2025 ILCOR Statement

2025 International Consensus on First Aid Science With Treatment Recommendations

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ABSTRACT

The International Liaison Committee on Resuscitation conducts continuous reviews of new, peer-reviewed, published first aid and cardiopulmonary resuscitation science and publishes more comprehensive reviews every 5 years. The First Aid chapter of the *2025 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations* addresses all published evidence reviewed by the First Aid Task Force science experts since 2020. This summary includes new systematic reviews on manual uterine massage for postpartum hemorrhage, unintentional injury from chest compressions in noncardiac arrests, and treatment of jellyfish stings. There are also new scoping reviews on the topics of first aid interventions to prevent adverse consequences of postpartum hemorrhage, spinal motion restriction, and preservation of an amputated body part. Summaries of systematic and scoping reviews included in the 2021 to 2024 annual summaries are also included to provide a more comprehensive reference for the reader. Members of the First Aid Task Force have assessed, discussed, and debated the certainty of the evidence, on the basis of the Grading of Recommendations, Assessment, Development, and Evaluation criteria, and their statements include consensus treatment recommendations. Insights into the deliberations of the task force are provided in the Justification and Evidence-to-Decision Framework Highlights sections. The task force also lists priority knowledge gaps for further research.

Key words: first aid, medical emergencies, trauma, environmental emergencies

INTRODUCTION

This First Aid (FA) Task Force chapter of the International Liaison Committee on Resuscitation (ILCOR) *International Consensus on Cardiopulmonary Resuscitation* (CPR) *and Emergency Cardiovascular Care Science With Treatment Recommendations* (CoSTR) includes all the reviews conducted by the FA Task Force in the previous year. Reviews conducted and published since the 2020 publication[1,2] are also summarized to provide a single, more comprehensive reference document for readers. This summary paper comprises 32 topic reviews, including 8 systematic reviews (SysRevs). Draft CoSTRs for all topics evaluated with SysRevs were posted on the ILCOR website[3] on a rolling basis. Each draft CoSTR includes the data reviewed and draft treatment recommendations, with public comments accepted for 2 weeks after posting. Task forces considered public feedback and provided responses. All CoSTRs are now available on the ILCOR website.[3]

Although only SysRevs can generate a full CoSTR and new treatment recommendations, many other topics were evaluated with scoping reviews (ScopRevs) or evidence updates (EvUps). Good practice statements, which represent the opinion of task force experts in light of very limited or no direct evidence, can be generated after ScopRevs and occasionally after EvUps in cases where the task force thinks providing guidance is especially important. A separate paper in this issue includes the full details of the evidence evaluation process.

This summary statement contains the final wording of the treatment recommendations and good practice statements as approved by the ILCOR FA Task Force, as well as summaries of the key evidence identified, key discussion points and knowledge gaps. Links to the published reviews and full online CoSTRs are provided in the corresponding sections. Evidence-to-decision tables for SysRevs are provided in Appendix A, and the complete EvUp worksheets are provided in Appendix B.

Topics are presented using the PICOST (population, intervention, comparator, outcomes, study design, and time frame) format. To minimize redundancy, the study designs have been removed from the text except in cases where designs included differed from the FA standard criteria. The standard study designs included are randomized clinical trials (RCTs) and nonrandomized studies (non-RCTs, interrupted time series, controlled before-and-after studies, and cohort studies) were eligible for inclusion. Case series, case reports, animal studies and unpublished studies (conference abstracts, trial protocols) were excluded. All languages were included provided there was an English abstract.

The FA Task Force has developed a framework to improve how we identify and evaluate first aid evidence. This framework consists of 4 essential domains that must be considered: the recipient, the provider, the treatment, and the setting (Table 1).

Table 1. Definition of First Aid (FA 7001)

First aid domains for evidence evaluation and treatment recommendations	Examples of characteristics
First aid recipient	Age, sex, gender, health status, capacity to provide consent
First aid provider	Knowledge, training/education, preparedness, familiarity, duty to respond, professional scope, capability
Treatment	Invasiveness, skill required, technology, efficacy and effectiveness, cost
Setting and environmental	Low or high resource, safety, cultural norms and values, urban or remote

Using these domains has strengthened our ability to conduct focused literature searches, evaluate evidence, and translate findings into practice. Moving forward, the task force may include illustrative case vignettes alongside its recommendations to demonstrate how evidence applies across different scenarios. These examples will help guideline authors and first aid providers understand how to adapt evidence-based guidelines to various emergency situations—from low-resource and remote settings to urban incidents—and across different provider skill levels—from untrained bystanders to health care professionals. In our future work, we will combine clear recommendations with practical examples, which will help practitioners to better

understand both the applications and limitations of first aid evidence, including when to seek additional help. Since 2024, we have also started applying an equity lens on our CoSTRs; included studies will be screened regarding content in PROGRESS Plus,[4] and an equity statement will be found in every CoSTR.

Within ILCOR, the FA Task Force highlights the critical role of promoting the helping behaviors of people in emergencies, emphasizing first aid's foundational importance in the chain of survival, including preventing, recognizing, and responding to a cardiac arrest.

The following topics are addressed in this FA Task Force CoSTR chapter. In addition, an overview of changes made in treatment recommendations since 2020 is provided in Table S1 in the supplement.

General Principles

- Pulse oximetry (FA 7010, ScopRev 2023)
- Use of supplemental oxygen (FA 7030, FA 519, FA 1549, FA 1649, ScopRev 2023, ScopRev 2024)
- Recovery position (FA 7040, FA 517, SysRev 2022)

First Aid for Medical Emergencies

- Recognition of anaphylaxis (FA 7110, FA 513, ScopRev 2023, EvUp 2025)
- Second dose of epinephrine (FA 7111, FA 500, ScopRev 2021, EvUp 2025)
- Removal of foreign-body airway obstruction (FA 7113, Basic Life Support [BLS] 368, EvUp 2025)
- Potential harms from bronchodilator administration (FA 7122, ScopRev 2023)
- Early aspirin or chest pain (FA 7140, FA586, EvUp 2025)

- Methods of glucose administration for hypoglycemia (FA 7161, FA 1585, EvUp 2025)
- Dietary sugar treatment for hypoglycemia (FA 7162, FA 795, EvUp 2025)
- Recognition of stroke (FA 7170, FA 801, EvUp 2025)
- Recognition of sepsis (FA 7180, ScopRev 2024)
- Interventions administered by lay providers for the treatment of postpartum hemorrhage (FA 7337, ScopRev 2025)
- Manual uterine massage for postpartum hemorrhage (FA 7336, SysRev 2025)
- Use of naloxone during resuscitation for suspected opioid-associated emergencies (FA 7442, BLS 811, EvUp 2025)
- Prevention of syncope with counter-pressure maneuvers (FA 7550 FA 798, EvUp 2025)
- Unintentional injury from CPR (FA 7670, BLS 353, SysRev 2025)

First Aid for Trauma Emergencies

- Spinal motion restriction (FA 7311, FA 772, ScopRev 2025 including the topic Spinal injury manual stabilization FA 7312, FA 1547)
- Cryotherapy for epistaxis (FA 7151, ScopRev 2021)
- Manual pressure and pressure devices for bleeding (FA 7331, FA 530, SysRev 2021, EvUp 2025)
- Type of tourniquets alone or in combinations with other methods of achieving hemostasis (FA 7333, FA 768, SysRev 2021, EvUp 2025)
- Types of pediatric tourniquets (FA 7333, FA 768, SysRev 2021)

- Hemostatic dressing (FA 7334, FA 769 EvUp 2025)
- Duration of cooling for burns (FA 7371, FA 770, SysRev 2021)
- Dental avulsion (FA 7361, FA794, EvUp 2025)
- Compression wrap for closed extremity joint injuries (FA 7381, FA 511, EvUp 2025)
- Preservation of traumatic, completely amputated or avulsed body parts (FA 7391, ScopRev 2025)

First Aid for Environmental Emergencies

- Exertion-related dehydration and rehydration (FA 7241, FA 584, SysRev 2021)
- Tick removal (FA 7231, SysRev 2021)
- Treatment of jellyfish stings (FA 7211, SysRev 2025)

Readers are encouraged to monitor the ILCOR website[3] to provide feedback on planned SysRevs and to provide comments when additional draft reviews are posted.

GENERAL PRINCIPLES

Use of Pulse Oximetry (FA 7010, ScopRev 2023)

Pulse oximetry has been used for monitoring of hospitalized patients at risk of hypoxemia as well as, more recently, for home use during the COVID-19 pandemic. The FA Task Force considered it timely to undertake a ScopRev[5] in 2022 to identify evidence relating to the use of pulse oximetry as a component of first aid assessment of acute symptoms associated with illness or injury. Details of this review can be found in the 2023 CoSTR summary.[5]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children in out-of-hospital or home settings with an acute illness or injury
- Intervention: Use of pulse oximetry in addition to standard first aid assessment)
- Comparator: Standard first aid assessment without the use of pulse oximetry
- Outcome: Any clinical outcome
- Time frame: All years up to November 16, 2022

Good Practice Statements (2023)

First aid providers who use pulse oximeters for the assessment of acute illness or injuries should be proficient in their use and understand their limitations, including equipment factors, environmental considerations, and patient-specific factors that may produce inaccurate and unreliable readings (good practice statement).

The use of a pulse oximeter for first aid assessment should not supersede or replace physical assessment (good practice statement).

Use of Supplemental Oxygen in the First Aid Setting (FA 7030, FA 519, FA 1549, FA 1649, ScopRev 2023, ScopRev 2024)

In the first aid setting, oxygen use has been described for loss of consciousness, diving emergencies, carbon monoxide poisoning, and during cardiac arrest. A 2015 CoSTR[6] and a 2023 ScopRev[5] identified evidence of potential harm with oxygen use in acute exacerbations of chronic obstructive pulmonary disease. A 2024 ScopRev[7] expanded the search dates and inclusion criteria. Details of this review can be found in the 2024 CoSTR summary.[8]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children who exhibit symptoms or signs of shortness of breath, difficulty breathing or hypoxia outside of a hospital
- Intervention: Administration of oxygen by a first aid provider
- Comparator: No administration of oxygen
- Outcome: Functional outcome at discharge, 30 days, 60 days, 180 days and/or 1 year, survival only at discharge, 30 days, 60 days, 180 days and/or 1 year, length of hospital stay, resolution of symptoms or signs, patient comfort, therapeutic endpoints (eg, oxygenation, ventilation)
- Time frame: All years to December 2, 2023

In 2023, the following good practice statement was formulated based on a limited search (FA 1549): “If first aid providers, trained to use oxygen, are administering supplemental oxygen to a person with known chronic obstructive pulmonary disease, they should titrate the supplemental oxygen to maintain an oxygen saturation by pulse oximetry between 88% and 92%.” Based on this 2024 ScopRev, the good practice statement was slightly changed.

Good Practice Statement (2024)

When a first aid provider trained in oxygen use administers oxygen to a person with acute difficulty breathing who confirms that they have chronic obstructive pulmonary disease, it is suggested that pulse oximetry be used, and that oxygen be titrated to maintain an oxygen saturation between 88% and 92% (good practice statement).

Although high-flow oxygen should in general be avoided in patients with chronic obstructive pulmonary disease with difficulty breathing in the out-of-hospital setting, high-flow oxygen should not be withheld in the presence of life-threatening hypoxia (oxygen saturation <88%) (good practice statement).

