

2023 Evidence Update Worksheet

Stroke Recognition

FA 7170 (FA 525)

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Task Force: First Aid

Date Submitted to SAC rep for peer review and approval:

SAC rep: E. Singletary

PICO / Research Question (FA 525):

Population: Among adults with suspected acute stroke

Intervention: use of a rapid stroke scoring system or scale

Comparators: Basic first aid assessment without the use of a scale

Outcomes:

- Change time to treatment (e.g. symptom onset to hospital/emergency department arrival or hospital admission) (Critical).
- Recognition of stroke (Important), high number considered beneficial for observational study 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: Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) are eligible for inclusion. Case series and case reports will also be considered for inclusion. As it is anticipated that there will be insufficient studies from which to draw a conclusion, the minimum number of cases for a case series to be included has been reduced for the default of 5 to 1 by the TFSR team.

Timeframe: All years and all languages are included as long as there is an English

Year of last full review: May 2020

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST (2020 CoSTR)

{Singletary 2020 A240; Singletary 2020 S284}:

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 FAST, MASS, CPSS or LAPSS 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 MASS or LAPSS, to increase specificity of stroke recognition (weak recommendation, low-certainty evidence).

For first aid, we suggest the use of FAST or CPSS stroke assessment scales/tools when blood glucose measurement is unavailable (weak recommendation, low-certainty evidence).

Current Search Strategy (for an existing PICOST) included in the attached approved PICOST

1. Pubmed: (Rerun Search strategy from May 26, 2020 to December 2, 2023)

Results: 460

(((((Stroke[MeSH Terms]) AND (acute[Title/Abstract])) OR (acute stroke*[Title/Abstract]) OR (acute cerebrovascular accident*[Title/Abstract])) AND ((scale*[Title/Abstract]) OR (score*[Title/Abstract]) OR (scoring[Title/Abstract])) AND ((Time-to-Treatment[MeSH Terms]) OR ("Time Factors" [MeSH Terms]) OR (time-to-treatment[Title/Abstract]) OR (recogn*[Title/Abstract]) OR (cognitive knowledge[Title/Abstract]) OR (neurologic outcome*[Title/Abstract]) OR (neurologic status[Title/Abstract]))) NOT (animals[mh] NOT humans[mh]) NOT ("letter"[pt] OR "comment"[pt] OR "editorial"[pt] or Case Reports[ptyp])) AND (2020/5/26:2023/9/30[pdat]))

2. Cochrane: (Rerun Search strategy from may 26, 2020 to December 2, 2023)

Results: 89

No.	Query	Results
#1	[mh Stroke]	15092
#2	acute:ab,ti	159023
#3	#1 AND #2	4463
#4	(acute near/3 stroke*):ab,ti	11167
#5	"acute cerebrovascular accident":ab,ti	15
#6	#3 OR #4 OR #5	12315
#7	scale*:ab,ti	235261
#8	score*:ab,ti	330369
#9	scoring:ab,ti	14764
#10	#7 OR #8 OR #9	450452
#11	[mh Time-to-Treatment]	562
#12	[mh "Time Factors"]	73026
#13	"time-to-treatment":ab,ti	2320
#14	recogn*:ab,ti	23020
#15	"cognitive knowledge":ab,ti	41
#16	"neurologic outcome":ab,ti	368
#17	"neurologic status":ab,ti	157
#18	#11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17	98328
#19	#6 AND #10 AND #18	496
#20	#6 AND #10 AND #18 with Cochrane Library publication date Between May 2020 and Oct 2023	89

3. Embase: (Rerun Search strategy from May 26, 2020 to December 2, 2023)

Results: 504

No.	Query	Results
#27	#25 NOT #26	504
#26	([editorial]/lim OR [letter]/lim OR 'case report'/de) AND [embase]/lim	3822445
#25	#23 NOT #24	550
#24	'animal'/exp NOT 'human'/exp AND [embase]/lim	4308285
#23	#7 AND #13 AND #22	555
#22	#14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21	197261
#21	'neurologic status':ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	452
#20	'neurologic outcomes':ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	799
#19	'neurologic outcome':ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	794

#18	'cognitive knowledge':ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	45
#17	recogn*:ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	180775
#16	'time to treatment':ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	2582
#15	'time factors'/de AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	4561
#14	'time to treatment'/de AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	9978
#13	#8 OR #9 OR #10 OR #11 OR #12	726630
#12	scoring:ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	36924
#11	score*:ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	501690
#10	scale*:ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	312973
#9	'rating scale'/de AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	12221
#8	'scoring system'/de AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	65806
#7	#3 OR #4 OR #5 OR #6	31559
#6	'acute cerebrovascular accidents':ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	49
#5	'acute cerebrovascular accident':ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	160
#4	((acute NEAR/3 stroke*):ab,ti) AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	20402
#3	#1 AND #2	19730
#2	acute:ab,ti AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	393857
#1	'cerebrovascular accident'/de AND [embase]/lim AND [25-05-2020]/sd NOT [30-09-2023]/sd	83553

Database searched: PubMed, Embase, Cochrane library

Time Frame: (existing PICOST) – updated from end of last search : May 26, 2021 – December 2, 2023

Time Frame: (new PICOST) – at the discretion of the Task Force (please specify): Not applicable.

