothorax.[3] One porcine study demonstrated that both vented and unvented chest seals provided improvements in breathing and blood oxygenation; however, in the presence of ongoing intrapleural air accumulation, the unvented chest seal eventually led to tension pneumothorax and hypoxemia.[4]

   The risk of occlusive dressing use in penetrating chest trauma has been detailed in the published literature since the 1950s.[5] Chest seal evaluations in animal models of hemopneumothoraxes have demonstrated how these devices can fail.[3] Any dressing or device placed over an opening in the chest wall has the potential to cause a tension pneumothorax, particularly if the device does not allow egress of air. A first aid provider who places a dressing or device should be aware of the potential complications and monitor for its occurrence.

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Superficial Wounds

Background

Superficial wounds and abrasions occur when the topmost layer of skin, the epidermis, is damaged. Often resulting from friction against a rough surface, they are frequently seen in outdoor activities, sports, work, and everyday accidents. Proper first aid care can prevent infection, accelerate healing, and reduce scarring.

A literature search was performed by the writing group in 2023.

First Aid for Superficial Wounds

COR	LOE	Recommendations
1	C-EO	1. Superficial wounds and abrasions should be thoroughly irrigated until there is no obvious debris or foreign matter in the wound.
1	C-EO	2. A superficial wound caused by an animal or human bite or with contamination with human or animal saliva should be evaluated in a medical facility as soon as possible.
2a	B-R	3. It is reasonable to use running tap water or sterile saline solutions for wound irrigation instead of antiseptic agents such as povidone-iodine.
2a	B-R	4. It is reasonable to cover clean superficial wounds and abrasions with an occlusive dressing to promote wound healing.
2a	C-EO	5. If a person with superficial wound or abrasion develops redness, swelling, foul-smelling wound drainage, increased pain, or fever, it is reasonable to remove the dressing, inspect the wound, and obtain medical care.

Recommendation-Specific Supportive Text

1. Although a 2022 Cochrane systematic review found no trials reporting wound infection that compared cleansing with tap water with no cleansing,[1] cleansing a wound to prevent infection makes empirical sense. Infection rates of wounds irrigated with tap water are similar to infection rates of wounds irrigated with sterile saline solution.[2,3] Although there is a paucity of evidence to show that any irrigation reduces infection rates in minor traumatic wounds[4] and simple rinsing may not provide the irrigation pressure needed to remove most bacterial contamination,[5,6] cleansing

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of traumatic wounds is generally accepted and recommended.[7–9]

2. Human and animal bite wounds or wounds contaminated with human or animal saliva are at increased risk for infection.[10] Early administration of antibiotics appears to prevent infection from high-risk human and other mammalian bites to the hand and may be useful for other bites.[10–12]
3. Several studies have not demonstrated a benefit of wound cleansing with povidone-iodine in addition to irrigation.[1,13] Similar infection rates appear to occur when wounds are irrigated with tap water, boiled water, distilled water, or sterile saline.[1,14,15]
4. Occlusive dressings such as film, petrolatum, hydrogel, and cellulose/collagen dressings result in better wound healing than dry dressings.[16,17] There is no indication that antibiotic or antibacterial dressings improve wound healing or decrease infection rates in clean wounds.[18–20]
5. Wound infection often requires treatment with antibiotics, which must be prescribed by a health care professional.

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Spinal Motion Restriction

Background

Strategies for spinal immobilization in patients with actual or potential spinal injuries have been used for decades because of concerns that movements associated with extrication and transportation could lead to worsening of original injury or additional new injury. However, these practices (rigid cervical collar and long spine board application) have been driven more by legal considerations and unproven theories than by concrete scientific or clinical evidence. Growing data suggest that they might even be detrimental, leading to their widespread deadoption.

These recommendations are intended for the members of the general public providing first aid. Appropriate exceptions may be made for first aid providers with additional training and special duties working in specific circumstances (eg, lifeguards treating a person with a diving injury).

This topic was the subject of a 2015 ILCOR systematic review[1] and a 2019 ILCOR scoping review.[2]

First Aid for Suspected Spinal Injury

COR	LOE	Recommendations
1	C-EO	1. For a person with a suspected spinal injury, the first aid provider should have the person remain as still as possible (unless safety considerations warrant movement) and activate the emergency response system.
3: Harm	C-LD	2. We recommend against routine spinal immobilization for patients with penetrating trauma (eg, gunshot or knife wounds).
3: Harm	C-LD	3. We recommend against the routine use of rigid cervical collars and long spine boards for spinal immobilization by first aid providers.

Recommendation-Specific Supportive Text

1. Spinal cord injuries in adults and children are often associated with significant and frequently

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life-threatening injuries to the head and brain, chest, and abdomen.[3,4] Having the injured person remain still may reduce the risk of worsening spinal cord or other injury while awaiting the arrival of EMS personnel.