The Recovery Position for Maintenance of Adequate Ventilation and the Prevention of Cardiac Arrest (FA 7040, FA 517, SysRev 2022)

The use of a recovery position for persons with a reduced level of responsiveness has been taught in first aid courses for decades, primarily as a means to reduce the risk of aspiration of gastric contents. The original PICOST wording from a 2015 SysRev[9] sought to compare a lateral, side-lying recovery position with a supine position in adults who are breathing and unresponsive in an out-of-hospital setting. The revised PICOST wording now clarifies the population of interest as adults and children with a reduced level of responsiveness of nontraumatic etiology and who do not require resuscitative interventions. A ScopRev was last done in 2020, and this SysRev[10] was undertaken with involvement of content experts from the FA and BLS Task Forces and included in the 2022 CoSTR summary.[11]

Population, Intervention, Comparator, Outcome, Study Designs, and Time Frame

- Population: Adults and children in the first aid setting who have a reduced level of responsiveness of nontraumatic etiology and do not require resuscitative interventions

- Intervention: Specific positioning (recovery positioning [ie, various semiprone, lateral recumbent, side-lying, or three-quarters prone positions of the body])
- Comparator: Supine or other position
- Outcome: Critical: survival, incidence of cardiac arrest, delayed detection of apnea and cardiac arrest. Important: need for airway management, incidence of aspiration, hypoxia, likelihood of cervical spine injury, complications (venous occlusion, arterial insufficiency, arm discomfort/pain, discomfort/pain, aspiration pneumonia)
- Study designs: In addition to the standard criteria, case reports published in letter form were included. ScopRevs and SysRevs were included for discussion and to assure no primary papers were missed, but data were not extracted from these reviews.
- Time frame: All years to November 17, 2021

Treatment Recommendations (2022)

When providing first aid to a person with a decreased level of responsiveness of nontraumatic etiology and who does not require immediate resuscitative interventions, we suggest the use of the recovery position (weak recommendation, very low–certainty evidence).

When the recovery position is used, monitoring should continue for signs of airway occlusion, inadequate or agonal breathing, and unresponsiveness (good practice statement).

If body position, including the recovery position, is a factor impairing the first aid provider's ability to determine the presence or absence of signs of life, the person should be immediately positioned supine and reassessed (good practice statement).

Persons found in positions associated with aspiration and positional asphyxia such as facedown, prone, or in neck and torso flexion positions should be repositioned supine for reassessment (good practice statement).

Recognition of Anaphylaxis (FA 7110, ScopRev 2023, EvUp 2025)

Population, Intervention, Comparator, Outcome, Study Design, and Time Frame

- Population: Adults and children experiencing anaphylaxis
- Intervention: Description of any specific symptoms to the first aid provider
- Comparator: Absence of any specific description
- Outcome: Anaphylaxis recognition (Critical)
- Study designs: In addition to the usual criteria, it was anticipated that there would be insufficient studies from which to draw a conclusion, so the minimum number of cases for a case series to be included was reduced from the default of 5 to 1 by the team.
- Time frame: October 28, 2023, to July 3, 2024

Summary of Evidence

Since the last ScopRev[12] in 2022, we identified 734 unique articles, of which 4 articles[5,13-15] were relevant. During the process to screen full text articles, it was noted that several studies reported an increase in knowledge of how to recognize anaphylaxis after educational interventions, viewing videos, health application (app) use, and coaching. Currently, there is insufficient evidence to justify conducting a SysRev on this topic. However, the available evidence suggests that a future SysRev on educational approaches for training lay providers to effectively care for affected individuals is warranted.

Treatment Recommendation (2010)

First aid providers should not be expected to recognize the signs and symptoms of anaphylaxis without repeated episodes of training and encounters with victims of anaphylaxis (good practice statement).

Second Dose of Epinephrine for Anaphylaxis (FA 7111, FA 500, ScopRev 2021, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children experiencing severe anaphylaxis requiring the use of epinephrine
- Intervention: Administration of a second dose of epinephrine
- Comparator: Administration of only one dose
- Outcome: Resolution of symptoms, adverse effects, complications
- Time frame: January 3, 2021, to October 2, 2024

Summary of Evidence

Since the last ScopRev[16] published in 2021, one[17] study examining methods of administration was identified. There was insufficient literature to impact the previous treatment recommendations. Updated SysRev or ScopRev is not recommended at this time.

Treatment Recommendations (2015)

We suggest a second dose of epinephrine be administered by autoinjector to adults and children with severe anaphylaxis whose symptoms are not relieved by an initial dose (weak recommendation, very low–certainty evidence).

Removal of Foreign-Body Airway Obstruction (FA 7113, BLS 368, EvUp 2025)

This topic was moved from the BLS Task Force to FA Task Force in 2023 because of its relevance to first aid providers. A SysRev was last done in 2020 by BLS[18].

Population, Intervention, Comparator, Outcome, Study Design, and Time Frame

- Population: Adults and children with foreign body airway obstruction in any setting
- Intervention: Interventions to remove foreign body airway obstruction, such as finger sweep, back slaps, abdominal thrusts, chest thrusts, and suction-based airway clearance devices
- Comparator: No action
- Outcome: Any clinical outcome
- Study designs: In addition to the standard criteria, case reports of injuries or complications were also eligible. Unpublished studies (eg, conference abstracts, trial protocols), animal studies, manikin studies and cadaver studies were excluded.
- Time frame: August 2019 through September 20, 2024

Summary of Evidence

This EvUp identified 17 new publications[19-35] since the previous SysRev[19] in 2019. The evidence suggests that regardless of which treatment is provided first, it is common for more than one intervention to be required for relief of a foreign body airway obstruction. One study suggests that back blows are more effective than chest or abdominal thrusts. [28]Airway clearance devices are increasing in prevalence. Currently, there are no treatment recommendations regarding these devices. An updated SysRev is warranted.

Treatment Recommendation (BLS 2020)

We suggest that back slaps are used initially in patients with a foreign body airway obstruction and an ineffective cough (weak recommendation, very low–certainty evidence).

We suggest that abdominal thrusts are used in adults and children with a foreign body airway obstruction and an ineffective cough where back slaps are ineffective (weak recommendation, very low–certainty evidence).

We suggest that rescuers consider the manual extraction of visible items in the mouth (weak recommendation, very low–certainty evidence).

We suggest against the use of blind finger sweeps in patients with a foreign body airway obstruction (weak recommendation, very low–certainty evidence).

We suggest that appropriately skilled individuals consider the use of Magill forceps to remove foreign body airway obstruction in OHCA patients with a foreign body airway obstruction (weak recommendation, very low–certainty evidence).

We suggest that chest thrusts are used in unconscious patients with a foreign body airway obstruction (weak recommendation, very low–certainty evidence).

We suggest that bystanders undertake interventions to support foreign body airway obstruction removal as soon as possible after recognition (weak recommendation, very low–certainty evidence).

Potential Harms From Bronchodilator Administration (FA 7122, ScopRev 2023)

Persons with asthma exacerbations benefit from administration of bronchodilators. However, it is unknown whether first aid providers can appropriately identify asthma exacerbations, and it is unknown whether bronchodilators could result in harm if administered to

individuals with undifferentiated respiratory symptoms. Details of this review can be found in the 2023 CoSTR summary.[5]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children in any setting with acute undifferentiated respiratory problems
- Intervention: Administration of any type of inhaled bronchodilator (eg, beta agonists, anticholinergics)
- Comparator: No administration of an inhaled bronchodilator
- Outcomes: Survival, dysrhythmia, cardiac ischemia, hypokalemia, need for emergency department treatment, need for hospitalization, and time to treatment
- Time frame: All years to November 2, 2022

Prior Treatment Recommendation (2015, Unchanged)

When an individual with asthma is experiencing difficulty breathing, we suggest that trained first aid providers assist the individual with administration of a bronchodilator (weak recommendation, very low–certainty evidence).

Early Aspirin for Chest Pain (FA 7140, FA 586, EvUp 2025)

Population, Intervention, Comparator, Outcome, Study Designs, and Time Frame

- Population: Adults who experience non-traumatic chest pain
- Intervention: Early or first aid administration of aspirin
- Comparator: Later or in-hospital administration of aspirin
- Outcome: Any outcome

- Time frame: October 1, 2019, to September 30, 2024

Summary of Evidence

Since the last SysRev[36] completed for 2019, 98 articles were screened, and none were relevant for the topic. Of note, one study[37] described increased risk of bleeding in chest pain patients administered aspirin or clopidogrel (or both) and finally diagnosed as type A aortic dissection necessitating surgical intervention. A new review is currently not warranted.

Treatment Recommendation (2019)

For adults with nontraumatic chest pain, we suggest the early administration of aspirin as a first aid intervention compared with late, in-hospital, administration of aspirin (weak recommendation, very low–certainty evidence).

Methods of Glucose Administration for Hypoglycemia (FA 7161, FA 1585, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children in any setting (in-hospital or out-of-hospital) with (suspected) hypoglycemia
- Intervention: Administration of glucose by any route appropriate for use by first aid providers
- Comparator: Administration of glucose by another route appropriate for first aid providers
- Outcomes: Resolution of symptoms; time to resolution of symptoms; blood or plasma glucose concentration at 20 minutes; resolution of hypoglycemia; time to resolution of hypoglycemia; any adverse event; administration delay.
- Time frame: September 13, 2021, to October 18, 2024

Summary of Evidence

Since the last SysRev[38] in 2021, no relevant new studies were identified. An updated SysRev is not warranted.

Treatment Recommendations (2021)

We recommend the use of oral glucose (swallowed) for individuals with suspected hypoglycemia who are conscious and able to swallow (strong recommendation, very low–certainty evidence).

We suggest against buccal glucose administration compared with oral glucose administration for individuals with suspected hypoglycemia who are conscious and able to swallow (weak recommendation, very low–certainty evidence).

If oral glucose (for example, tablet) is not immediately available, we suggest a combined oral plus buccal glucose (for example, glucose gel) administration for individuals with suspected hypoglycemia who are conscious and able to swallow (weak recommendation, very low–certainty evidence).

We suggest the use of sublingual glucose administration for suspected hypoglycemia for children who may be uncooperative with the oral (swallowed) glucose administration route (weak recommendation, very low–certainty evidence).

Dietary Sugar Treatment for Hypoglycemia (FA 7162, FA 795, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children with symptomatic hypoglycemia
- Intervention: Administration of dietary forms of sugar
- Comparator: Standard dose (15–20 g) of glucose tablets

- Outcomes: Time to resolution of symptoms, complications, blood glucose level after treatment, hypoglycemia (defined as the persistence of symptoms (yes/no) or recurrence of symptomatic hypoglycemia for more than 15 minutes after treatment), hospital length of stay
- Time frame: January 1, 2020, to December 8, 2024

Summary of Evidence

Since the last SysRev[39] in 2017, we identified 3 relevant studies. One RCT[40] with 3 arms in children with diabetes type 1 aged 12 to 16 years trekking for 5 days found no difference between any of the 3 arms: 0.3 g glucose preparation/kg, sugar fondant candies, and fruit juice. A narrative review[41] explored the optimal dose of carbohydrates in nonsevere hypoglycemia; their conclusion was that most recover after 15 to 20 g, but individual strategies based on body weight or type of insulin delivery system might be relevant in future guidelines. One trial[42] showed that oral intake of carbohydrates in patients with type 1 diabetes could be beneficial earlier, that is, at higher blood glucose levels than traditional cutoffs to avoid hypoglycemia. This might be relevant from a first aid perspective but is out of the scope for the current PICO (population, intervention, comparator, outcome). Based on these studies, additional reviews (systematic or scoping review) on this specific or similar topics are not recommended at this time.

Treatment Recommendations (2015, Unchanged)

We recommend that first aid providers administer glucose tablets for treatment of symptomatic hypoglycemia in conscious adults and children (strong recommendation, low-quality evidence).

We suggest that if glucose tablets are not available, various forms of dietary sugars such as Skittles, Mentos, sugar cubes, jelly beans, or orange juice can be used to treat symptomatic

hypoglycemia in conscious adults and children (weak recommendation, very low–quality evidence).

There is insufficient evidence to make a recommendation on the use of whole milk, cornstarch hydrolysate, and glucose solution, or glucose gels as compared with glucose tablets for the treatment of symptomatic hypoglycemia.

Recognition of Stroke (FA 7170, FA 801, EvUp 2025)

Population, Intervention, Comparator, Outcome, Study Design, and Time Frame

- Population: Adults with suspected acute stroke
- Intervention: Use of a rapid stroke scoring system or scale
- Comparator: Basic first aid assessment without the use of a stroke scale
- Outcomes: Time to treatment (eg, symptom onset to hospital/emergency department arrival or hospital admission [Critical], recognition of stroke [Important], high sensitivity and high specificity considered beneficial for diagnosis study, discharge with favorable neurologic status [increase considered beneficial] [Important], survival with favorable neurologic outcome [increase considered beneficial] [Important], increased public/layperson recognition of stroke signs [Important])
- Study Designs: In addition to standard criteria, because it was anticipated that there would be insufficient studies from which to draw a conclusion, the minimum number of cases for a case series to be included was reduced from the default of 5 to 1.
- Time frame: May 26, 2020, to June 31, 2024

Summary of Evidence

Since the last SysRev[43] in 2020, we did not identify any relevant articles. An update of the SysRev is not currently indicated.