Date Search Completed: December 2, 2023

Search Results (Number of articles identified and number identified as relevant):

PubMed: n=460

EMBASE: n=504

COCHRANE LIBRARY: n=89

OTHER SOURCES: n=1

Total result before de-duping: 1054

Total results after de-duping: 862

Number of relevant articles identified: 6

Search Results: PRISMA diagram:

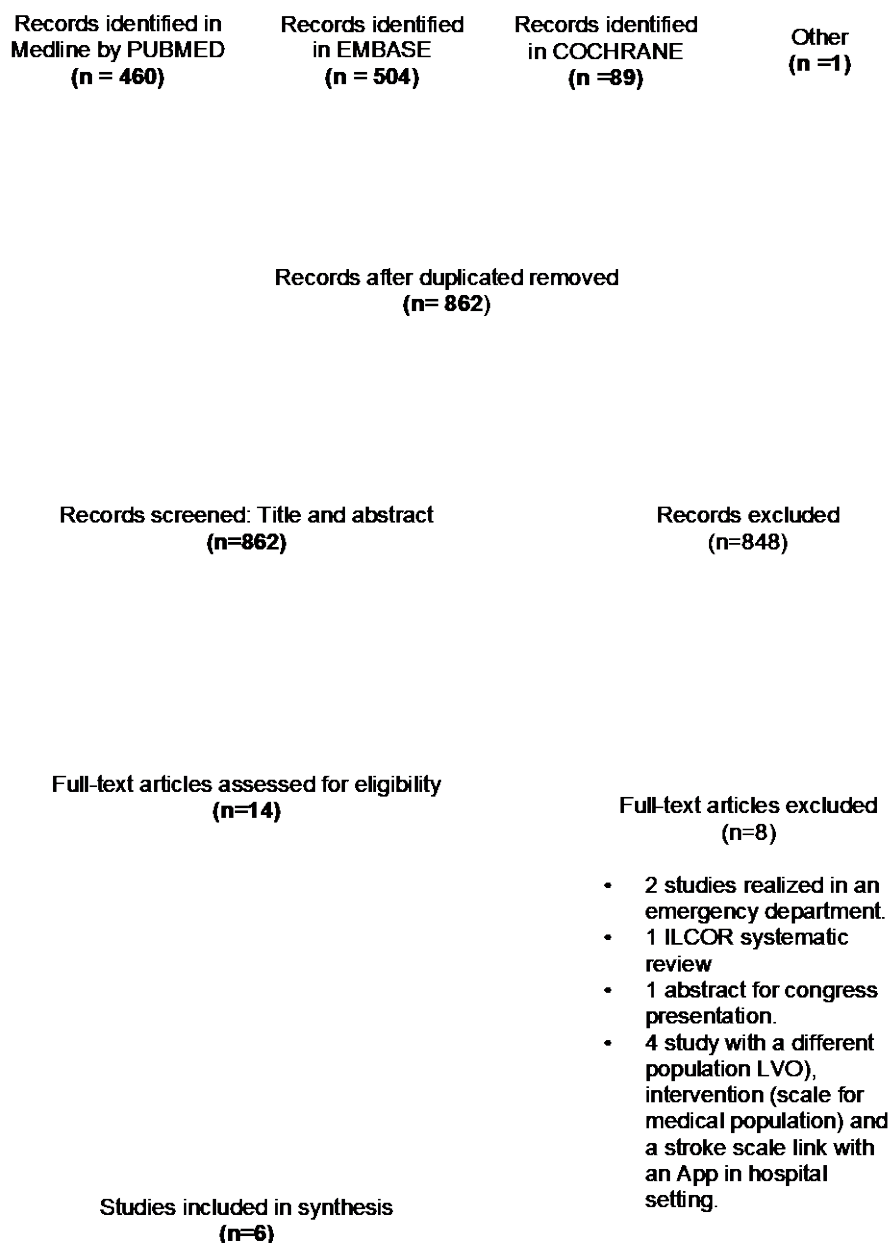


FIGURE 1: PRISMA diagram (diagram illustrating the flow of articles throughout the selection procedures).

Abbreviations : PRISMA Preferred reporting items for systematic reviews and meta-analyses.

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097. For more information, visit www.prisma-statement.org.

Inclusion/Exclusion Criteria:

	Inclusion	Exclusion
Population	Adults with suspected acute stroke.	Trauma unless the trauma was secondary to the occurrence of a stroke-induced fall Large vessel occlusion Child and children
Intervention	Use of a rapid stroke scoring system or scale (or test) (as FAST, LAPDS, CPSS, OPSS, KPSS, LAMS, MPDS, MASS, RACE or other).	<ul style="list-style-type: none"> - stroke scale usable by dispatch centers providers - stroke scale usable by physicians, stroke physician, neurologist, general practitioner in any setting. - Stroke scale usable in an emergency department or in-hospital - Stroke scale retrospectively calculated by a neurologist or a physician with pre-hospital EMS data. - Scoring systems designed to detect Large Vessel Occlusion. These scales are intended for use by more advanced prehospital care providers to help triage of these patients to stroke centers capable of performing thrombectomy or thrombolysis. This scoring systems are beyond the capability of most first aid or lay providers.
Comparison	Standard first aid assessment (without the use of a scale).	<ul style="list-style-type: none"> - scale with an app use, - Stroke scale made by phone by the dispatcher or physician.
Outcome	<ul style="list-style-type: none"> - change time to treatment (eg door to balloon), - recognition of stroke, - discharge with favorable neurologic status, - cognitive knowledge, - survival with favorable neurologic outcome. 	<ul style="list-style-type: none"> - Change time to treatment: measure by on-scene EMS time. - Recognition of acute stroke: non-medical diagnosis of stroke or diagnosis of stroke without precision or without documented hospital.