2. A systematic review and meta-analysis found that routine spinal immobilization for penetrating trauma is associated with increased mortality and has not been shown to have a beneficial effect on mitigating neurological deficits.[5,6]
3. The gradual de-emphasis and deadoption of the use of spinal immobilization by professional EMS have not been associated with an increase in disabling spinal cord injuries.[7] Systematic reviews have found that immobilization devices, including rigid cervical collars and spine boards, are associated with patient discomfort and pressure ulcer development.[8–10] Prior treatment guidelines from the AHA, the Red Cross, and ILCOR and a 2019 systematic review provided a weak recommendation against the routine use of cervical collars for stable patients in the first aid setting.[1,11,12]

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Concussion

Background

Concussion is a type of mild traumatic brain injury that is caused by an action or injury that rapidly moves the head and brain back and forth. According to the National Center for Health Statistics, in 2022, 2.3 million children and adolescents had ever received a diagnosis of concussion or brain injury.[1] Signs and symptoms of concussions include headache, nausea, impaired balance, difficulties concentrating, confusion, emotional lability, and fatigue.[2,3] Repeated concussions may lead to long-term difficulties with memory, concentrating, fatigue, headache, and other neurological sequelae.[2,4–6]

Symptom-based tools have been developed to assess the presence and severity of a concussion during sports; however, they require specific training.[2,5,7–12] To date, there is no validated scoring system for concussion identification in the first aid setting.

ILCOR performed a scoping review on concussion assessment in 2020.[13] An updated literature search was performed by the writing group in 2023.

First Aid for Concussion

COR	LOE	Recommendations
1	B-NR	1. A person with signs and symptoms of a concussion should be immediately removed from activity (play/sports) and not allowed to return to activity until evaluated by a health care professional.
1	C-EO	2. For a person with signs or symptoms of severe head injury (such as loss of consciousness, worsening headache, vomiting, altered mental status, seizures, visual changes, swelling, or deformities of the scalp), EMS should be activated.

Recommendation-Specific Supportive Text

1. A broad consensus of health care organizations recommends removing the person with a concussion from sports and other activities posing a risk of reinjury until the injured person has fully recovered.[2,14–17] Specific requirements and timing of return to contact vary and should be determined in consultation with a health care professional.
2. Loss of consciousness, severe or worsening headache, repeated vomiting, altered mental status, seizure, neurological signs and symptoms, and skull fracture are all associated with an increased risk of life-threatening brain injury such as epidural hematoma, subdural hematoma, open skull fracture, or brain edema, which may require hospital treatment.

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Sprains and Strains

Background

Strains and sprains are common soft tissue injuries that occur after movements or falls that stress joints or muscles. These lead to overstretching or tearing of ligaments, tendons, and muscles. Acute symptoms after the injury include pain, swelling, and limited mobility to the affected extremity or joint. Studies of therapy during the subacute and healing phases of sprain and strain injuries provide indirect evidence for the first aid setting.

The ILCOR performed a systematic review of compression wraps in 2020.[1] An updated literature search was performed by the writing group in 2023.

First Aid for Sprains and Strains

COR	LOE	Recommendations
1	C-EO	1. A person with a painful extremity injury that limits use should avoid activities that cause pain and seek medical attention.
2a	C-LD	2. It can be useful for first aid providers to apply cold (such as with ice and water surrounded by a damp cloth) to an acute sprain or strain for pain and swelling. Cold application should be limited to 20 to 30 minutes per application without direct contact on the skin to avoid cold injury.
2b	C-LD	3. First aid providers may consider applying a compression wrap after an acute ankle sprain or strain to promote comfort after an injury. Application of the compression wrap should be performed without compromising circulation.

Recommendation-Specific Supportive Text

1. The mainstay of treatment for strains and sprains is rest and limiting the use of the injured extremity. Often in the first aid setting, there is uncertainty about whether an injury is a sprain, strain, or a fracture; limiting use of the injured extremity avoids worsening the injury.
2. Cold application can acutely decrease pain and swelling in joint sprains and muscle strains. In an RCT of 74 patients with sports-related soft tissue injury, cold therapy to soft tissue injuries improved pain scores at weeks 1, 2, and 4 after injury.[2] Cold therapy improved edema compared with heat therapy in the acute time period.[3] However, cold application has not been demonstrated to improve function or time to recovery.[4] The greatest tissue cooling is achieved by using a bag filled with ice and water surrounded by a damp cloth.[5,6] Other modalities such as refreezable gel packs or ice alone can also be used but do not cool the area as effectively as an ice and water mixture.[6,7] Experts recommend limiting the duration of cold application to 20 to 30 minutes for 3 to 4 times daily.[8] To prevent cold injury, ice should not be placed directly on the skin.

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3. Applying a compression wrap to an acute ankle sprain may provide comfort and relieve pain in the acute time frame.[9,10] Caution should be taken when applying compression to not compromise circulation from overtightening the compression wrap. A systematic review of 6 RCTs and 2 nonrandomized trials concluded that compression wraps did not reduce swelling or pain in ankle sprains or strains during the recovery time frame.[11] In addition, compression wraps did not improve ankle joint function, range of motion, or time to recovery.[12] A systematic review of 8 RCTs did not find a significant difference between rigid, semirigid, and flexible compression wraps when analyzing postinjury symptoms and ankle stability.[12,13] No studies were identified that address the utility of compression wraps for other joint injuries.