Treatment Recommendations (2020)

We recommend that first aid providers use stroke assessment scales/tools for adults with suspected acute stroke (strong recommendation, low-certainty evidence).

For first aid, we suggest the use of Face, Arms, Speech, Time, Melbourne Ambulance Stroke Scale, Cincinnati Prehospital Stroke Scale, or Los Angeles Prehospital Stroke Screen scales/tools for stroke assessment (weak recommendation, low-certainty evidence).

For first aid, we suggest the use of stroke assessment scales/tools that include blood glucose measurement when available, such as Melbourne Ambulance Stroke Scale or Los Angeles Prehospital Stroke Screen, to increase specificity of stroke recognition (weak recommendation, low-certainty evidence).

For first aid, we suggest the use of Face, Arms, Speech, Time or Cincinnati Prehospital Stroke Scale stroke assessment scales/tools when blood glucose measurement is unavailable (weak recommendation, low-certainty evidence).

Recognition of Sepsis (FA 7180, ScopRev 2024)

A significant proportion of preventable deaths worldwide are caused by sepsis, and early detection and treatment is beneficial. No review was undertaken until 2024, when the task force prioritized a ScopRev on the recognition and awareness of sepsis by first aid providers evaluating adults with an acute illness. The completed ScopRev[44] and CoSTR can be found in the 2024 CoSTR summary.[7]

Population, Intervention, Comparator, Outcome, Study Design, and Time Frame

- Population: Adults who are being evaluated by a first aid provider for an acute illness
- Intervention: The presence of any specific signs or symptoms (ie, pale, blue, or mottled skin, lips, tongue, gums, or nails; nonblanching rash; difficulty breathing or rapid respiratory rates; rigors/shivering; lack of urination in a day; muscle pain; confusion; or slurred speech)
- Comparator: Fever (≥38°C, 100.4°F) with signs of infection
- Outcomes: Recognition of a seriously ill person requiring hospitalization or evaluation by a physician for sepsis and increased awareness of sepsis
- Study designs: In addition to the standard criteria, gray literature, social media posts, non–peer-reviewed studies, unpublished studies, conference abstracts, and trial protocols were eligible for inclusion.
- Time frame: All years to December 2, 2023

Good Practice Statement (2024)

Those providing first aid should consider an infection in any person who presents with an acute illness, and if the illness is associated with any abnormal signs or symptoms, they should urgently seek further medical evaluation (good practice statement).

Interventions Administered by Lay Providers for the Treatment of Postpartum Hemorrhage (FA 7337, ScopRev 2025)

Rationale for Review

Postpartum hemorrhage is the leading cause of maternal mortality and morbidity worldwide, particularly in low-income countries with limited resources.[45] Early recognition and prompt treatment have the ability to prevent many deaths and long term health challenges.[46] The

FA Task Force performed a ScopRev to examine interventions for treating postpartum hemorrhage by lay providers, a topic that had not been reviewed by ILCOR before. The full report of the ScopRev[47] can be found online.[48]

Population, Intervention, Comparator, Outcome, Study Designs, and Time Frame

- Population: First aid or emergency care administered by a lay provider to anyone experiencing postpartum hemorrhage
- Intervention: Interventions that are classified as emergency care include those that fall within the following 2 categories:
  - Physical interventions: Examples of physical interventions administered by a lay provider include external uterine massage, bimanual compression, aortic compression, antishock garment, manual removal of placenta, or manual removal of clots.
  - Medications/Pharmaceuticals: Examples of medical interventions administered by a lay provider include iron supplementation, prostaglandin E1/misoprostol, or any other drug that may be accessible without intervention from a medical professional.
- Excluded interventions include those that require hospital/clinic support through medical professionals such as a blood transfusion, or any invasive surgical intervention such as curettage, uterine or pelvic artery ligation, uterine tamponade, or hysterectomy.
- Comparator: No intervention
- Outcomes: Any clinical outcome
- Study Designs: In addition to standard criteria, gray literature including social media, non-peer reviewed studies, unpublished studies, case reports, conference abstracts and trial protocols were eligible for inclusion.

- Time Frame: All years to October 22, 2024

Summary of Evidence

Sixteen articles were included in this ScopRev, including 1 opinion article,[49] 2 observational training and/or performance assessment,[50,51] 5 qualitative studies,[52-56] 3 cross-sectional studies,[57-59] 2 guidelines,[60,61] 2 non-RCTs,[62,63] and 1 RCT.[48] Interventions in these studies were primarily implemented by traditional birth attendants or similar persons with minimal formal training.

Three drugs were discussed: misoprostol, oxytocin, and ergotamine. All medications were administered orally, rectally, or intramuscularly and were therefore considered compatible with first aid practices. Misoprostol was administered rectally or orally in doses ranging from 400 to 1000 mcg.[59-64] Evidence on misoprostol came from the RCT,[64] both non-RCTs,[62,63] a cross-sectional study,[59] and both guidelines.[60,61] Oxytocin was discussed in both guidelines[60,61] and 1 cross-sectional study[57] in the context of a Uniject autoinjector, which keeps the medication cool and enables lay administration.[57,60,61] Ergotamine/ergometrine was kept and used in lay settings[55,57] and was further recommended for intramuscular delivery in low-resource settings in both guidelines.[60,61]

Controlled cord traction was not recommended for use by unskilled birth attendants in both guidelines.[60,61] In lower-resource settings, some unskilled providers applied it in the absence of skilled birth attendants.[53]

The use of uterine balloon tamponade was found to be effective and simple to use by community providers in 1 qualitative study.[54] A novel intrauterine tamponade device developed for administration by people with minimal training increased usability.[50]

The use of a compression lower body suit, so-called nonpneumatic antishock garment, which forces blood back to the vital organs, was highlighted by 2 studies, a guideline and an opinion article.[60,65] These garments are conventionally used only in health care facilities but were described as having high potential for application by lay providers. Herbal medicines commonly used by traditional birth attendants were also addressed in several qualitative and cross-sectional studies and guidelines[52,53,55-58] but discouraged based on harms or lack of benefit.[55]

Task Force Insights

Most birth attendants globally are untrained or trained to a level that would align with a first aid provider outside of the birthing or obstetrical domain.[66] Determining the difference between preventing and treating postpartum hemorrhage can be difficult, especially when interventions used for prevention and treatment are often the same (eg, manual external uterine massage, oxytocin). Most studies were qualitative and retrospective in nature, leading to an increased risk of bias and overall low quality of evidence. Only 1 RCT[64] was performed and evaluated only the efficacy of misoprostol.[64]

Although we excluded studies on conventional uterine balloon tamponade, we included studies on innovative devices useable by nonskilled providers.

This ScopRev triggered a SysRev on manual uterine massage (FA 7336), which is included below.

Task Force Knowledge Gaps

- The effect of first aid interventions for postpartum hemorrhage on long-term outcomes
- Most studies were qualitative and retrospective in nature, leading to an increased risk of bias and overall low quality of evidence.

Manual Uterine Massage for Postpartum Hemorrhage (FA 7336, SysRev 2025)

Rationale for Review

The FA Task Force undertook a SysRev on this topic because many international guidelines and other knowledge syntheses recommend external uterine massage for the prevention and management of postpartum hemorrhage.[46,67-73] Postpartum hemorrhage is a major cause of global morbidity and mortality, particularly in lower-resource settings where most birth attendants have limited professional health education and may be considered lay or first aid providers.[66] Manual external uterine massage is a simple and safe physical maneuver similar to other manual maneuvers taught to first aid providers and may reduce morbidity and mortality. This SysRev was registered in Prospective Register of Systematic Reviews (PROSPERO) (CRD42024572048). The full CoSTR can be found online.[74]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Those experiencing post-partum hemorrhage
- Intervention: Manual external uterine massage administered by a lay provider
- Comparator: Any other first aid intervention to treat postpartum hemorrhaging, or no intervention
- Outcomes: Maternal survival (critical), blood loss (critical), future fertility, surgical intervention, organ dysfunction, pain, and blood transfusion
- Time frame: All years to March 22, 2024

Consensus on Science

We identified a single RCT[75] including 127 women who had recently given birth in Kenya and were advised to perform self-massage cued by an alarm every 15 minutes for the first 120 minutes after birth. The study reported better compliance with an alarm every 15 minutes but

a non–statistically significant difference in the important outcomes of blood loss and blood transfusion (weak recommendation, very low–certainty evidence).

Treatment Recommendation (2025)

We suggest external uterine massage, including self-massage, in the immediate postpartum period in comparison with no intervention to prevent postpartum hemorrhage, which can lead to maternal death (weak recommendation, very low–certainty evidence).

Justification and Evidence-to-Decision Framework Highlights

The complete evidence-to-decision table is provided in Appendix A.

External uterine massage is a ubiquitous standard for professional birth attendants and first responders for the prevention and management of postpartum hemorrhage.[67,72,73,76] External uterine massage is a simple and safe physical maneuver, equivalent to other physical interventions routinely taught to first aid providers (eg, moving a patient, splinting an injured limb, applying direct pressure or a tourniquet to a bleeding wound).

Postpartum hemorrhage is a major source of global morbidity and mortality, especially in settings with limited or no access to professional health care providers. Therefore, recommendations that limit external uterine massage to health care professionals would potentially compound health inequities. Although the identified study did not demonstrate a statistically significant reduction in blood loss or blood transfusion, it did demonstrate that external uterine massage can be taught to lay providers.

Task Force Knowledge Gaps

- The importance of the pressure and firmness of the uterine massage for the effectiveness of the intervention; the included study could not measure or regulate the strength or firmness of

the uterine massage by study participants and did not describe if or how this was controlled or taught.

- More studies examining massage by lay providers, such as traditional birth attendants, are needed.
- Whether manual uterine massage affects maternal outcome beyond 120 minutes

Use of Naloxone During Resuscitation for Suspected Opioid-Associated Emergencies (FA 7442, BLS 811, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children with suspected opioid-associated cardiac or respiratory arrest in the prehospital setting
- Intervention: Bystander naloxone administration (intramuscular or intranasal), in addition to standard CPR
- Comparator: Standard CPR only
- Outcomes: Any clinical outcome
- Time frame: July 2019 to December 12, 2023

Summary of Evidence

This PICO question was transferred from the BLS Task Force to the FA Task Force after 2020. Since the last SysRev in 2020, 356 new titles were screened. No new evidence was identified, and an update to the SysRev is not indicated. The current ILCOR practice is to use good practice statements in place of treatment recommendations for cases in which there is insufficient evidence for a treatment recommendation but the task force thinks guidance is

warranted. The previous treatment recommendation based on expert consensus from 2020 has therefore been changed to a good practice statement.

Good Practice Statement (2020)

We suggest CPR be started without delay in any unconscious person not breathing normally and that naloxone be used by lay rescuers in suspected opioid-related respiratory or circulatory arrest (good practice statement).

Prevention of Syncope With Counter-Pressure Maneuvers (FA 7550, FA 798, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children with signs and symptoms of faintness or presyncope of suspected vasovagal or orthostatic origin
- Intervention: Interventions such as pressure counter maneuvers, body positioning, hydration, or other
- Comparator: No intervention or any other intervention
- Outcomes: Avoiding or preventing syncope or transient loss of consciousness, resolution of symptoms or symptoms response, hemodynamic status (including systolic and diastolic blood pressure, change in heart rate, cardiac output, stroke volume, or blood flow velocity), recurrences of presyncope and/or syncope, time to resolution of symptoms, adverse events, admission to hospital, quality of life
- Time frame: December 2, 2021, to December 2, 2023

Summary of Evidence

Since the 2020 SysRev,[77] 2 SysRevs[78,79] were identified on the use of physical counterpressure maneuvers for the prevention of syncope. Additionally, 1 RCT[80] was found assessing counterpressure maneuvers during dental extraction in patients with a history of dental

anxiety and previous syncope. The SysRevs and single RCT support the conclusions of the 2019 CoSTR and 2020 CoSTR. An updated SysRev is not indicated at this time.