Characteristics of prehospital stroke recognition scales from 2020 systematic review {Meyran 2020}

Assessment	FAST	CPSS	OPSS	KPSS	ROSIER	MASS	Med PACS	LAPSS	PreHAST	FASTER	BEFAST
Number of physical examination items	3	3	4	5	5	4	5	3	8	5	5
Facial droop	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Arm weakness/drift	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Leg weakness/drift			Yes	Yes	Yes		Yes		Yes		
Hand grip strength						Yes		Yes			
Stability										Yes	
Speech difficulty	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Eye position, gaze preference							Yes		Yes		
Visual field					Yes				Yes	Yes	
Eye diplopia											Yes
Sensory (pain)									Yes		
Balance coordination											Yes
Command, verbal instruction									Yes ¹		
Denial/Neglect											
Consciousness disturbance				Yes							
Level of consciousness				Yes							
Score range	0-3	0-3	0-4	0-13	-2 to 5	0-4	0-5	0-3	0-19	0-5	0-5
Eligibility criteria	Yes ²		Yes ³		Yes ⁴	Yes ⁵	Yes ⁶	Yes ⁷	Yes ⁸	Yes ⁹	Yes
Blood glucose measurement			Yes		Yes	Yes	Yes	Yes		Yes	

Abbreviations : BEFAST Balance Eyes Face Arm Speech Time on call; CPSS Cincinnati Prehospital Stroke Scale; FAST Face Arm Speech Time; FASTER Face, Arm, Speech, Time, Emergency Response; KPSS Kurashiki Prehospital Stroke Scale; LAPSS Los Angeles Prehospital Stroke Scale; MASS Melbourne Ambulance Stroke Screen; MedPACS Medic Prehospital Assessment for Code Stroke; OPSS Ontario PreHospital Stroke Scale; PreHAST PreHospital Ambulance Stroke Test; ROSIER Recognition of Stroke in the Emergency Room.

1. Verbal instruction and sensory, Close your eyes! Grip your hand! (n-paretic side); 2. GCS<7 or suspected head injury exclusion original paper; 3. seizure at onset, can be transported to arrive within two hours of onset, time since symptom onset < two hours, GCS < 10, blood glucose > 4 mmol/L, symptoms of the stroke have resolved; 4. Blood glucose > 3.5 mmol/L, history of seizure; 5. history of seizure, time since symptom onset < 24 hours, at baseline, patient is not wheelchair bound or bedridden, age > 45 years, blood glucose 2.8 to 22.2 mmol/L; 6. history of seizure, time since symptom onset < 24 hours, at baseline, patient is not wheelchair bound or bedridden, blood glucose 3.3 to 22.2 mmol/L; 7. history of seizure, at baseline, patient is not wheelchair bound or bedridden, blood glucose 2.8 to 22.2 mmol/L, age limit = 40 years; 8. Age > 18 years, intended for use, only in conscious people, i.e. alert or aroused by stimulation; 9. Time of onset less than two hours, blood glucose measurement inside the range of 4-17mmol/L.

Summary of Evidence Update:

For this evidence update about use of a stroke scale to improve recognition of stroke by lay persons and first aid providers in a prehospital setting, we identified:

- Two systematic reviews {Budinčević 2022 1541; Chen 2021 765069}.
- Four diagnostic studies {Baratloo 2023 58; Brisette 2023 403; Gude 2022 541; Saberian 2021 453}.

Summary of the selected studies

Systematic reviews

- 1- In 2022, **Budinčević** conduct a narrative review to provide an overview of commonly used stroke scales in emergency, clinical prehospital and hospital settings, and research {Budinčević 2022 1541}. In the pre-hospital setting and for the first aid setting, the authors indicated that FAST is the most

communally use stroke scale, but, although it is very useful for anterior circulation strokes, it can miss over 70% of patients with posterior circulation strokes {Budinčević 2022 1541}. For improved diagnosis of posterior circulation strokes, the authors propose adding assessment of balance (B) and eye (E) symptoms to FAST (BE-FAST) or using another modification of FAST that includes eye deviation and anosognosia/neglect (FAST-ED).

- 2- In 2021, **Chen** conducted a systematic review and meta-analysis to evaluate and compare the predictive value of Face, Arm, Speech, Time (FAST) and Balance, Eyes, Face, Arm, Speech, Time (BEFAST) scale in the acute ischemic stroke (AIS) {Chen 2021 765069}. 9 studies (7 prospective cohort, 2 cross-sectional), including 6,151 participants, were analysed. The results showed that the FAST scale had higher sensitivity (0.77, 95% CI, 0.64-0.86) than BEFAST (0.68, 95% CI, 0.23-0.93) in detecting AIS. By contrast, BEFAST had a higher specificity (0.85, 95% CI, 0.72-0.92) than FAST (0.60, 95% CI, 0.38-0.78). The diagnostic value of BEFAST (2.44) in AIS was higher than FAST (1.57). Previous studies found that 14% of patients with AIS would be missed using FAST alone, and this proportion was reduced to 4.4% with the addition of a history of gait and visual symptoms (BEFAST). This systematic review included studies in a prehospital and hospital setting. There was moderate heterogeneity across studies; meta-regression and subgroup analysis fail output due to the limited BEFAST data. Another limitation was that few included studies did not explicitly exclude participants. The quality of all prospective and cross-sectional studies was moderate. The review concluded that FAST, as well as BEFAST, might be useful in the diagnosis of AIS, but AIS could not be confirmed nor excluded by the sole use of FAST or BEFAST. Because the diagnostic value of BEFAST in AIS was higher than FAST, it might have an important role in the rapid recognition of AIS. Future prospective studies are needed to ascertain the diagnostic value of FAST and BEFAST in the anterior and posterior circulation.