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Fractures

Background

Extremity fractures are painful injuries that can become life or limb threatening when involving long bones, major blood vessels, or extensive soft tissue damage. Fractures of a long bone such as the femur can cause severe external or internal bleeding, and open fractures (if the fractured bone disrupts the skin) are at high risk for infection. Signs of an extremity fracture may include obvious deformity, swelling, or bruising of a limb; severe pain with movement or inability to move an extremity; or visible, protruding bone.

After an extensive literature review performed by the writing group in 2023, these recommendations were based on consensus from expert opinion because the search identified no published studies on caring for fractures in the first aid setting.

First Aid for Fractures

COR	LOE	Recommendations
1	C-EO	1. If a fracture is associated with an open wound and severe bleeding, the First Aid for Severe External Bleeding and First Aid for Life-Threatening Extremity Bleeding That Is Not Controlled by Direct Pressure recommendations should be followed.
1	C-EO	2. If a fractured extremity is blue, purple, or pale, the emergency response system should be activated immediately.
2a	C-EO	3. Splinting of a fractured extremity can be useful to reduce pain, reduce risk for further injury, and facilitate transport to a medical facility.
2b	C-EO	4. It may be reasonable to treat a deformed fractured extremity in the position found unless straightening the fracture is necessary to facilitate safe and prompt transport to a medical facility.
2b	C-EO	5. Covering open wounds associated with a suspected fracture with a clean dressing may be useful to lower the risk for further contamination and infection.

Recommendation-Specific Supportive Text

1. Long-bone fractures and open fractures can cause substantial and possibly life-threatening blood loss.
2. Blue, purple, or pale extremities may indicate poor perfusion to the extremity, a limb-threatening injury for which professional medical care should be sought immediately.
3. There is a lack of evidence demonstrating clear benefits from fracture splinting in the prehospital first aid setting. However, fracture immobilization is an essential part of definitive fracture treatment. Splinting as a first aid measure may be helpful to reduce pain, prevent further injury, and facilitate transport.[1,2]
4. Splinting an injured extremity in the position found is accepted first aid practice.[3,4] Although reducing angulated fractures may reduce pain and improve

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blood flow, there are risks, including injury to nerves, blood vessels, and other soft tissue, as well as risk of converting a closed fracture to an open fracture. No study evaluating whether first aid providers are able to perform fracture reduction safely could be found.[4]

5. As with any open wound, covering an open fracture protects against additional contamination.[3]

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Burns: Cooling Thermal Burns

Background

Thermal burns are caused by contact with flames, hot liquids, hot surfaces, and hot gases. Burns can lead to damaging physical, functional, cosmetic, and psychosocial consequences.[1] Immediate first aid care can reduce these consequences, and understanding the indications for ED referral can be lifesaving.[2]

Superficial (first-degree) burns are characterized by skin redness and pain without blistering or other loosening or destruction of the skin surface (Figure 7). The intact skin maintains its barrier function. First-degree burns generally heal without scarring, and the risk of infection is low. Partial-thickness (second-degree) and full-thickness (third-degree) burns involve destruction of the epidermis and injury to deeper layers and often require treatment beyond what can be provided in the first aid setting to speed healing, prevent infection, and reduce scarring.[2,4] Large partial-thickness burns (partial-thickness burns that involve the face, hands, feet, or genitalia), all full-thickness burns, and concern for inhalation injury (soot around the nose or mouth, difficulty breathing) require hospital treatment.

Active cooling to "stop the burn" has long been advocated as essential immediate first aid for thermal burns. Although burn-cooling sprays have also been studied, the majority of studies involve immediate application of cool running water. There is a lack of international consensus about the optimal duration of cooling of thermal burns.

This topic was last reviewed by ILCOR in 2022[5] and was included in a 2022 update.[6] An updated literature search was performed by the writing group in 2023.

First Aid Cooling of Thermal Burns

COR	LOE	Recommendations
1	B-NR	1. Thermal burns should be cooled immediately, preferably with clean running water.
1	C-LD	2. Preadolescent children with thermal burns being actively cooled with running water should be monitored for signs or symptoms of hypothermia.
2b	B-NR	3. It may be reasonable to cool thermal burns for 5 to 20 minutes.
2b	C-LD	4. If clean running water is not available, it may be reasonable to cool superficial burns (with the skin intact) with ice wrapped in cloth.