Treatment Recommendation (2019)

We recommend the use of any type of physical counter-pressure maneuver by individuals with acute symptoms of presyncope due to vasovagal or orthostatic causes in the first aid setting (strong recommendation, low-certainty and very low–certainty evidence).

We suggest that lower body physical counter-pressure maneuvers are preferable to upper body and abdominal physical counter-pressure maneuvers (weak recommendation, very low–certainty evidence).

Unintentional Injury From Laypersons Providing Chest Compressions to Patients Who Are Not in Cardiac Arrest (FA 7670, BLS 353, SysRev 2025)

Rationale for Review

Delivery of high-quality chest compressions is a key step in the chain of survival for patients in cardiac arrest. Immediate CPR initiated by laypersons is associated with improved outcomes. However, there may be a reluctance among laypersons to initiate CPR for fear of causing unintentional injuries. Since the last review[81] in 2020, the topic has been moved from the ILCOR BLS Task Force to FA Task Force, prompting a new SysRev[82] focusing on layperson rescuers. The term *harm* was changed to *unintentional injury*. The SysRev was registered before initiation (PROSPERO Registration CRD42023476764). The complete-CoSTR can be found online.[83]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children outside of a hospital who are not in cardiac arrest
- Intervention: Provision of chest compressions by laypersons

- Comparator: No use of chest compressions
- Outcomes: Survival with favorable neurological outcome at discharge, 30 days, 60 days, 180 days, and/or 1 year; unintentional physical injury (previously *harm*) (eg, rib fracture, bleeding); risk of unintentional injury (eg, aspiration, rhabdomyolysis)
- Time frame: All years to September 17, 2024

Consensus on Science

Since the last SysRev, 1 new study[84] was identified. In the total of 5 studies,[84-88] including 1031 patients not in cardiac arrest who received CPR, 7 (0.7%) experienced unintentional physical injury. Additionally, 2 (0.2%) patients had a risk of unintentional injuries and a further 24 (2%) had symptoms such as chest pain or discomfort. No deaths caused by CPR were reported, but 61 (6%) patients died before being discharged from the hospital. The included studies were too heterogeneous to perform a meta-analysis.

Prior Treatment Recommendations (2020)

We recommend that laypersons initiate CPR for presumed cardiac arrest without concerns of harm to patients not in cardiac arrest (strong recommendation, very low–certainty evidence).

Treatment Recommendations (2025)

We recommend that laypersons initiate CPR for presumed cardiac arrest without concerns of causing unintentional injury (strong recommendation, low-certainty evidence).

We recommend that other rescuers (eg, trained bystanders, health care professionals, and those with a duty to respond) initiate CPR for presumed cardiac arrest without concerns of causing unintentional injury to persons not in cardiac arrest (good practice statement).

Justification and Evidence-to-Decision Framework Highlights

The complete evidence-to-decision table is provided in Appendix A.

In making this discordant recommendation, the FA Task Force placed a higher value on the potential survival benefits of CPR initiated by laypersons for patients in cardiac arrest and a lower value on the low risk of injury in patients not in cardiac arrest. The intention of this recommendation is to strongly encourage and support laypersons who are willing to initiate CPR in any setting when they believe someone has suffered a cardiac arrest.

The included studies focused on laypersons and not on other persons, such as health care professionals or those with a duty to respond, but the task force believes that the benefit of starting CPR outweighs the harm and used the indirect evidence to make a good practice statement.

The incidence of chest wall bone fractures was substantially lower than the incidence reported after CPR in patients who were in cardiac arrest. This could be because of the shorter duration of CPR (most often <5 minutes)[82] initiated by laypersons and stopped by professional rescuers. However, the possibility of underreporting due to nonsystematic diagnostic studies cannot be excluded.

The task force discussed how the use of a structured equity assessment, such as the PROGRESS Plus tool,[4] might increase equity-focused reporting. The proportion of men and women were roughly equal in the included studies. However, in 3 studies, the layperson often had some kind of relationship with the patient, as either a family member or personnel at a nursing home. Both types of relationships might be accompanied by fear of causing an injury, and still they most likely would be more willing to cause an unintentional injury if it comes with survival.

Task Force Knowledge Gaps

- More studies are needed with robust methodology to identify unintentional injuries and provide follow-up after hospital discharge.
- The incidence and pattern of injuries from CPR given to children not in cardiac arrest.
- Few aspects of equity were reported in studies.

Spinal Motion Restriction for Possible Traumatic Cervical Spinal Injury (FA 7311, FA 7312, FA 1547, ScopRev 2025)

Rationale for Review

In many countries, spinal motion restriction protocols are used by emergency medical service professionals, but similar guidance for first aid providers continues to be debated. There is ongoing controversy around the use of cervical collars and other devices by both trained emergency medical service providers and lay first aid providers and concern regarding the evidence of harm from cervical collars, as well as the risk of secondary spinal cord injury after the initial trauma. Manual stabilization of spinal injury (FA 7312, FA 1547) was included in this new PICO. This ScopRev encompasses literature published in the last 25 years, including previous work done by the 2015 FA Task Force.[6,89] The full report of the ScopRev can be found online.[90]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children with possible traumatic cervical spinal injury
- Intervention: Cervical spinal motion restriction performed by a trained first aid provider
- Comparator: No cervical spinal motion restriction, or another type of cervical spinal motion restriction

- Outcome: Any clinical outcome
- Time frame: January 1,1999 to July 31, 2024

Summary of Evidence

We included 66 studies, including 22 RCTs,[91-112] 19 non-RCTs,[113-131] 8 cohort studies,[132-139] 3 interrupted time series,[140-142] 7 case series,[143-149] and 7 retrospective chart reviews.[150-156] Out of a total of 46 experimental studies, 36 (78%) were performed in live human volunteers,[91-96,98-100,102-113,116-121,123,125-127,130,131,141,142,147,149] and 5 primarily used human cadaver models[114,115,124,128,129] to assess range of cervical motion and adverse effects of spinal motion restriction. The 20 observational studies[132-140,143-146,150-156] mainly investigated the risk of secondary spinal injury, functional outcomes, and adverse effects of spinal motion restriction in trauma patients.

Evidence for the effectiveness of spinal motion restriction compared with no spinal motion restriction was provided in 46 studies,[91,94,96-98,102,104-108,111-115,117,118,120-122,124,127,128,130,132,133,135,136,140-154,156] with most (n=35) comparing cervical collar use with no cervical collar use. Together, these studies indicated that cervical collars decrease the range of cervical motion but lead to impaired respiratory and swallowing function as well as increased intracranial pressure.

Twenty-nine studies[91,94-97,99-101,103-110,112,114,117,118,120,123,125,128-131,137,143] compared multiple types of spinal motion restriction. Four studies compared soft foam with rigid collars,[114,117,128,143] suggesting that the use of soft foam collars allows significantly more cervical motion[114,117,128] but is not associated with an increased risk of secondary spinal injury.[143] One study[103] showed no significant differences in range of cervical motion between improvised (eg, a folded fleece jacket) and commercially available collars. Five studies[95,96,100,105,110] showed that in comparison

with 2-piece rigid collars, one-piece rigid collars result in greater restriction of cervical motion and cause significantly lower increases in jugular venous pressure but create higher interface pressures.

The effectiveness of spinal motion restriction methods or devices during simulated extrication from vehicles was assessed in 4 studies.[92,93,119,126] These suggested that collar application in combination with unassisted self-extrication, whereby a person is asked to leave the vehicle themselves without further instructions, creates the least range of cervical motion.

Finally, 5 studies[132,134,138,139,155] found no significant difference in the incidence of spinal cord injuries or functional outcomes of trauma patients before and after the implementation of spinal motion restriction protocols.

Task Force Insights

Most of the evidence comes from experimental studies in healthy young adult volunteers or human cadavers. Therefore, the findings may not be generalizable to adults and children with possible traumatic cervical spine injury. Also, 40% of all included studies were conducted in the United States.

Only 2 studies[103,117] looked at improvised devices for spinal motion restriction, which may be particularly useful for first aid in low-resource settings. In contrast, many experimental studies included direct comparisons of multiple commercially available cervical collars. There was marked heterogeneity across studies in the different brands or specific features of cervical collars, including in their design (1-piece or 2-piece) and structure (rigid, semirigid, soft, improvised).

The task force recognize that trained first aid providers in selected circumstances (eg, ski patrols and lifeguards) might be capable of using cervical collars but concluded that formal data

synthesis and determination of the certainty of the vast evidence base is required to confidently withdraw the existing treatment recommendation or to formulate any further treatment recommendation or good practice statement.

The task force, however, recognizes that the existing treatment recommendation should not preclude the selective use of spinal motion restriction by trained first aid providers using existing spinal motion restriction protocols.

This ScopRev provides a comprehensive overview of the available evidence and may serve as a basis for future SysRevs on one or more narrowly defined PICO questions, which will be discussed in the upcoming year within the task force.

Task Force Knowledge Gaps

- The potential benefits and harms of spinal motion restriction in conscious or unconscious persons, performed by untrained or trained first aid providers
- Optimal methods for spinal motion restriction that could be applied specifically in low-resource settings (eg, a folded fleece jacket as an improvised collar, a folded towel wrapped around the neck and crossed around the chest)

Treatment Recommendation (2015)

We suggest against the use of cervical collars by first aid providers (weak recommendation, very low–certainty evidence).

Cryotherapy for Epistaxis (FA 7151, ScopRev 2021)

Cryotherapy, or cooling, has been suggested to shrink nasal mucosa and cause vasoconstriction as a method to aid hemostasis. For 2021, the FA Task Force prioritized the topic for a ScopRev to identify the scientific evidence behind such recommendations for the use of

cryotherapy for epistaxis. Details of this ScopRev[157] can be found in the 2021 CoSTR summary.[158]

Population, Intervention, Comparator, Outcome, Study Design, and Time Frame

- Population: Adults and children receiving first aid for acute epistaxis
- Intervention: Cryotherapy alone or cryotherapy with nose pinching
- Comparator: Nose pinching alone
- Outcome: Time to hemostasis control (minutes), hemostasis (yes/no), reduction of nasal blood volume (volume), reduction of pain, need for follow-up care (yes/no), adverse events (yes/no), recovery time (days/min), reduction of swelling (volume)
- Study designs: In addition to the standard criteria, gray literature was available for inclusion. Further, we examined ILCOR's 8 member councils' and their subcouncils' websites.
- Time frame: All years to January 14, 2021; a gray literature search was conducted December 28, 2020

There was insufficient evidence to support a good practice statement.

Manual Pressure and Pressure Devices (FA 7331, FA 530, SysRev 2021, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children with severe, life-threatening external bleeding from an extremity
- Intervention: Direct pressure to the wound with a compression dressing, compression bandage, compression device, wound clamp, application of a junctional pressurize, proximal manual pressure
- Comparator: Direct manual pressure

- Outcomes:
  - Critical: Mortality due to bleeding; cessation of bleeding, achieving hemostasis; time to achieving hemostasis
  - Important: Mortality from any cause; decrease in bleeding; complications/adverse effects (eg, wound infection, limb loss, re-bleeding, pain related to an intervention)
- Time frame: November 22, 2019, to July 2, 2024

Summary of Evidence

Since the 2021 SysRev,[159] 7 studies[160-166] were identified on the use of pressure devices or pressure points compared with direct manual pressure. While findings in these studies suggest some potential benefits for the use of pressure points or pressure devices in some settings, the results are confounded by the indirect nature of the evidence and potential bias. Given these limitations, a ScopRev or SysRev is not warranted at this time. Future ScopRev or SysRev should clarify the definitions of devices for manual pressure versus limb tourniquets.

Treatment Recommendation (2020)

We recommend that first aid providers use direct manual compression compared with the use of external compression devises or pressure dressings/bandages for severe life-threatening external bleeding (strong recommendation, very low–certainty evidence).

We recommend against the use of pressure points compared with the use of direct pressure by first aid providers for severe, life-threatening external bleeding (strong recommendation, very low–certainty evidence).

Type of Tourniquets Alone or in Combinations With Other Methods of Achieving Hemostasis (FA 7333, FA 768, SysRev 2021, EvUp 2025)

The original PICO was a mega-PICO with several sub-PICOs.[159] The EvUp below focused on one of the sub-PICOs.