Observational studies

- 1- Between June 2015 and December 2019, **Brisette** conducted five FAST public awareness campaigns in a large urban area of Quebec, Canada (Laval and Montreal) and assessed the association of these consecutive campaigns with EMS calls for suspected stroke {Brisette 2023 403}. After five FAST public awareness campaigns, mean daily EMS calls increased by 28% ($p < 0.001$) for any suspected stroke and by 61% ($p < 0.001$) for stroke with symptom onset < 5 hours, compared to 10.1% for headaches ($p = 0.012$) (negative control). Significant increases in daily EMS calls were observed after three campaigns (highest OR=1.26; 95% CI: 1.11, 1.43; $p < 0.001$). There were no significant changes in calls after individual campaigns for suspected stroke with symptom onset < 5 hours, or suspected stroke with CPSS 3/3. These results may help us to identify potential benefits and limitations to stroke public awareness campaigns using a public stroke scale as FAST acronyms and modify them in future iterations to improve their impact.
- 2- In June 2021 **Saberian** published a Multicenter Diagnostic Accuracy Study on 8 Prehospital Stroke Screening Scales (CPSS, LAPSS, MASS, Med-PACS, OPSS, PreHAST, ROSIER, FAST) {Saberian 2021 453}. All data were gathered through a pre-prepared checklist, using the clinical records of the patients. 805 patients were analysed and 562 (69.8%) had an AIS (gold standard: MRI). Based on the findings of the study, highly sensitive tests that can be used in this regard are CPSS, FAST, and Med PACS, all of which have about 95% sensitivity. On the other hand, none of the studied tools has a high specificity (specificity above 95%) in any of the examined cut-offs. So, to define a criterion for ruling out the diagnosis of stroke in the ED with a clinical rule, the authors state it may be necessary to perform more analysis and consider designing a new scoring system for this purpose.
- 3- In September 2022, **Baratloo** conducted a cross-sectional diagnostic accuracy study of prehospital clinical stroke diagnosis tools {Baratloo 2023 58}. This study follows on from Saberian's and aims to develop a new clinical tool for the diagnosis of AIS in the prehospital stage. All patients transferred to the ED who underwent brain MRI with the impression of AIS was evaluated by 9 clinical tools for stroke

diagnosis in the pre-hospital phase (RACE, CPSS, LAPSS, MASS, Med-PACS, OPSS, PreHAST, ROSIER, FAST). Nineteen items from those scales were reviewed and recorded. The new clinical tool was developed based on the backward method of multivariable logistic regression analysis. It was composed of 8 items: sensory-pain, head and gaze deviation, unilateral arm/leg weakness or drift, visual field, speech disturbance, asymmetric facial weakness, age > 55 years and include blood glucose level. Eight hundred and six patients were analysed, The AUC-ROC of the new clinical tool was 0.893 (95% CI: 0.869-0.917), and its best cut-off point was scoring ≥ 3 for positive AIS. At this cut-off point, sensitivity and specificity were 84.42% and 79.72%, respectively. However, it now remains to assess this new tool in the field.

- 4- In a prospective validation study, **Gude** investigated the performance of a two part of the Prehospital Stroke score (PreSS) performed by emergency medical service providers for screening and subsequent severity assessment combined with a stroke neurologist telephone conference {Gude 2022 541}. PreSS part 1 is designed to identify stroke or TIA in a prehospital setting. PreSS part 2 is a stroke severity scale designed to identify large vessel occlusion (LVO) (table 1). PreSS part 1 alone identified stroke/TIA with a Se of 93.7%, a Sp of 22.6%, an AUC of 0.69. The combined PreSS part 1 and teleconference identified stroke/TIA with a Se of 89.3%, a Sp of 64.5% an AUC of 0.80. Regarding LVO, PreSS part 1 with teleconference recognized 96.7% of all cases as stroke. PreSS part 2 had a sensitivity of 55.7%, specificity of 91.5%, and AUC of 0.86 for identification of LVO. The author identified PreSS as a simple stroke scale use in a prehospital setting with a good performance which can be increased when it is add with a neurologist teleconference.

Table 1: The two-part Prehospital Stroke Scale (PreSS). PreSS part 1 is positive if total score ≥ 1 point, PreSS part 2 is only use if part 1 is positive. PreSS part 2 is positive if total score is 2 or 3 points.