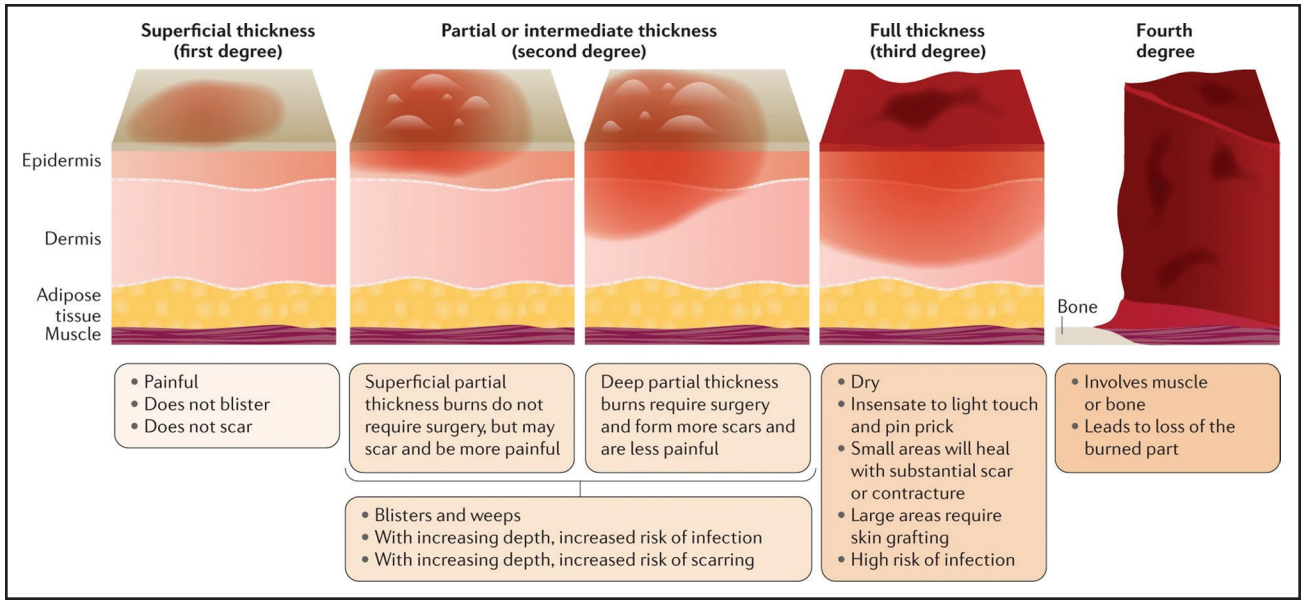

Figure 7. Depth of burns.
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Recommendation-Specific Supportive Text

1. Cooling of burns with running water is an established and beneficial intervention with little risk of harm.[5,6] A meta-analysis of observational data (7 studies, 11 383 adults and children) suggests a decrease in the need for subsequent care in patients with thermal burns who receive immediate active cooling with clean running water.[7]
2. Because of their larger surface area–to–volume ratio, preadolescent children are more likely to develop hypothermia than adolescents and adults. A study of 117 children with thermal burns who received whole-body cooling in the shower reported that 5 children (4%) developed hypothermia or were visibly cold with shivering.[8] By observing for signs and symptoms of hypothermia and, when possible, monitoring temperature, first aid providers can avoid accidentally causing a child with burn injury to become hypothermic.
3. An ILCOR meta-analysis of 4 studies involving 5978 adults and children did not demonstrate a clear duration of cooling that was most effective and concluded that the ideal cooling duration is unknown.[5] Leading international organizations recommend active cooling durations of 5 to 20 minutes.[9–12]
4. Porcine model thermal burn studies have demonstrated that ice reduces tissue temperatures after thermal burn, but the application of ice has not resulted in faster wound re-epithelializing, or healing with less scarring, compared with no treatment. Of note, there is risk of additional tissue damage when ice is used with compression.[13] If cool or cold clean running water is unavailable and ice is used, the ice should be placed in a cloth or towel before being applied to the burn area and limited to 10 minutes of application time to prevent frostbite injury.

Thermal Burn Care After Cooling

First Aid for Thermal Burns After Cooling		
COR	**LOE**	**Recommendations**
1	B-NR	1. A person with a full-thickness burn or with a partial-thickness burn that is larger than the person's palm or involves the person's face, hands, feet, or genitals should promptly seek evaluation by a health care professional.
1	C-EO	2. For a person with evidence of smoke inhalation injury such as facial burns, difficulty breathing, singed nasal hairs, or soot around the nose or mouth, EMS should be activated.
1	C-EO	3. A person with thermal burns should promptly remove all jewelry, belts, and other tight items from burned areas.
2a	B-NR	4. It is reasonable to give over-the-counter pain medications for pain from thermal burns.
2b	B-R	5. After cooling, for small partial-thickness burns being managed at home, it may be reasonable to apply petrolatum, petrolatum-based antibiotic ointment, honey, or aloe vera and a clean nonadherent dressing to open burn wounds.
2b	C-EO	6. After cooling, while awaiting evaluation by a health care professional, it may be reasonable to loosely cover a burn that has intact skin or an intact blister with a clean cloth or nonadherent dry dressing.