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children with severe, life-threatening external bleeding from an extremity
- Intervention: Improvised tourniquets, direct manual pressure or direct pressure to the wound with a compression dressing, compression bandage or compression device, hemostatic dressings
- Comparator: Manufactured tourniquets
- Outcomes:
  - Critical: Mortality due to bleeding; cessation of bleeding or achieving hemostasis; time to achieving hemostasis
  - Important: Mortality from any cause, decrease in bleeding, complications/adverse effects (eg, wound infection, limb loss, re-bleeding, pain related to an intervention)
- Time frame: November 22, 2019, to June 29, 2024

Summary of Evidence

Since the last SysRev[159] in 2021, 29 articles[167-195] were identified regarding the use of tourniquets for life-threatening extremity bleeding. The data support the use of tourniquets compared with no use of a tourniquet for life-threatening extremity hemorrhage. Studies demonstrate reduced in-hospital mortality and a lower incidence of shock when tourniquets are

used. Evidence supports the use of commercial tourniquets compared with improvised tourniquets because commercial tourniquets achieve better arterial occlusion and are simpler to apply. Therefore, based on this EvUp, a SysRev on tourniquet use in children was undertaken and is included here.

Treatment Recommendation (2020)

We suggest that first aid providers use a tourniquet in comparison with direct manual pressure alone for severe, life-threatening external bleeding that is amenable to the application of a tourniquet (weak recommendation, very low–certainty evidence).

We suggest that first aid providers use a tourniquet rather than a hemostatic dressing for severe, life-threatening external bleeding that is amenable to the use of a tourniquet (weak recommendation, very low–certainty evidence).

Types of Pediatric Tourniquets (FA 7333, FA 768, SysRev, 2021 CoSTR Summary)

A SysRev[196] of the use of tourniquets in the children (<19 years of age) was conducted for the 2021 CoSTR summary.[158]

Population, Intervention, Comparator, Outcome, Study Designs, and Time Frame

- Population: Children (<19 years of age) with severe, life-threatening bleeding from an extremity wound
- Intervention: Commercial elastic wrap tourniquet or commercial ratcheting tourniquet
- Comparator: Commercial windlass rod-type tourniquet
- Outcome: Mortality, control of bleeding (including surrogate outcome of obliteration of Doppler pulses), blood loss, shock/hypotension, and adverse events

- Study designs: In addition to standard criteria, modeling studies, studies of tourniquets applied solely to maintain a bloodless surgical field, and those relating only to education were excluded.
- Time frame: All years to October 1, 2020

Treatment Recommendations (2021)

We suggest the use of a manufactured windlass tourniquet for the management of life-threatening extremity bleeding in children (weak recommendation, very low–certainty evidence).

We are unable to recommend for or against the use of other tourniquet types in children because of lack of evidence.

For infants and children with extremities that are too small to allow the snug application of a tourniquet before activating the circumferential tightening mechanism, we recommend the use of direct manual pressure with or without the application of a hemostatic trauma dressing (good practice statement).

Hemostatic Dressing (FA 7334, FA 769, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children with severe, life-threatening external bleeding
- Intervention: Hemostatic dressings with or without direct pressure (manual or pressure to the wound with a compression dressing, compression bandage, or compression device)
- Comparator: Direct manual pressure or direct pressure to the wound with a compression dressing, compression bandage, or compression device
- Outcomes:

- Critical: Mortality due to bleeding; cessation of bleeding, achieving hemostasis; time to achieving hemostasis
- Important: Mortality from any cause; decrease in bleeding; complications/adverse effects (eg, wound infection, limb loss, rebleeding, pain related to an intervention)

- Time frame: November 1, 2019, until November 2024

Summary of Evidence

Since the 2020 SysRev,[159] 5 articles[197-201] were identified regarding the use of hemostatic dressings for the control of life-threatening bleeding. While much of the data continue to be indirect, data continue to suggest that hemostatic dressings decrease the duration of bleeding and improve survival when compared with conventional gauze used to stop life-threatening bleeding. There continues to be a low reported rate of side effects. The new studies identified support the existing recommendations. Therefore, based on this EvUp, no additional ScopRev or SysRev is warranted.

Treatment Recommendations (2020)

We suggest that first aid providers use a hemostatic dressing with direct pressure as opposed to direct pressure alone for severe, life-threatening external bleeding (weak recommendation, very low–certainty evidence).

For the treatment of severe, life-threatening external bleeding by first aid providers, due to very limited data and very low confidence in effect estimates, we are unable to recommend the use of any one specific type of hemostatic dressing compared with another.

Duration of Cooling With Water for Thermal Burns (FA 7371, FA 770 SysRev 2021)

This topic was prioritized by the ILCOR FA Task Force because of a lack of international consensus about the optimal duration for cooling of thermal burns with running water in the first

aid setting and because of newly identified relevant studies since the topic was last reviewed in 2015. A SysRev[202] was undertaken on behalf of the FA and Pediatric Task Forces and was included in the 2021 CoSTR summary.[158]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children in first aid settings with a thermal burn
- Intervention: Active cooling using running water for 20 minutes or more as an immediate first aid intervention
- Comparator: Active cooling using running water for any other duration as an immediate first aid intervention
- Outcome: Size of burn, defined as percentage of total body surface area at any reported time point; depth of burn, defined as any degree of deep partial or full thickness burn depth; pain, defined as any measurement of pain or administration of pain relief medications; adverse outcomes, defined as any adverse outcome, including hypothermia; wound healing, defined as time to re-epithelization in days; and complications within 24 hours, defined as organ dysfunction, ICU care, infections (within 7 days), bleeding, and rhabdomyolysis as well as the need for surgical procedures such as skin grafting, fasciotomy, or escharotomy
- Time frame: All years to February 10, 2021

Treatment Recommendations (2021)

We recommend the immediate active cooling of thermal burns using running water as a first aid intervention for adults and children (strong recommendation, very low–certainty evidence).

Because no difference in outcomes could be demonstrated with the different cooling durations studied, a specific duration of cooling cannot be recommended.

Young children with thermal burns being actively cooled with running water should be monitored for signs and/or symptoms of excessive body cooling (good practice statement).

Dental Avulsion (FA 7361, FA 794, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children in any setting (in-hospital or out-of-hospital) with an avulsed permanent tooth
- Intervention: Any storage media, container, or technique
- Comparator: Storage in whole milk or the patient's saliva
- Outcomes:
  - Critical: Success of replantation and tooth survival or viability
  - Important: Color of the tooth, infection rate, malfunction (eating, speech) and pain
- Time frame: July 1, 2019, and updated to December 2, 2023

Summary of Evidence

Since the last SysRev[203] in 2020, 3 studies[204-206] were identified regarding the use of a storage medium, container, or technique for an avulsed permanent tooth. The evidence suggests that storage in a cooler temperature favored viability of periodontal ligament fibroblasts for all storage media, except for Hanks' Balanced Salt Solution (a buffered salt solution). Propolis (a natural product made by bees by mixing resin, wax, and oils), cow milk, and almond milk can be alternative storage mediums. Based on this EvUp, an updated SysRev is not warranted.

Treatment Recommendation (2020)

We suggest the use of Hanks´ Balanced Salt Solution, propolis (from 0.04 mg to 2.5 mg per mL 0.4% ethanol), oral rehydration salt solutions including Ricetral (oral rehydration salt

solutions containing sodium chloride, glucose, potassium chloride, citrate [or extruded rice]), or cling film compared with any form of cow's milk for temporary storage of an avulsed tooth that cannot be immediately replanted (weak recommendation, very low–certainty evidence). If none of the above choices are available, we suggest the use of cow's milk, any percent fat or form, compared with tap water, buttermilk, castor oil, turmeric extract, or saline (sodium chloride) for temporary storage of an avulsed tooth (weak recommendation, very low–certainty evidence).

There is insufficient evidence to recommend for or against temporary storage of an avulsed tooth in saliva compared with alternative solutions.

There is insufficient evidence to recommend for or against temporary storage of an avulsed tooth in probiotic media, epigallocatechin-3-gallate, Dentosafe box, or egg white compared with cow's milk.

Compression Wrap for Closed Extremity Joint Injuries (FA 7381, FA 511, EvUp 2025)

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults in the prehospital setting with a closed extremity joint injury
- Intervention: Compression wrap, elastic wrap
- Comparator: No compression wrap or elastic wrap
- Outcomes: Reduction of pain and reduction of swelling/edema (critical), recovery time, range of motion, adverse effects (important)
- Time frame: January 1, 2020, to September 30, 2024

Summary of Evidence

Since the SysRev[207] in 2020, no new studies were identified.

Treatment Recommendations (2019)

We suggest either application of a compression bandage or no application of a compression bandage for adults with an acute closed ankle joint injury (weak recommendation, very low–certainty evidence).

Due to a lack of identified evidence, we are unable to recommend for or against use of a compression bandage for closed joint injuries on other joints besides the ankle.

Preservation of Traumatic, Completely Amputated or Avulsed Body Parts (FA 7391, ScopRev 2025)

Rationale for Review

Complete amputation of extremities or digits is a physically and emotionally traumatic experience that can lead to long-term disability and disfigurement. Globally, the incidence and prevalence of traumatic amputations reached 11.37 million and 552.45 million respectively[208] in 2019. Nonfreezing cold storage of an ischemic amputated limb or digit is essential to improve the potential for successful replantation and revascularization, particularly when transport times are prolonged.[209] Only 35% of patients with traumatic amputations present to the emergency department with properly preserved amputated body parts, making it difficult for surgeons to offer replantation when it would otherwise be an option.[210,211] The full report of this ScopRev can be found online.[212]

Population, Intervention, Comparator, Outcome, Study Designs, and Time Frame

- Population: Adults and children with a traumatic complete amputation or a complete avulsion of an external body part (eg, digit, hand, arm) or soft tissue in the out-of-hospital setting
  - Excluded: Adults and children with a partial amputation or avulsion, an internal avulsion, or a surgical amputation

- Intervention: Any approach to preservation of the amputated body part or avulsed tissue for possible replantation/attachment
- Comparator: Another approach to preservation of the amputated body part or avulsed tissue for possible replantation/attachment
- Outcomes: Any clinical outcome; the task force further specified a priori the critical outcome of attempted and successful replantation of amputated body parts or reattachment of avulsed tissue.
- Study designs: In addition to standard criteria, the gray literature search included relevant guidelines from ILCOR-member organizations.
- Time frame: All years to April 17, 2024

Summary of Evidence

This review identified 37 studies[212] from 23 countries with various study designs: 23 case reports,[213-235] 2 case series,[236,237] 2 experimental studies using animal models,[238,239] 1 prospective observational study,[240] 6 retrospective observational studies,[210,241-245] and 3 SysRevs with meta-analyses.[246-248]

All studies included human subjects except for the 2 experimental studies. The experimental studies[238,239] assessed replantation success following storage of amputated parts for between 21 and 24 hours at room temperature, 4°C and minus 5°C. Case reports[213-235] and series described varying degrees of successful replantation with revascularization of completely amputated or avulsed body parts that, before hospital arrival, were cooled by different means or stored without cooling. Total ischemic time between amputation and replantation ranged from 2 hours to 15 days. Successful replantation was reported in nearly all case reports and series with amputations involving body parts without skeletal muscle (eg, digits) and in those cases with

longer ischemic times when the part(s) were preserved with cold storage.[215,219,228,234] Unsuccessful replantations were described in cases of prolonged (eg, up to 30 hours) ischemia without cooling[229] or cleaning/soaking the part in water for 2 hours.[231] The process described for cooling varied widely but often involved wrapping the part in moist gauze, placing it in a plastic bag and then placing the bag in another container with ice or an ice-water mix. A complete overview of characteristics and key findings from the case reports and series is presented in Table 2.