PreSS part 1 (prehospital setting)	If present
Arm drift	1 point
Speech impairment	1 point
Fascial droop	1 point
Other: leg weakness, sensory changes, ataxia, visual field defects, diplopia	1 point
PreSS part 2 (for LVO only)	If present
Arm drift (re-use from part 1)	1 point
Inability to specify current age or month	1 point
Head and/or eye deviation	1 point

In conclusion:

We found **two systematic reviews**.

- A narrative review without data which proposes to improve FAST by adding assess balance (B) and eye (E) symptoms (BE-FAST) or eye deviation and anosognosia/neglect (FAST-ED) {Budinčević 2022 1541}.
- A systematic review and meta-analysis which evaluate and compare FAST with BEFAST {Chen 2021 765069}. FAST had higher sensitivity than BEFAST, while BEFAST had a higher Specificity than FAST. The diagnostic value of BEFAST in AIS was higher than with FAST.

We have identified **four observational studies**.

For Intervention studies

We did not identify any comparative studies evaluating stroke recognition for the outcomes: “**Time to treatment**”, “**recognition of stroke**”, “**favorable neurologic status**” or “**survival with favorable neurologic outcome**”.

For outcome of “**increased public/layperson recognition of stroke signs**”, we found one observational study which assessed the effect of five FAST consecutive campaigns on EMS calls for suspected stroke (Brissette et al. 2023). Many campaigns are necessary to significantly increased daily EMS calls for any suspected stroke and for stroke with symptom onset <5 hours.

For Diagnostic studies

For the outcome of **recognition of stroke** (diagnostic studies, outcome defined as correct stroke diagnosis), we found **three new studies**.

- The first one assesses eight Prehospital Stroke Screening Scales (CPSS, LAPSS, MASS, Med-PACS, OPSS, PreHAST, ROSIER, FAST) in a prehospital setting {Saberian 2021 453}. CPSS, FAST, and Med PACS are high sensitivity tests with more than 95%. But none of the studied tools has a high specificity above 95% in any of the examined cut-offs.
- The second article proposes to create a new clinical tool composed of 8 items including blood glucose measurement and the performance of this new scale must be assessed in the field {Baratloo 2023 58}.
- The third article is an investigation into the performance a Prehospital Stroke Score (PreSS) performed by an emergency medical technician combined with a stroke neurologist telephone conference {Gude 2022 541}. In a prehospital setting, the accuracy of PreSS is similar to other stroke scales but it can be increased to identify stroke/TIA when it is included with a neurologist teleconference.

Title, Location and link to selected articles:

Title	First Authors (year)	Location	Link
Stroke Scales as Assessment Tools in Emergency Settings: A Narrative Review	Budinčević H (2022)	Zagreb, Croatia	https://www.mdpi.com/1648-9144/58/11/1541 https://pubmed.ncbi.nlm.nih.gov/36363498/
A Systematic Review and Meta-Analysis Comparing FAST and BEFAST in Acute Stroke Patients	Chen, X. (2022)	Basel, Switzerland	https://doi.org/10.3389/fneur.2021.765069 https://pubmed.ncbi.nlm.nih.gov/35153975/
A Multicenter Diagnostic Accuracy Study on Prehospital Stroke Screening Scales	Saberian P. (2022)	Tehran, Iran	https://pubmed.ncbi.nlm.nih.gov/34488307/ https://doi.org/10.34172/aim.2021.65
Impact of bilingual face, arm, speech, time (FAST) public awareness campaigns on emergency medical services (EMS) activation in a large Canadian metropolitan area	Brissette V (2023)	Quebec, Canada	https://link.springer.com/article/10.1007/s43678-023-00482-6 https://pubmed.ncbi.nlm.nih.gov/37010730/
A nomogram-based clinical tool for acute ischemic stroke screening in prehospital setting	Baratloo A. (2023)	Tehran, Iran	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10444598/ https://doi.org/10.18502/cjn.v22i1.12618
The Prehospital Stroke Score and telephone conference: A prospective validation.	Gude, M. F (2022)	Aarhus, Denmark	https://onlinelibrary.wiley.com/doi/10.1111/ane.13580 https://pubmed.ncbi.nlm.nih.gov/35023151/