Recommendation-Specific Supportive Text

1. Burns involving the face, hands, feet, and genitals may require surgical intervention to prevent permanent disability. Burns with a large surface area can lead to significant fluid loss and multisystem organ failure. The American Burn Association recommends that patients with second- or third-degree burns involving the face, hands, feet, and genitals and those involving >10% body surface area (5% in children) be treated in a specialized burn center because of the likely need for intravenous fluid resuscitation, surgery, and other specialized treatments.[14,15]
2. Inhalation injury from hot smoke can lead rapidly to loss of the airway due to airway swelling. Evidence of inhalation injury can also be indicative of carbon monoxide poisoning. A person with signs of inhalation injury such as facial burns, difficulty breathing, singed nasal hairs, or soot around the nose or mouth should have EMS activated immediately.[15a]
3. Because burned tissue swells, expert consensus advocates that jewelry be removed before the onset of swelling to prevent constriction and vascular ischemia.[9]
4. Over-the-counter analgesics such as acetaminophen or NSAIDs are well tolerated and generally recommended for burn pain.[16,17] A prospective study enrolling 61 patients with second- or third-degree burns randomly assigned to either receive 800 mg IV ibuprofen or placebo every 6 hours found no significant incidence in serious adverse events.[18]
5. Petrolatum (with or without topical antibiotics such as polymyxin), honey, and aloe have been shown to improve healing time in patients with partial-thickness, "open" burns, including unroofed blisters, compared with no dressing or various controls.[3,19–31] Most studies assessed the use of various burn treatments daily or continuously until complete healing; short-term use in the first aid setting has not been well studied. Specialized burn dressings are assumed not to be available in the first aid setting.

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6. Covering a partial- or full-thickness burn with a nonadherent bandage or clean cloth protects the wound and reduces pain while avoiding heat entrapment until the burn can be assessed by a health care professional.[14]

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Dental Avulsion

Background

After traumatic avulsion of a permanent tooth, the chance of survival of the tooth is greatest if it can be replanted immediately after the time of injury. The injured person may be able to replant the tooth themselves with follow-up care delivered by a dentist; in many cases, however, the individual is unable to replant the tooth themselves, and a dentist or physician is needed for further care.

If immediate intervention cannot occur, minimizing extra-alveolar dry time by transporting the avulsed tooth in a medium that can preserve the viability of the periodontal ligament cells improves the chances of successful reimplantation. The efficacy of various storage materials and methods available to the first aid provider has been evaluated in the literature compared with cow's milk or the patient's saliva. In addition to the methods evaluated later, storage in aloe vera gel and coconut water has been proposed; these techniques were not

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supported by enough consistent evidence to inform a recommendation.[1–3]

These recommendations pertain only to the avulsion of permanent teeth; primary teeth (also known as deciduous teeth or baby teeth) are not typically replanted.

The ILCOR performed a systematic review on this topic in 2020.[4] An updated literature search was performed by the writing group in 2023.

First Aid for Dental Avulsion		
COR	**LOE**	**Recommendations**
1	C-EO	1. When a permanent tooth becomes avulsed (knocked out), initial actions include removing visible debris from the tooth by brief rinsing (<10 seconds), taking care not to damage the tooth or attached tissue, and attempting to replant the tooth in the socket.
1	C-EO	2. When a permanent tooth is avulsed, the person should seek dental or medical care immediately. They should bring the tooth if not successfully replanted.
2a	C-LD	3. If an avulsed permanent tooth cannot be immediately replanted, it can be beneficial to place the tooth in Hanks Balanced Salt Solution, oral rehydration salt solutions, propolis, or rice water (if preprepared), or to wrap the tooth in cling film to prevent dehydration.
2b	C-LD	4. If an avulsed permanent tooth cannot be immediately replanted and the aforementioned solutions or interventions are not available, storage of the tooth in cow's milk or saliva may be considered.
2b	C-EO	5. If an avulsed permanent tooth cannot be immediately replanted and none of the above storage mediums are available, a probiotic, egg white, or almond milk may be considered.
3: Harm	C-LD	6. An avulsed permanent tooth should not be stored in tap water.

Recommendation-Specific Supportive Text

1. The likelihood of successful reimplantation decreases rapidly as long as the tooth remains out of the socket, particularly if the periosteal ligament dies or is injured.[5–7]
2. Many people need assistance reimplanting a tooth, particularly if the injured person is a child. Stabilization of the reimplanted tooth by a dentist is often necessary.[6]
3. Storage of an avulsed permanent tooth in Hanks Balanced Salt Solution, oral rehydration salt solutions, propolis, rice water, and cling wrap has demonstrated improved periodontal ligament cell viability compared with storage in cow's milk.[1,8–11] Oral rehydration salt solution is the nonproprietary name for the balanced mixture of glucose and electrolytes (sodium, chloride, potassium, and citrate) that has been used to treat and prevent clinical dehydration due to diarrheal diseases.[12] Oral rehydration salt solutions can be purchased commercially or made from materials commonly found in the home. Table 12 provides a ranking of solutions based on the likelihood of successful reimplantation after avulsed tooth storage.