Table 2. Preservation of Traumatically Amputated/Avulsed Parts Characteristics of Case Reports and Series

First author, year, country	Population	Preservation technique	Main findings for patient outcomes
Akyurek,[213] 2020, United States	72-year-old female, equestrian accident, scalp avulsion	Avulsed scalp left under snow for 4 hours before being located	Uncomplicated/complete survival of replanted scalp, normal appearance at 4 years
Borenstein,[214] 1990, Israel	2 female teenagers with complete avulsion of the scalp and 3/4 ears	Case 1: Scalp with 2 auricles wrapped in wet gauze, placed in a plastic bag surrounded by ice; hospital arrival 2 hours post injury Case 2: Total avulsion of scalp and left auricle; preservation technique not described	Case 1: 95% of the scalp and left auricle survived; new hair growth, eyebrow movement at 3-months post-op Case 2: Partial survival of scalp, some grafting required; no survival of replanted ears
Braga-Silva,[215] 2016, Brazil	55-year-old female, amputation of distal ring finger from knife	Patient presented without amputated part; finger located later, placed in sealed jar, refrigerated at 4°C for 15 days	Survival of cold-preserved replanted finger despite 15-day delay; good function, cosmesis and 2-point discrimination at 8-year follow-up
deLagausie,[216] 2008, France	4-year-old male, amputated penis	Placed in container with ice without direct contact, 6 hours	Successful replantation of penis after cold ischemic time 6 hours; normal function at 8-year follow-up
Dvořák,[217] 2020, Czech Republic	38-year-old male, avulsed ear	Ear wrapped in moistened gauze and stored on dry ice, arrived frozen/rigid	Successful replantation despite frozen avulsed/amputated ear; cosmetic changes and cold intolerance on long-term follow-up
Elsahy,[235] 1974, Canada	14-year-old male, avulsed left nasal ala from dog bite	Tissue lost for 2 hours; at hospital, immersed in saline, refrigerated at 7°C for 2 hours	Successful grafting 4 hours after injury following 2 hours warm ischemia and 2 hours cold ischemia; normal skin color at 7 months
Facio,[218] 2015,	30-year-old male, amputated penis	No cooling of amputated part for initial 5 hours, then stored 1 hour in a	Successful replantation of transplanted penis after 5 hours warm ischemia; erectile

First author, year, country	Population	Preservation technique	Main findings for patient outcomes
Brazil		clean plastic container with saline and ice cubes	function, urinary pattern, cosmesis acceptable at 2-year follow-up
Fernandez-Palacios,[219] 2009, Spain	28-year-old male, hand amputation at sea	Hand stored in a plastic bag on ice inside an isothermal box; prolonged transport time due to remote (ocean) location	Successful replantation at 13 hours post injury; post-transplant infection; recovery at 3 weeks
Firdaus,[220] 2017, Malaysia	8-year-old male, above elbow amputation from motorcycle accident	"A witness immediately buys an ice bag from shop nearby and the amputated part was well preserved"	Successful replantation of cold-preserved arm; good circulation in the immediate post-operative period; no further follow-up described
García-Murray,[221] 2009, Mexico	27-year-old female hostage, bilateral ear helix amputations	Both ears unpreserved for 2 hours, then wrapped in moist gauze, placed in sterile plastic bag, kept in a bucket filled with ice/water then refrigerated 3 hours	Failed replantation after 2 hours warm ischemia, 52 hours cold ischemia; successful salvage procedure with reattachment of ears, reconstruction and free flap; good cosmesis at 12 months
Gunasagaran,[222] 2022, Malaysia	42-year-old female, left thumb amputation from machete	Amputated thumb found on side of road (unknown time interval after injury), placed in plastic bag with ice; on arrival 2 hours later, ice had melted, thumb immersed in ice water; thumb then wrapped in moist gauze, stored in "ice box"	Successful replantation despite 2 hours storage directly on ice followed by ice water; no frostbite or maceration of the amputated thumb observed after storage on ice/in ice water; good motion/function of thumb at follow-up
Henry,[223] 2020, UK	34-year-old male, amputated penis	No preservation for 15 hours, then put on ice/transported with patient	Survival of penile transplant despite 15 hours warm ischemia time; debridement and skin graft needed at 2 months, normal function at 6 weeks
Kyrmizakis,[224] 2006, Greece	47-year-old male and 20-year-old male, amputated ears	For both cases, auricles placed in plastic bag with saline, surrounded by ice, transported with patient	Case 1: Successful replantation after 4 hours cold ischemia time as composite graft but required revision at 3 months; no complications at 6 months except 10% decrease in size Case 2: Successful replantation after 3 hours of cold ischemia time, composite graft, revision at 3 months
Li,[225] 2020, China	3-year-old male, right leg amputation at knee level by sword	No specific care of the amputated leg before hospital arrival (warm ischemia time: 2 hours); leg then wrapped in saline-soaked gauze, placed in a plastic bag with ice for 400 km transfer to hospital (cold ischemia time <6 hours)	Successful replantation of leg after 2 hours of warm ischemia time, <6 hours cold ischemia; partial motor and sensory functions 6 months after surgery; during follow-ups, the patient underwent sustained rehabilitation and recovered well
Liang,[226]	30-yr-old male, left ear	Auricle retrieved 5 hours post-amputation; at	Successful replantation 10 hours after complete amputation of auricle; warm

First author, year, country	Population	Preservation technique	Main findings for patient outcomes
2004, China	amputation by knife	hospital auricle cleaned and "preserved in ice" for 5 hours	ischemia time 5 hours, 5 hours cold ischemia time in-hospital; 1-year follow-up showed color, contour, temperature similar to right ear
Makki,[227] 2020, Denmark	Case 1: 43-year-old male, amputation of upper lip by human bite Case 2: 30-year-old male, upper lip amputated in bicycle-motor vehicle collision	Avulsed lips both wrapped in saline-soaked gauze and placed on ice in a bag	At the 8-day follow-up, both patients had 100% healed cleft lip and flap survival; at the 12-month follow-up, case 1 had a cosmetically acceptable result with full movement in the upper lip
May,[228] 1981, United States	28-year-old male, amputation of 4 fingers of the left hand from a paper cutting machine	Digits placed in plastic bag surrounded by iced saline (unclear if cooling occurred before arrival at hospital; patient presented with amputated parts soon after injury)	Because of the time required to replant all digits, a cold ischemia time of up to 28 hours was recorded for the final digit; all digits survived replantation; the case suggests that the margin of safety in digit replantation may be greater than previously thought
Musa,[229] 2016, Nigeria	15-year-old male, avulsion of penis from a grinding machine, with scrotal laceration and devitalized tissues	Initially resuscitation at local hospital; amputated penis wrapped in gauze at hospital and sent with patient to higher level of care, arrived 30 hours post injury; no cooling of amputated tissue	Patient presented 30 hours after injury with the penis mummified, precluding replantation
Salem,[230] 2009, Egypt	23-year-old male, penile amputation	Amputated penis kept dry in plastic bag, double bagged in ice and slush for 2 hours	Successful replantation after 2 hours cold ischemia, 5 hours warm (intraoperative) ischemia
Selmi,[231] 2018, Turkey	11-year-old male, amputation of right testicle from bicycle	Testicle found in muddy water, cleaned with soap/water, placed in jar of water for 2 hours before arrival at ER	No testicular replantation attempted due to storage in water and condition of testicle
Szlosser,[232] 2015, Poland	82-year-old male, trans-metacarpal amputation of 4 fingers by circular saw	Amputated fingers "cooled" and "stored appropriately" 3 hours prior to arrival at hospital	2/4 amputated fingers were replanted, 4 hours warm ischemia (operative) time; at 8 months, minimal movement of fingers; however, because the thumb was uninjured, hand grasp was preserved, and patient was satisfied with the result; age alone should not be an absolute contraindication to finger replantation
Usui,[233] 1979, Japan	14-year-old male, left distal one third leg amputation from a mower	Cooling of the amputated part in ice water; 5-hour transportation time to the hospital	Successful replantation, 5 hours cold ischemia time; at 4-year follow-up, no joint contracture or deformity; child able to walk and run as fast as other children his age; success was attributed to the patient's youth, ideal conditions for nerve repair, and the prearrival preservation of the amputated part in ice water

First author, year, country	Population	Preservation technique	Main findings for patient outcomes
Wei,[234] 1988, Taiwan	24-year-old female, amputations of 8 fingers by a paper cutting machine	Prearrival: All 8 digits wrapped in normal saline-soaked gauze and preserved in an ice bag; 76-hour transportation time to the hospital	All replantations were successful following 76-hour transport time with cold preservation and total cold ischemia times of 84, 86, and 94 hours for the left thumb, right thumb and left index finger; at 8 months post-op, the patient was able to perform most routine household tasks
Berger,[236] 1977, Austria	33 patients with 27 complete amputations, 41 incomplete amputations	Prearrival method of preservation or cooling not described except for 4 cases described as "improper first aid contributing to failed replant procedure," including: - Liquid-filled glass (1) - Floating in ice water (1) - No cooling (2)	Functional replantation not achieved in 9 of 11 cases; warm ischemia time of more than 8 hours felt responsible for failure of replantation in 2 cases; review did not clearly describe the specific prearrival method of preservation or cooling technique other than for 4 cases; cold ischemia times of up to 12 hours and a warm ischemia time of up to 6 hours considered the limit for replantation, although consideration of injury mechanism and storage technique were both necessary for exclusion of replantation
O'Brien,[237] 1973, Australia	8 patients, complete amputation of total 14 digits	The amputated fingers were "cooled in ice" (n=3), "cooled by ice in a plastic bag" (n=4), and not reported (n=1)	Of 14 digital amputations, 11 survived replantation (83%), with ischemia times of 7 to 14 hours; for preservation methods linked to replantation failures due to complications, one was "cooled in ice," one not reported

The observational studies assessed factors potentially associated with successful replantation and functional recovery, including the method of preservation of the amputated part prior to hospital arrival and the total ischemic time. Three cohort studies[240,243-245] reported an association between cold preservation for up to 6 hours and successful replantation of major upper extremity , although replantation of upper extremities was reported in a fourth study[245] to be successful after 7 to 13 hours without cold preservation but with limited functional outcomes. A complete overview of experimental and observational studies with key findings is presented in Table 3.

Table 3. Preservation of Traumatically Amputated/Avulsed Parts-Characteristics of Experimental and Observational Studies

Author, year, country	Population	Preservation technique	Main findings for preservation technique	Other outcomes
Hayhurst,[238] 1974, Australia	10 Macaque monkeys with surgically amputated index	1.5 hours of warm ischemia during amputation procedure; fingers	Preservation for 21 hours at 4°C did not produce enough damage to preclude a reasonable	The first 3 amputated fingers had complete necrosis; 1 subject died unexpectedly

Author, year, country	Population	Preservation technique	Main findings for preservation technique	Other outcomes
	fingers, replanted at 24 hours	then wrapped in saline-moistened surgical sponge, kept at ~4°C for ~21 hours; finger allowed to return to room temperature for up to 2.5 hours for replantation	chance of survival in digital replantation	with normal appearing replanted finger; 1 finger had bleeding and necrosis felt due to anticoagulant overdosage or trauma; the final 5 finger replants were successful with survival of replants at up to 35 days
VanGiesen,[239] 1983, United States	40 amputated rabbit ears replanted at 24 hours	1. Room air storage and replanted within 1 hour (control) 2. Immersed in lactated Ringer's at 4°C (24 hours) 3. Nonimmersed, ear wrapped in lactated Ringer's moistened sponge at 4°C (24 hours) 4. Immersed in normal saline at 4°C (24 hours) 5. Nonimmersed, ear wrapped in saline moistened sponge at 4°C (24 hours) 6. Immersed in lactated Ringer's and wrapped in a sponge at room temperature (24 hours) 7. Frozen, nonimmersed, wrapped in lactated Ringer's moistened sponge at 0° to -5°C (24 hours) 8. Nonimmersed wrapped in lactated Ringer's moistened sponge for 2 hours at room temperature and 4°C for 22 hours	1. 5/5 replants survived 2. 5/5 replants survived 3. 5/5 replants survived 4. 5/5 replants survived 5. 4/5 replants survived 6. 0/5 replants survived 7. 0/5 replants survived 8. 4/5 replants survived	All replants failed to survive after 24 hours of storage at room temperature or at minus 5°C; 2 other failures were recorded: 1 stored at 4°C wrapped in a moistened normal saline surgical sponge, and 1 stored 2 hours at room temperature followed by 22 hours of storage at 4°C; no difference was shown when the amputated part was stored in either lactated Ringer's or normal saline solution at 4°C The author suggests that the best method for preservation would be to wrap the amputated part in saline-moistened gauze and place this packet in a plastic bag to be floated in an iced saline solution. No difference among conventional methods of storage were noted if the amputated part is not frozen or allowed to become normothermic for more than 2 hours.