Relevant Guidelines or Systematic Reviews

Organization (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations or conclusion
Bundicevic 2022 {Budinčević 2022 1541}	Narrative systematic review	Provide an overview of commonly used stroke scales in emergency, clinical prehospital and hospital settings, and research	39 articles cited	The most commonly used scale in a prehospital setting for stroke recognition is the Face, Arms, Speech, Time (FAST) test. Among many prehospital stroke scales, the Los Angeles Prehospital Stroke Screen (LAPSS) has the highest sensitivity and specificity for confirming stroke diagnosis. The National Institutes of Health Stroke Scale (NIHSS) is the most recommended tool for the evaluation of stroke patients in hospital settings and research, and it has two variants: the shortened NIHSS for Emergency Medical Service and the modified NIHSS. The evaluation of comatose patients usually involves assessment with the Glasgow Coma Scale, which is very useful in patients with hemorrhagic stroke or traumatic brain injury. In patients with subarachnoid hemorrhage, the outcome is usually assessed with the Hunt and Hess scale	Stroke rating scales are useful tools in everyday clinical practice and research. Despite their limitations, specific scales are used either as stroke recognition tools or as a quantification tool for measuring severity, disability, outcome, or other aspects of stroke. The currently preferred scales are: (1) FAST, for prehospital settings and stroke recognition by the public, and (2) the NIHSS and mRS for clinical in-hospital evaluation and research purposes.
Chen 2021 {Chen 2021 765069}	Systematic review and meta-analysis	Study Aim: aimed to explore the diagnostic value of the FAST and BEFAST for AIS patients; a quantitative reference for clinical practice was provided. Population: Acute ischemic stroke Intervention: FAST Comparison: BEFAST	9 articles: 7 prospective cohort & 2 cross-sectional	For FAST Se: 0.77 [95% CI (0.64–0.86)], Sp: 0.60 [95% CI (0.38–0.78)], AUC: 0.76, DOR: 1.57. For BEFAST Se: 0.68 [95% CI (0.23–0.93)], Sp: 0.85 [95% CI (0.72–0.92)], t AUC: 0.86, DOR: 2.44. For FAST, meta-regression analysis showed that prospective	FAST, as well as BEFAST, might be useful in the diagnosis of AIS. AIS could neither be confirmed nor excluded by the sole use of FAST or BEFAST. The diagnostic value of BEFAST in AIS was higher than FAST; thus, it might have an important role in the fast recognition of AIS. Nonetheless, it still remains unclear whether it could be applied for screening of all patients with stroke in the prehospital setting or in hospital, or whether the test characteristics of the FAST and BEFAST scales could be separately assessed for posterior and anterior

		Outcomes: Diagnosis accuracy		design, satisfactory description of the index test, and a broad spectrum of disease contributed to the heterogeneity in sensitivity, while no sources contributed to the heterogeneity in specificity.	circulation. Future prospective studies are needed to explore the diagnostic value of FAST and BEFAST in the anterior and posterior circulation, respectively, so as to improve the recognition rate of stroke, promote timely intervention, and reduce the burden on families and society.
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Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Aim/Study Type/Design/Location/Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
Gude 2021 {Gude 2022 541}	Study Aim: investigate the performance of a two-part stroke scale for screening and subsequent severity assessment combined with a telephone conference (teleconference). Study Type: Prospective observational study Design; Study Diagnostic study Location: Aarhus, Denmark Size (N) N = 792	Population: all patients Intervention: PreSS score Target population: Patient with stroke suspicion Reference standard: Neuro imaging (MRI, CT, angiography) & follow up of patient without imaging Outcomes: Diagnosis accuracy Inclusion Criteria: All patients with a complete PreSS score in prehospital setting (EMS provider) 6 Month period (June 21, 2018 to December 20, 2018) Exclusion Criteria: PreSS not completed	1° endpoint: PreSS part 1 alone for stroke/TIA Se ; 93.7%(95% CI 90.8-95.9), Sp: 22.6%(95% CI 18.6-27), PPV: 53.4%(95% CI 49.6-57.3), NPV : 79.1%(95% CI 70.6-86.1), AUC : 0.69(95% CI 0.66-0.73), +LR : 1.21 (95% CI 1.14-1.28) -LR: 0.278 (95% CI 0.181-0.427). PreSS part 1 with teleconference for stroke/TIA Se: 89.3%(95% CI 85.7-92.2), Sp: 64.5%(95% CI 59.3-69.5), PPV: 73.0%(95% CI 6 8.7-77), NPV: 84.8%(95% CI 80-88.9), AUC: 0.80 (95% CI 0.77-0.83), +LR: 2.52 (95% CI 2.18-2.91) -LR: 0.166 (95% CI 0.123-0.224).	The overall performance of PreSS is high considering the unselected inclusion of putative stroke patients in our study and the low pre-test probability of both stroke/TIA (48.6%) and LVO (9.2%). The broad inclusion makes the results generalizable to other stroke care settings. The high performance of PreSS and teleconference makes it possible to direct just above half of patients with LVO- to EVT-capable CSC and to admit nearly all of the remaining patients with LVO at the nearest stroke center (PSC or CSC). This can be achieved while ensuring that only few patients, with a non-LVO stroke, have a longer transport to CSC which could potentially delay thrombolysis.
Brissette 2023 {Brissette 2023 403}	Study aim: Assess the association of bilingual English and French FAST/VITE stroke awareness campaigns with EMS call volumes for suspected strokes.	Population: public of EMS agency Intervention: Five FAST campaign	1° endpoint: There is a positive linear trend in EMS calls during the observation period (2015-2019) for any stroke and stroke <5h, but a weak negative	There is an inconsistent impact of individual FAST campaigns on EMS calls for any suspected stroke and did not observe significant EMS call changes after individual campaigns for acute (<5h) and severe (CPSS 3/3) strokes. These results may help stakeholders identify potential