Table 12. Storage Media Options for an Avulsed Tooth

First choice (highest rate of reimplantation success)
Hanks Balanced Salt Solution
Oral rehydration salt solutions
Propolis solution (10%, 50%, or 100%)
Rice water (preprepared)
Wrapping in cling film
Second-line options
Cow's milk (any fat content)
The person's saliva
Third-line options
Another person's saliva
Probiotic media (eg, probiotic yogurt, *Lactobacillus reuteri* solution)
Egg white
Almond milk

4–5. Observational studies comparing cow's milk and the injured person's own saliva as storage media found no difference in the rates of successful replantation.[10,11] Depending on the injured person's age and mental status, temporary storage of the avulsed tooth in the injured person's mouth may pose a choking hazard. Storing the tooth in the mouth of another person involves infection risk, although in some cases (eg, a parent), the people involved may consider this risk to be acceptable.[1,5,7–9,11,13]

6. Two studies found harm to periodontal ligament cell viability when a tooth is stored in tap water.[14,15]

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Suspected Foreign Body in the Eye

Background

Eye injuries are a common presentation to EDs; about half of those presentations are due to ocular foreign bodies.[1] Foreign-body sensation can be caused by a loose foreign body (eg, an eyelash or piece of dust or sand), a foreign body embedded on the surface of the cornea, superficial corneal abrasion, a penetrating eye injury, or other causes such as chemical injury, ultraviolet radiation exposure, eye inflammation, or infection.[2] Ocular foreign bodies are a common workplace injury.[3]

High-speed injuries such as from grinding or injuries from sharp objects can cause significant injury to the globe ranging from simple corneal abrasion to penetration injury to the anterior or posterior chamber of the eye. Foreign bodies embedded on the cornea often need to be removed by a health care professional.

Although it is common for health care professionals to prescribe antibiotics to prevent infection from corneal abrasions or foreign body, the utility of this practice is unclear.[4,5]

Overall, limited data are available on the treatment of a suspected foreign body in the eye by a first aid provider.

A literature search was performed by the writing group in 2023.

First Aid for Suspected Foreign Body in the Eye

COR	LOE	Recommendations
1	C-LD	1. A person who sustains a high-velocity eye injury (such as injuries from grinding, nailing, or machinery), penetrating eye injury from a sharp or metal object, irregular pupil after trauma, eye bleeding after trauma, or loss of vision after trauma should seek immediate medical attention.
1	C-LD	2. A person who has persistent foreign-body sensation in the eye should seek immediate medical attention.

First Aid for Suspected Foreign Body in the Eye (Continued)

COR	LOE	Recommendations
1	C-LD	3. A person who develops a foreign-body sensation in the eye associated with contact lens use should remove the contact lens, discontinue contact lens use, and seek medical attention.
1	C-EO	4. A person with a foreign-body sensation in the eye should not rub their eye.
1	C-EO	5. Taping a hard plastic eye shield, paper cup, or plastic cup over the eye can help prevent unintentional touching of the eye.
2a	C-EO	6. It is reasonable for a person with a foreign body in the eye from a low-energy mechanism (eg, dust, dirt, other object blown into the eye by wind; eyelash in the eye) to attempt to remove the foreign body by allowing natural tears to wash out the object or by irrigating the eye with tap water or a commercial eye wash solution.
2a	C-EO	7. It is reasonable to take over-the-counter oral acetaminophen or NSAIDs to treat residual discomfort after ocular foreign-body removal.

Recommendation-Specific Supportive Text

1. Loss of visual acuity, bleeding from the eye, and alteration of the normal structural appearance of the eye such as irregular pupil shape may represent serious pathology such as a penetrating globe injury, corneal ulceration, infection, or corneal abrasion and are likely to require treatment by a health care professional.[3,6]
2. In an observational study of 79 participants with a foreign-body sensation, those with no foreign body present after irrigation had a greater improvement in pain score than those in whom a foreign body remained present after irrigation and those who did not receive eye irrigation.[7] If there is no improvement in pain after simple irrigation, there may be a retained foreign body or abrasion, and the person should be evaluated by a health care professional.
3. Contact lenses can be a cause of a corneal abrasion or ulcer, both of which cause foreign-body sensation. A corneal ulcer can cause penetrating eye injury and permanent eye scarring.[8,9] Evaluation by a health care professional can differentiate these conditions and enable appropriate treatment.

4–5. Rubbing the eye may worsen corneal abrasion from an ocular foreign body or worsen a penetrating eye injury.[3] Taping an eye shield or a paper or plastic drinking cup over the injured eye may prevent the person from rubbing their eye.[10–12]

6. In a quasi-randomized study, 79 adults with a foreign-body sensation and no signs of open-globe injury received low-pressure eye irrigation with 500 mL normal saline with the head in the dependent position compared with no irrigation. Those with irrigation had significantly lower foreign-body retention and better improvement

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in pain than those without irrigation.[7] Tap water irrigation is well tolerated in studies of patients with chemical exposure to the eye[13] and is readily available in most settings. Some people may need assistance maintaining open eyelids during irrigation.