Author, year, country	Population	Preservation technique	Main findings for preservation technique	Other outcomes
Li,[242] 2008, China	211 patients (117 males and 94 females, mean age 26.2 years [range 1–67 years]) with 211 complete fingertip amputations undergoing replantation surgery	1. Dry storage at room temperature (*n* = 84 digits) 2. Dry storage at 2-6°C (*n* = 106 digits) 3. Immersed in saline or ethanol (*n* = 21 digits)	Compared with immersion in saline or ethanol, dry storage at room temperature was associated with increased survival rates in a non-statistically significant manner (aOR: 0.314, 95% CI [0.041–2.399], p=0.264); compared with immersion in saline or ethanol, dry storage at 2°C–6°C was significantly associated with increased survival (aOR: 0.028, 95% CI [0.003–0.270], p=0.002); no statistical difference between room- and low-temperature (2°C–6°C) preservation, suggesting that the amputated fingertip could withstand longer warm ischemia time	Binary logistic regression analysis for predictor of digit survival found that injury mechanism, platelet count, preservation of amputated part before admission, vein grafting, and smoking after the operation were independent prognostic variables that influence the survival of the replanted fingertip
Chen,[241] 2017, China	896 amputated fingers (average patient age 22.0±3.8 years)	1. Freeze-dried (n=536) 2. Room temperature/dry (n=273) 3. Soaking liquid (n=87) Specifics of how and when preservation performed not described	1. 518 (60.9%) survived vs 18 (40.0%) did not survive 2. 257 (30.2%) survived vs 16 (35.6%) did not survive 3. 76 (8.9%) survived vs 11 (24.4%) did not survive	851/896 (94.98%) of amputated fingers were successfully replanted; univariate analysis showed successful replantation correlated with ischemic time, etiology of injury, age, plane of severed finders, ways of preservation, artery reconstruction, platelet level and incidence of vascular crisis (P<0.05)
Okumuş,[243] 2020, Turkey	14 patients (14 males, mean age 29.6 years, range 11–45 years) with work-related amputations of an upper extremity	All amputated parts but one arrived at hospital "in properly prepared cold ischemic conditions"; one without cooling had "appropriate" warm ischemic time	Replantation of amputated extremity in 11/14 cases (withheld in multilevel crush); "recommended ischemia times for reliable success with replantation are 12 hours of warm and 24 hours of cold ischemia for digits, and 6 hours of warm and 12 hours of cold ischemia for major replants; the amputated part should be wrapped in a saline-moistened gauze sponge and placed in a	Overall satisfaction, recovery of active motion of digits and thumb opposition, wrist and elbow joints, recovery of sensitivity in the median and ulnar nerve distribution, and ability of the surviving hand and/or forearm to perform daily work were all judged satisfactory in hand replantations;

Author, year, country	Population	Preservation technique	Main findings for preservation technique	Other outcomes
			plastic bag; the plastic bag should be sealed and placed on ice; the amputated part should not be placed directly on ice"	some distal ulnar nerve motor function problems reported in 3 cases with replantation at the elbow
Tark,[244] 1989, Korea	261 replantations of amputated digits and hands in 153 patients; 176 were complete amputations	"Hypothermic" preservation (no description given of how "hypothermic preservation" was accomplished, and if performed before arrival to a hospital	Survival of replanted amputated parts was assessed based on a warm or cold ischemia time of ≤12 or ≥13 hours; there was no significant relationship between survival of the replant and length of ischemic time in the cold ischemia amputated parts group; success rate of replantation within 12 hours of warm ischemia was higher than that after 13 hours of warm ischemia	140 of 176 (80%) complete amputations were successfully replanted; clean-cut proximal level amputations and hypothermic-preserved amputation parts had the highest survival rate; a higher survival rate seen with repair of both digital arteries and 2 veins rather than only 1
The Hoang,[245] 2009, Vietnam	10 males, complete forearm amputations, ages 14 months–42 years	None of the amputated arms were "properly preserved"	Ischemia times ranged from 7–13 hours; 1 illustrative case described the amputated arm wrapped in a towel, transported with the patient 3 hours to the hospital; no prehospital storage/preservation of the amputated part was performed, beyond one case in which the arm was wrapped in a towel	All patients arrived at the hospital within 2–8 hours post injury; none of the amputated parts were properly stored; overall survival of replanted limbs was 100%; functional outcomes of replanted forearms at 20 months rated from "excellent" to "fair" in 70% of patients
Sinatro,[210] 2022, United States	91 patients with traumatic amputation and documented modality of preservation seen at a single tertiary center	Prearrival "proper preservation" assessed, defined as "wrapping the part in saline soaked gauze inside a watertight bag and placing it on ice"	Most patients (60/91, 65.9%) arrived without proper preservation of their amputated parts; of 74 patients transported by EMS, only 35.1% had proper preservation of their amputated part; only 25.5% of patients presenting from home had proper preservation of their amputated part(s)	Replantation was attempted at a significantly lower rate (n=14, 23.3%) in patients with improperly preserved parts than in those with properly preserved parts (n=18, 58.1%) (P=0.001)
Waikakul,[240] 1998,Thailand	186 patients (137 male, 39 female, ages 19–38 years) with upper limb amputations: 24	"Good preservation" defined as "cooling" without further description	Prearrival preservation by cooling of the amputated part showed a significant effect on the outcome and was a better predictor than ischemic time	There were 167 successful replantations and 16 failed replantations; of 102 amputated extremities that were cooled, 3

Author, year, country	Population	Preservation technique	Main findings for preservation technique	Other outcomes
	amputations at the palm, 75 at the wrist, 50 at the forearm, 9 disarticulations at the elbow, 28 amputations through the upper arm			replantations failed; 99 were successful; for amputated parts with "poor" preservation, 13 replantations failed, and 68 were successful (P <0.05, X2 8.14); total ischemic time, gender and age did not affect results; the type and severity of injury were also good predictors of successful replantation and functional outcome at 2 years

aOR indicates adjusted odds ratio.

Three SysRevs with meta-analysis (Table 4) assessed clinical outcomes for amputated parts preserved with cooling compared with no cooling of tissue, but in most cases failed to describe the actual method of cooling or other factors such as cold or warm ischemia times.[246-248]

Table 4. FA7391 Preservation of traumatic amputated/avulsed body parts. Systematic Review Characteristics and Findings

Author, Year, Country	Population	Intervention	Comparison	Primary Outcome	Findings for Cold Preservation	Other Factors Assessed
Shaterian,[248] 2018, United States	2 studies with 6000-digit amputation and replantation cases *Note:* One of the 2 studies was excluded from this scoping review as it did not provide any description of how prehospital cooling was accomplished or time interval between injury, cooling and replantation.	"Cold" preservation No description was provided in this review of how or when cooling of the amputated part occurred or how long cooling took place.	"Warm" or room temperature preservation	Replant survival	The method of preservation was not statistically associated with replant survival (OR: 0.94 [p>0.05]).	Meta-analysis showed the number of venous anastomosis (0 versus 1 versus 2), the number of arterial anastomosis (0 versus 1 versus 2), and mechanism of injury (sharp versus blunt cut versus avulsion versus crush) to influence replant survival (p<0.05). No significant association between survival and age, sex, zone of injury, digit number, tobacco use, ischemia time, method of preservation, and use of vein graft.
Ma,[247] 2016,China	22 observational studies with 2,641 patients (aged 1–75 years) with 4678 amputated digits in total; studies conducted in Brazil, China, Yugoslavia, Korea, United States, Japan, Singapore, Italy, and India	Cold ("ice") preservation	Compression bandage	Survival of replanted digit	Meta-analysis of survival rates suggested that cold preservation is associated with better replantation survival rates than emergency compression bandaging (OR 4.89, 95% CI [2.14, 11.20], P = 0.0002).	Gender and ischemia time had no significant influence on the survival rate of amputation replantation (P>0.05). Age, injured hand, injury type, zone, and the method of preservation the amputated digit significantly influence the survival rate of digital replantation (P<0.05).
Huawei,[246] 2015,China	3 studies included in meta-analysis of preservation technique and survival rate, total of 979 patients with 1755 amputated digits (no references provided in the review)	Storage in an ice bag	No storage in an ice bag	Survival rate of replanted fingers	Cold storage improves the survival rate; specific methods used to cool the amputated part in the included studies were not detailed.	Amputated digits stored in low temperature more likely to survive than that in common temperature (OR 4.89, 95% CI 2.14–11.20, p=0.0002) There was no significant association between ischemia time ≤12 hours and ≥12 hours and replantation survival rate (no skeletal muscle in finger).

OR indicates odds ratio.

Care for amputated body parts was found in guidelines from St. John Ambulance[249] and from several National Societies of the International Federation of Red Cross and Red Crescent.[250-252] The guidelines[250-252] describe wrapping the amputated part in moist gauze and placing it in a watertight container, which is then placed in another larger container with ice or a mixture of ice and water.

Task Force Insights

Following a traumatic amputation or avulsion, the priority is to care for the patient, including control of life-threatening bleeding. However, care of the amputated or avulsed part is sometimes overlooked or delayed. Our ScopRev found that in 9 out of 23 case reports, there was a delay in retrieving the amputated part due to the part being lost, intentionally discarded, or intentionally withheld in a hostage situation (Table 2).

More distal amputated parts (such as digits) without skeletal muscle appear to tolerate longer periods of ischemia without cold preservation (eg, up to 12 hours) while cold preservation appears to extend the tolerable ischemic time before successful replantation to 24 or more hours. Observational studies of major upper extremity amputations note successful replantation and function when cold preservation techniques were used, with extension of time to replantation to 12 hours versus 6 hours without cold preservation.

Guidelines identified provide a reasonable approach to providing cold but nonfreezing storage of amputated or avulsed body parts. Wrapping the part in gauze or cloth is intended to prevent freezing of the tissue. Moistening the cloth with saline or water is intended to prevent desiccation of exposed tissues. Some guidelines also suggest labeling the container holding the body part with the name of the person, time of injury, and time the amputated part was placed in cold storage.

Most evidence identified in this review appears to support the prehospital cold storage of amputated or avulsed body parts, when feasible, especially when transport of the part to a replantation center may be delayed or take up to 6 hours. A SysRev of this topic is planned.

Good Practice Statements (2025)

Success in replantation is time dependent; completely amputated and avulsed external body parts such as fingers, hands, arms, and legs should be retrieved and transported as soon as possible, preferably to the same health care facility as the injured person (good practice statement).

Replantation outcomes may be improved by cooling without freezing the amputated or avulsed part as soon as possible and throughout transportation to a health care facility. If feasible, this can be accomplished by wrapping the part in a moist clean cloth or gauze and sealing it in a watertight bag or container prior to cooling (good practice statement).

Task Force Knowledge Gaps

- The optimal techniques for the provision of cold storage or an amputated or avulsed body part in the first aid/out-of-hospital setting, including coolers and freezer packs, instant cold packs, cool water, battery-powered coolers, and their association with successful replantation
- Systematic collection and reporting of data on the methods of prehospital preservation by first aid providers and prehospital professionals specifically should be performed by both clinicians and researchers.

Exertion-Related Dehydration and Rehydration (FA 7241, FA 584, SysRev 2021)

During prolonged exercise, sweat losses generally exceed fluid intake, and even low levels of dehydration can lead to impaired physical and cognitive performance. In such situations, it is of utmost importance to promote postexercise drinking to restore fluid balance,[253]

yet there is no clear endorsement regarding the specific type of rehydrating fluid. Therefore, a SysRev[254,255] was undertaken on behalf of the FA Task Force and was included in the 2021 CoSTR summary.[158]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Adults and children with exertion-related dehydration
- Intervention: Drinking oral carbohydrate-electrolyte or alternative rehydrating liquids
- Comparator: Drinking water
- Outcomes: Volume/hydration status (measured as cumulative urine volume, net fluid balance, hematocrit, hemoglobin, plasma volume change), vital signs (measured as heart rate), development of hyponatremia (measured as serum sodium concentration, serum/plasma osmolality), need for advanced medical care, and patient satisfaction (measured as thirst perception, perceived intensity of stomach fullness, nausea, stomach upset, abdominal discomfort)
- Time frame: All years to February 21, 2021

Treatment Recommendations (2021)

We recommend the use of any readily available rehydration drink or water for treating exertion-related dehydration in the first aid setting (good practice statement).