Study Acronym; Author; Year Published	Study Aim/Study Type/Design/Location/Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
	2015 to 2019 Laval and Montreal (Quebec, Canada). Study design single-group, univariate interrupted time-series Location: Quebec, Canada Study size	EMS call for headache are negative control Outcomes: Daily EMS call in the period for: - Any suspected stroke, - stroke with symptoms < 5 hours, - Suspected stroke with CPSS 3/3	trend in calls for CPSS 3/3 stroke. There is a significant increase in mean daily EMS calls between the pre-intervention and post-intervention periods reaching 28.0% for any stroke and 61.0% for stroke <5h. There is a 15% increase in daily EMS calls for any stroke after campaign 1, a 26% increase after campaign 3 and a 15% increase after campaign 4. There is no significant changes in daily EMS calls after each individual FAST campaign for stroke <5h, CPSS 3/3 stroke or headache	benefits and limitations of public awareness campaigns using the FAST acronym.
Saberian 2021 {Saberian 2021 453}	Study aim: Examine the accuracy of eight clinical scales in terms of stroke diagnosis. Study design Multicenter Diagnostic Accuracy Study (Cross-sectional study) Location: Tehran, Iran Study size: N=805	Population: All patients who were referred to the ED and underwent a brain MRI for a suspicious stroke Intervention: one of 8 prehospital stroke scale (CPSS, LAPSS, MASS, Med-PACS, OPSS, PreHAST, ROSIER, FAST) Standard reference : MRI Outcomes: Diagnosis accuracy, Se, Sp, +LR, -LR, PPV, PNV, prevalence. Exclusion Criteria: History of head trauma, previous stroke, known neurological disease or previous neurological surgery, and those who had left the ED against medical advice before undergoing brain	Of all the registered patients, 562 (69.8%) had an AIS. Rosier: Se 95.0 (92.9, 96.7); Sp: 60.1(53.6, 66.3) ; Accuracy 84.4%(81.9, 87.0). LAPSS: Se 71.9 (68.0, 75.6); Sp 82.8(77.5, 87.3); Accuracy 75.2% (72.2, 78.2). FAST: Se: 94.8 (92.7, 96.5); Sp 55.1(48.7, 61.5) ; Accuracy 82.9%(80.3, 86.5). CPSS: Se 95.0 (92.9, 96.7); Sp 54.3(47.8, 60.7); Accuracy 82.7%(80.1, 85.4) Med PACS: Se 95.7 (93.7, 97.2); Sp 50.6(44.2, 57.1) ; Accuracy: 82.1%(79.5, 84.8). OPSS: Se 80.8 (77.3, 84.0); Sp 59.5(53.0, 65.7) ; Accuracy 74.4% (71.4, 77.4). PreHAST: Se 93.2 (90.8, 95.2); Sp 46.5(40.1, 53.0) ; Accuracy 79.1% (76.3, 81.9). MASS: Se 86.73 (83.6, 89.5); Sp 61.8(55.0,	Based on the findings, highly sensitive tests that can be used in this regard are CPSS, FAST, and Med PACS, all of which have about 95% sensitivity. On the other hand, none of the studied tools were desirable (specificity above 95%) in any of the examined cut-offs. LAPSS as the highest specificity.

Study Acronym; Author; Year Published	Study Aim/Study Type/Design/Location/Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
		MRI were excluded.	68.3) ; Accuracy 79.6% (76.8, 82.5). (all data in table 3 in the article)	
Baratloo 2023 {Baratloo 2023 58}	<p>Study aim: develop a new clinical tool for the diagnosis of AIS in the prehospital stage.</p> <p>Study design Multicenter Diagnostic Accuracy Study (Cross-sectional study)</p> <p>Location: Tehran, Iran</p> <p>Study size: N=805</p>	<p>Population: All patients who were referred to the ED and underwent a brain MRI for a suspicious stroke</p> <p>Intervention: one of 9 prehospital stroke scale (RACE, CPSS, LAPSS, MASS, Med-PACS, OPSS, PreHAST, ROSIER, FAST)</p> <p>Standard reference: MRI</p> <p>Outcomes: Diagnosis accuracy, Se, Sp, +LR, -LR, PPV, PNV, prevalence.</p> <p>Exclusion Criteria: History of head trauma, previous stroke, known neurological disease or previous neurological surgery, and those who had left the ED against medical advice before undergoing brain MRI were excluded.</p>	<p>Stronger criteria for predicting diagnosis of AIS univariate analysis:</p> <ul style="list-style-type: none"> - “sensory (pain) perception only on one side vs. normal” [odds ratio (OR) = 38.57], - “head and gaze deviation” (OR = 28.01), - “unilateral arm/leg weakness or drift” (OR = 13.12), - “arm drift or weakness/hand grip” (OR = 11.60), - “leg weakness/drift” (OR = 11.11). <p>Stronger criteria for predicting diagnosis of AIS in the multivariable model, 8 criteria were remained, of which</p> <ul style="list-style-type: none"> - “head and gaze deviation” (OR = 10.40), - “sensory (pain) perception only on one side vs. normal” (OR = 8.81), - “blood glucose between 50 and 400 mg/dl” (OR = 9.73) <p>New tool AUC-ROC : 0.893 (95% CI : 0.869-0.917) Cut-off point ≥ 3 for positive AIS: Se 84.42%, Sp 79.72%.</p>	<p>The new nomogram-based clinical tool for the diagnosis of AIS in the prehospital stage, had acceptable specificity and sensitivity, and is comparable with previous tools.</p> <p>It is highly expected that level of knowledge and experience of the EMTs is one of the most important effective factors and preparing calculators on their cellphones or notebooks would be helpful.</p>

Reviewer Comments (including whether to meet criteria for a formal review):

Results from the new articles found during this evidence update do not modify the conclusions of our last systematic review or the treatment recommendations from the 2020 CoSTR.{Singletary 2020 S284; Singletary 2020 A240}. None of the new studies of established stroke scoring systems, or of new stroke scoring systems, offer any novelty in terms of public recognition of stroke by lay public or first aid providers in a prehospital setting.