7. Few experimental data were identified to guide the first aid treatment of local symptoms from a suspected foreign body. Expert opinion recommends the use of over-the-counter oral analgesic agents such as acetaminophen and ibuprofen.[3,6]

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Epistaxis

Background

Nose bleeds (epistaxis) are acute bleeding from the nares or nasal cavity that may occur spontaneously or as a result of trauma. Epistaxis is usually self-limited and resolves spontaneously. Epistaxis is most common in people <10 years and ≥60 years of age.[1] Epistaxis is the primary reason for 1 in every 313 ED visits in the United States.[2] The risk of epistaxis is likely increased in people taking oral anticoagulant medications.[3–5]

ILCOR performed a systematic review of cryotherapy for epistaxis in 2021.[6] An updated literature search was performed by the writing group in 2023.

First Aid for Epistaxis		
COR	**LOE**	**Recommendations**
1	C-LD	1. A person experiencing epistaxis should sit with their head slightly forward with their nostrils pinched for 10 to 15 minutes.
1	C-EO	2. A person experiencing epistaxis that does not stop after 15 minutes of continuous manual pressure or who becomes lightheaded from epistaxis should seek medical attention.
1	C-EO	3. A person with epistaxis due to trauma should seek medical attention if they experience signs of brain injury, obvious nasal deformity, or signs of facial fracture.
2a	C-LD	4. It is reasonable for a person experiencing epistaxis who is taking anticoagulant or antiplatelet medication, or who has a blood-clotting disorder, to seek care from a health care professional, unless bleeding has stopped.
2b	C-LD	5. The usefulness of cryotherapy (ice) for managing epistaxis in the first aid setting is unknown.

Recommendation-Specific Supportive Text

1–2. The treatment of nose bleeds (epistaxis) involves having the person sit down and continuously hold the lower third or soft portion of the nose pinched closed to help the blood clot.[5] Leaning forward stops blood from entering the airway (which can cause trouble breathing) or the stomach (which can cause vomiting). The bleeding person should be instructed to breathe through their mouth and spit out any blood. Nasal pressure alone is the only intervention required in the vast majority of cases, including 20% of cases managed in EDs.[7] Ongoing epistaxis can lead to anemia and shock due to blood loss.

3. Traumatic epistaxis is a form of craniofacial trauma and may be associated with traumatic brain injury and facial bone fractures. Signs of traumatic brain injury, including loss of consciousness, altered mental status, repeated vomiting, change in vision, difficulty moving or walking, or severe headache, indicate the potential for a medical emergency requiring activation of the emergency response system. Epistaxis is associated with nasal bone fracture, which is associated with fractures of other facial bones.[8]

4. Patients taking either anticoagulant or antiplatelet therapy, including aspirin, are at increased risk of severe epistaxis and hospital admission compared with patients not on these medications,[9] and often have multiple comorbidities. Nosebleed in these patients is more likely to require intervention from a health care professional than nosebleed in people not taking anticoagulant medication.[3–5,10,11]

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5. A 2020 ILCOR scoping review of the management of epistaxis in the first aid setting found only expert opinion and indirect evidence for the use of cryotherapy (ice) for epistaxis. Some experts believe that cryotherapy can vasoconstrict the blood vessels of the nasal mucosa and reduce the flowing blood and blood volume when applied to the nose. Studies of cryotherapy application methods were found to be inconsistent and never applied directly to the nose but instead to the forehead, in the mouth, around the neck, or in a combination. The scoping review found that the literature lacks the evidence to support recommendations for using cryotherapy as an intervention for epistaxis in the first aid setting.[6]

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KNOWLEDGE GAPS AND PRIORITIES OF RESEARCH

Throughout the evidence search, synthesis, and guideline writing process, our group identified several knowledge gaps and research priorities. Overall, there is a lack of first aid research, meaning research evaluating care provided by nonprofessional responders in prehospital first aid settings. The vast majority of research returned through our searches was indirect to first aid, extrapolated from in-hospital settings involving health care professionals. Research evaluating care by first aid providers in the first aid setting is urgently needed.

Similarly, first aid research would benefit from patient- and public-involved research methods. First aid research (and guideline development) should include the active involvement of individuals who provide first aid (laypeople and trained responders) and who are in groups targeted by first aid guidelines (early childhood educators, workplace safety personnel, athletic trainers). Furthermore, effective first aid may result in the ill or injured person appropriately not seeking additional care; thus, the avoided health care interaction is never recorded and cannot be reported in research. Therefore, novel