We suggest rehydration for exertion-related dehydration with a 4% to 9% carbohydrate-electrolyte drink. Alternative rehydration options include 0% to 3.9% carbohydrate-electrolyte drinks, water, coconut water, or skim or low-fat cow's milk (weak recommendation, very low–certainty evidence).

There is insufficient evidence to recommend for or against rehydration with beer (0%–5% alcohol).

Methods of Tick Removal (FA 7231 SysRev 2021)

This topic was prioritized by the FA Task Force because of a lack of international consensus in guidelines for removal of an attached tick in the first aid setting and a lack of prior SysRevs of this topic by ILCOR. This CoSTR was created with the adolopment process[256] by using a recent SysRev.[257] Details of this review can be found in the 2021 CoSTR summary.[158]

Population, Intervention, Comparator, Outcome, and Time Frame

- Population: Individuals in the first aid setting with a tick attached to the skin
- Intervention: Any tick-removal method, including heat, chemical, commercial tick removal apparatus, or tweezers/forceps
- Comparator: Any other method of tick removal
- Outcome: Transmission of disease, removal of (parts of) the tick, damaged or broken-off mouth parts
- Time frame: 2017 (date of the adoloped SysRev) to February 14, 2021

Treatment Recommendations (2021)

We recommend against the use of chemicals, heat, or ice in comparison with mechanical methods for the removal of a tick (strong recommendation, very low–certainty evidence).

We suggest either pulling with tweezers or using commercial devices according to the manufacturer's instructions to remove a tick rather than removal by hand (weak recommendation, very low–certainty evidence).

Treatment of Jellyfish Stings (FA 7211, SysRev 2025)

Rationale for Review

This topic was prioritized by the FA Task Force based on the morbidity that jellyfish stings cause throughout the world. Jellyfish envenomation is common in coastal areas. While most jellyfish stings have localized effects only, stings by some species of jellyfish can cause systemic illness or death. In 2023, an updated Cochrane SysRev[258] on interventions for the treatment of jellyfish stings was published, and an ILCOR systematic reviewer was a member of the author team. That Cochrane review included randomized controlled trials only, and because of the very low certainty of the evidence, the authors concluded that the effectiveness of the treatments evaluated was uncertain. The FA Task Force undertook this review, including randomized and nonrandomized research, to identify a broader range of evidence and help in the formulation of treatment recommendations. The full CoSTR can be found online.[259]

Population, Intervention, Comparator, Outcome, Study Design, and Time Frame

- Population: Adults and children with a suspected jellyfish sting
- Intervention: Any pain-reducing or harm-minimizing technique (or combination of techniques) appropriate for first aid, such as vinegar, seawater, topical anesthetics, meat tenderizer, cold packs, urine, wet sand rubs, aloe, other commercial topical products (eg, Sting No More), or pressure bandaging with immobilization
- Comparator: Heat or cold treatment in any form appropriate for first aid (hot/cold water, hot rocks, hot packs, cold packs) or no treatment
- Outcomes: Pain reduction (yes/no or amount), time to pain reduction, survival, need for hospitalization, adverse effects/complications (hypothermia, burns, worsening of pain, anaphylaxis, Irukandji syndrome)

- Study designs: In addition to the standard criteria, unpublished scientific abstracts were eligible for inclusion.
- Time frame: All years to October 1, 2024

Consensus on Science

The 2023 Cochrane SysRev[258] included 9 studies[260-267] that were RCTs and quasi-RCTs. The current task force SysRev included the Cochrane data and identified 5 additional nonrandomized studies.[268-272] Evidence from all studies was of very low certainty and heterogenous, therefore no meta-analysis was possible. In the 2023 Cochrane SysRev, interventions were characterized into hot or cold treatments, topical treatments, and parenteral treatments. The overall evidence for all outcomes was of very low certainty and data were conflicting on the efficacy of heat and cold therapy. The RCT data suggested that heat (eg, hot water) may reduce pain when compared with cold after stings from *Physalia*. However, heat may not be superior to cold in reducing pain for the jellyfish *Carybdea alata* and *Chironex fleckeri*. Further, the RCT data did not find a significant difference in outcomes between different topical treatments (ie, application of seawater, fresh water, sting aid, Adolph's meat tenderizer, isopropyl alcohol, heated water, acetic acid, lidocaine, or sodium bicarbonate). The Cochrane authors concluded that because of the very low certainty of evidence, the effectiveness of any of the treatments evaluated in the review was uncertain. The Cochrane SysRev included a patient who sustained a first-degree burn following application of 10% ammonia.[258] The Cochrane SysRev did not report any cases of increasing pain or redness of skin after treatment with vinegar (5% acetic acid). This current task force SysRev identified 5 additional nonrandomized studies that reported the critical outcome of pain reduction. Details of study findings are provided in Table 5.

Table 5. Jellyfish Stings (FA 7211). Included studies for the critical outcome pain relief and adverse effects/complications

Outcome	Study, year	Finding
Pain reduction (relief): critical	McGee[258] 2023	Heat may reduce pain when compared to cold following stings from *Physalia* (at 1 hour RR 2.66, 95% CI 1.71–4.15; at 6 hours RR 2.25, 95% CI 1.42–3.56; at the end of treatment RR 1.63, 95% CI 0.81–3.27). However, heat may not reduce pain for the *Carybdea alata* and *Chironex fleckeri* (at 1 hour RR 1.16, 95% CI 0.71–1.89; at 6 hours RR 1.66, 95% CI 0.56–4.94; pain at the end of treatment RR 3.54, 95% CI 0.82–15.31). Topical application of seawater, fresh water, sting aid, Adolph's meat tenderizer, isopropyl alcohol, heated water, acetic acid, lidocaine, or sodium bicarbonate resulted in no significant difference in overall improvement between the different treatments.
	Lopez[268] 2000	Hot water demonstrated a benefit in pain reduction as participants receiving hot water immersion (110°F) had a relative risk of 1.600 (95% CI 0.9354–2.7367) for pain relief compared to those with ice pack therapy.
	Knudsen[269] 2016	Following treatment, VAS regarding pain for hot water immersion was 0.5 and for topical lidocaine 5% was 1.3 at 30 minutes ($p<0.05$).
	Yoshimoto[270] 2002	An odds ratio of 11.5 (95% CI 1.007–131.28) was found regarding pain relief for heat therapy (hot shower, hot pack, hot wet compress) application versus parenteral analgesics. An odds ratio of 22.0 (95% CI 1.40–378.90) was obtained for pain relief in heat application versus parenteral benzodiazepines.
	Birsa[271] 2010	Application of lidocaine concentrations of 10% and 15% produced immediate relief; 4% and 5% solutions produced relief after approximately 1 minute, while 1, 2, and 3% solutions required 10 to 20 minutes provide noticeable relief. Benzocaine provided some relief but took 10 or more minutes.
	Pyo[272] 2016	Sea salt water and 10% lidocaine provided pain relief and less erythema in *Nemopilema nomurai* stings. Pain and erythema were increased by treatment with topical application of 4% acetic acid, ethanol (70%) and isopropanol compared with sea salt water. In *Carybdea mora* stings, seawater and 10% lidocaine reduced pain and erythema. Ethanol (70%) and isopropanol increased pain and erythema compared with sea salt water.
Adverse effects/complications: important	McGee[258] 2023	Ammonia treatment resulted in a first-degree burn in 1 participant.
	Birsa[271] 2010	Areas of redness were observed after treatment with benzocaine. More areas of skin redness were observed after treatment 5% acetic acid, or ethanol (70%) than in control (no treatment).
	Pyo[272] 2016	Erythema developed with 4% acetic acid, ethanol (70%) and isopropanol following sting by *Nemopilema nomurai*. Erythema developed with ethanol (70%) and isopropanol following sting by *Carybdea mura* tentacles.

RR indicates relative risk, and VAS, visual analog scale.

In these studies, heat therapy provided benefit compared with ice pack therapy. Topical lidocaine also appeared beneficial compared with parenteral analgesics and benzodiazepines.[268-270] The use of seawater and topical lidocaine also provided pain relief and reduced erythema compared to no treatment.[271,272] Faster pain relief and fewer areas of redness on skin were achieved with higher concentrations of topical lidocaine compared with benzocaine.[271] In contrast, pain was increased by treatment with acetic acid, ethanol, or isopropanol compared with controls using sea salt water.[272]

Treatment Recommendations (2025)

Following a jellyfish sting, we recommend rinsing the area of the sting with seawater. (strong recommendation, very low–certainty evidence).

For non–life-threatening jellyfish envenomation, we suggest the use of heated water (40–45° C, 104–113° F) (immersion, irrigation or shower) or hot pack application compared with application of a cold pack, topical lidocaine, benzocaine, acetic acid, Adolph's meat tenderizer, sting aid, or sodium bicarbonate to relieve pain from a jellyfish sting (weak recommendation, very low–certainty evidence).

We recommend against the use of topical 10% ammonia, isopropanol, or ethanol for the treatment of jellyfish stings (weak recommendation, low-certainty evidence).

Justification and Evidence-to-Decision Framework Highlights

The complete evidence-to-decision table is provided in Appendix A.

In making these recommendations, the FA Task Force considered the following:

Seawater should be available at the setting where envenomation occurs and requires no additional cost. Seawater should preferentially be used to wash the area to remove remaining tentacles or nematocysts that are stuck to the skin.

While hot water appears to demonstrate a benefit in the non-RCTs compared with other treatments, access to hot water may not be feasible in many parts of the world. Hot water may also lead to skin burns if the temperature is too hot. In some locations, solar-heated water bags and instant hot packs are available at beach lifeguard stations for treatment of jellyfish stings. Fresh water may activate nematocysts remaining on the skin,[273] therefore it is preferred to rinse the area of the sting with seawater prior to application of hot fresh water.

The included studies used a water temperature range of 40°C to 45°C (104° to 113°F); 1 study used hot packs that were reported to be 43°C (109°F), and 1 study used a "hot shower" without reporting the water temperature. It may be most practical to use water as warm as the person can safely and comfortably tolerate.

In the Cochrane SysRev,[258] 1 study showed that ethanol resulted in increased pain following jellyfish stings compared with seawater while 2 other studies reported less reduction in pain with ethanol and isopropyl alcohol compared with seawater.

The efficacy of first aid treatment may depend on the species of jellyfish causing the envenomation and the benefit of heat therapy was evaluated in stings due to *Physalia, Cyanea capillata*, and *Marine cnidaria*. However, in many instances, it is not feasible for lay first aid providers to know the type of jellyfish, resulting in the envenoming before beginning treatment.

Task Force Knowledge Gaps

- Whether the effect of jellyfish sting treatments differs by species of jellyfish
- The effect of different jellyfish sting treatments on survival or need for hospitalization

Topics Not Included in the 2025 Review

The following topics have not been reviewed by a SysRev or ScopRev since 2020.

General Principles

- Optimal position for shock (FA 7131, FA 520, EvUp 2020[1])

First Aid for Medical Emergencies

- Supplemental oxygen for stroke (FA 7031, SysRev 2020[1])
- Bronchodilators for acute asthma exacerbation (FA 7121, FA 534, EvUp 2022[11])
- Oral dilution with milk or water for poisoning with caustic substance ingestion (FA 7421, FA 537, EvUp 2022[11])

First Aid for Trauma Emergencies

- Thermal injury dressing (FA 7251, FA 1545, ScopRev 2020[1])
- Open chest wound dressings (FA 7321, FA 525, EvUp 2022[11])
- Foreign body in eye (FA 7351, FA 1544, EvUp 2015[274])
- Single-stage scoring systems for concussion (FA 7341 FA 799, EvUp 2022[11])

First Aid for Environmental Emergencies

- Pressure Immobilization following snake bite (FA 7221, EvUp 2021[158])
- Heatstroke cooling (FA 7242, FA 1548, SysRev 2020[275], EvUp 2022[11])

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