Table 13. First Aid: Key Knowledge Gaps

Which "red flag" signs and symptoms are most important for first aid providers to learn to identify?
What is the role of positioning in individuals with a decreased level of alertness (ie, supine vs recovery) on the incidence and detection of cardiac arrest?
What is the effect of passive leg raise on individuals experiencing syncope and shock in the first aid setting?
What is the effectiveness of oxygen administered in the first aid setting for adults or children exhibiting signs or symptoms of shortness of breath, difficulty breathing, or hypoxia? Are there important safety concerns in the first aid setting?
How accurate and trustworthy are pulse oximeters used by first aid providers, and what is the role of the pulse oximeter as a component of a first aid assessment?
What barriers exist for first aid providers assisting individuals to take their own medication during acute exacerbations of asthma, anaphylaxis, diabetes?
What are the most effective, safe, and practical rewarming methods for hypothermic people in the first aid setting?
What are the most effective and practical rewarming methods for individuals with frostbite?
What is the best way for first aid providers to assess the severity of hypothermia? Are first aid providers willing and able to accurately measure core temperature?
Are untrained rescuers and first aid providers able to effectively apply tourniquets to control life-threatening bleeding? Does this vary between various manufactured and improvised devices?
Is indirect manual pressure, including use of compression of pressure points or the use of mechanical pressure devices, effective for bleeding control in the first aid setting?
Are open chest wounds best managed with occlusive dressings or with nonocclusive dressings or left open in the first aid setting?
Will the deadoption of spine immobilization practices cause benefit or harm for injured individuals?
Does splinting of long-bone fractures reduce pain or improve outcome?
Is straightening of an angulated fracture by first aid providers associated with less pain, bleeding, or nerve or muscle injury compared with immobilization in the position found?
What are the ideal cooling method and duration for thermal burns treated in the first aid setting?

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research methods are required to describe the effectiveness of first aid care from the perspective of health care system avoidance.

Some conditions and therapies have a particular paucity of evidence to guide treatments, despite being foundational content for first aid courses, such as the immobilization of long-bone fractures, rewarming of frostbite, or cooling of thermal burns. RCTs of different immobilization strategies and cooling/warming methods are needed. The role of technology such as mobile phones and wearables is also an important area for future research, including fall detection, measurement and monitoring of vital signs, and just-in-time training, instructions, and decision support tools.

The majority of first aid providers and recipients in the research used to develop these guidelines are male and White and reside in North America and Western Europe. The unique needs and perspectives of people not fitting this narrow description are required. Researchers should record and report the sex and ethnicity of their participants and strive for great diversity in recruitment when feasible. Low-resource settings and low- and middle-income countries may experience the greatest impact from robust first aid training, and work is urgently required to understand the unique first aid needs in these communities and settings. In addition, more work needs to be done studying different approaches to first aid in infants, toddlers, and children.

Some critical knowledge gaps identified by the writing group are summarized in Table 13.

ARTICLE INFORMATION

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This guideline was approved by the American Heart Association Science Advisory and Coordinating Committee on June 19, 2024, the American Red Cross on June 15, 2024, and the American Heart Association Executive Committee on August 5, 2024. A copy of the document is available at https://professional.heart.org/statements by using either "Search for Guidelines & Statements" or the "Browse by Topic" area. To purchase additional reprints, call 215-356-2721 or email Meredith.Edelman@wolterskluwer.com

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Disclosures

Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/ Honoraria	Expert Witness	Ownership Interest	Consultant/ Advisory Board	Other
Matthew J. Douma	University of Alberta (Canada)	None	None	None	None	None	None	None
Elizabeth K. Hewett Brumberg	UPMC Children's Hospital of Pittsburgh	None	None	None	None	None	American Red Cross*	None
Kostas Alibertis	University of Virginia Health System	None	None	None	None	None	None	None
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Michael P. Goldman	Yale School of Medicine	None	None	None	None	None	None	None
Katrina Harper-Kirksey	Cedars-Sinai	None	None	None	None	None	None	None
Seth C. Hawkins	Wake Forest School of Medicine	None	None	None	None	None	None	Wilderness Medical Society*; Cambridge University Press*
Amber Hoover	American Heart Association	None	None	None	None	None	None	None
Amy Kule	Loyola University Medical Center	None	None	None	None	None	None	None
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Sarah Frances McClure	Cody Regional Health System	None	None	None	None	None	None	None
George Sam Wang	University of Colorado	None	None	None	None	None	None	None
Mark Whelchel	American Red Cross	None	None	None	None	None	None	None
Lynn White	Global Medical Response	None	None	None	None	None	None	None

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*Modest.

†Significant.

Reviewer Disclosures

Reviewer	Employment (Where?)	Research Grant	Other Research Support	Speakers' Bureau/ Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
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Sarita Chung	Harvard University	None	None	None	None	None	American Red Cross Scientific Advisory Board*	None
Andre Pennardt	Federal Emergency Management Agency	None	None	None	None	None	Committee for Tactical Emergency Casualty Care†	None
Tia T. Raymond	Medical City Children's Hospital	None	None	None	None	None	None	None
Will Smith	Wilderness and Emergency Medicine Consulting (WEMC), LLC	None	None	None	None	None	None	None
Paria M Wilson	Cincinnati Children's Hospital Medical Center	None	None	None	None	None	None	None

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