We did not find intervention (scale versus no scale) studies that assess “Time to treatment”, “recognition of stroke”, “favorable neurologic status” or “survival with favorable neurologic outcomes”. The majority of the articles found are diagnostic studies that assessed the accuracy of stroke scales in a hospital and prehospital setting. Nevertheless, we have found one educational study that assesses the effect of a stroke scale awareness campaign for the lay public. It's not enough to create a score; you also need to know how to effectively disseminate its use to the lay public. This opens up a theme for future research.

All the studies included in the 2020 CoSTR {Singletary 2020 S284; Singletary 2020 A240} as well as those selected for this update were carried out in high-income countries. The working group wonders how effective it might be to identify the signs of stroke in low- and middle-income countries, and their importance in improving patient outcomes.

The working group reminds us that a stroke scale designed for the prehospital setting must have a lower number of diagnostic criteria, easy-to-identify clinical signs and simplicity of implementation, making them applicable for use by first aid providers and lay persons. It is also important to specify that for lay provider use, a stroke scale that has high sensitivity for identifying stroke is preferable, while for other trained prehospital care providers and those with the ability to check glucose levels, the stroke assessment scales that are more specific and include blood glucose measurement are suggested. Nevertheless, FAST is the currently preferred scale for prehospital settings and for stroke recognition by the public.

An update of systematic review is not currently indicated.

The previous 2020 treatment recommendations remain unchanged:

“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 FAST, MASS, CPSS or LAPSS 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 MASS or LAPSS, to increase specificity of stroke recognition (weak recommendation, low-certainty evidence).

For first aid, we suggest the use of FAST or CPSS stroke assessment scales/tools when blood glucose measurement is unavailable (weak recommendation, low-certainty evidence).”

Reference list

Baratloo A, Ramezani M, Rafiemanesh H, Sharifi M, Karimi S. A nomogram-based clinical tool for acute ischemic stroke screening in prehospital setting. *Curr. J. Neurol.* 2023;22(1):58–62. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10444598/>

Brissette V, Rioux B, Choisi T, Poppe AY. Impact of bilingual face, arm, speech, time (FAST) public awareness campaigns on emergency medical services (EMS) activation in a large Canadian metropolitan area. *Can. J. Emerg. Med.* [Internet]. 2023;25(5):403–10. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/37010730>

Budinčević H, Meštrović A, Demarin V. Stroke Scales as Assessment Tools in Emergency Settings: A Narrative Review. *Medicina* [Internet]. 2022;58(11):1541. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/36363498>

Chen X, Zhao X, Xu F, Guo M, Yang Y, Zhong L, et al. A Systematic Review and Meta-Analysis Comparing FAST and BEFAST in Acute Stroke Patients. *Front. Neurol.* [Internet]. 2021;12:765069. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/35153975>

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Meyran D, Cassan P, Avau B, Singletary E, Zideman DA. Stroke Recognition for First Aid Providers: A Systematic Review and Meta-Analysis. *Cureus* [Internet]. 2020;12:e11386. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/33312787>

Saberian P, Rafiemanesh H, Heydari F, Mirbaha S, Karimi S, Baratloo A. A Multicenter Diagnostic Accuracy Study on Prehospital Stroke Screening Scales. *Arch. Iran. Med.* 2021;24(6):453–60. Available from: <https://pubmed.ncbi.nlm.nih.gov/34488307/>

Singletary EM, Zideman DA, Bendall JC, Berry DA, Borra V, Carlson JN, et al. 2020 International Consensus on First Aid Science With Treatment Recommendations. *Resuscitation.* 2020a;156:A240–82. Available from: <https://pubmed.ncbi.nlm.nih.gov/33098920/>

Singletary EM, Zideman DA, Bendall JC, Berry DC, Borra V, Carlson JN, et al. 2020 International Consensus on First Aid Science With Treatment Recommendations. *Circulation.* 2020b;142(16_suppl_1):S284–334. Available from: <https://pubmed.ncbi.nlm.nih.gov/33084394/>

Evidence Update Worksheet

FA 7031 Oxygen for Acute Stroke

FA 7031

Worksheet author(s): Wei-Tien Chang, Kevin Kai-Wei Lin, Matthew J. Douma, Eunice M. Singletary, Therese Djärv

Task Force: First Aid Task Force

Date Submitted to SAC rep for peer review and approval: 28 November 2023

SAC rep: Jestin N. Carlson

PICOST / Research Question: (Attach SAC representative approved completed PICOST template)

Among adults (aged ≥ 18 years) with suspected acute stroke (P), does use of supplementary oxygen (I), compared with no use of supplementary oxygen (C), change outcome (O)?

Year of last full review: (insert year where this PICOST was most recently reviewed)

2021

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST:

Treatment Recommendation

For adults with suspected acute stroke, we suggest against the routine use of supplementary oxygen in the first aid setting compared with no use of supplementary oxygen (weak recommendation, low to moderate certainty of evidence)

Current Search Strategy (for an existing PICOST) included in the attached approved PICOST

Cochrane

- #1 MeSH descriptor: [Stroke] explode all trees
- #2 MeSH descriptor: [Brain Ischemia] explode all trees
- #3 MeSH descriptor: [Intracranial Hemorrhages] explode all trees
- #4 ((Infarct* or hemorrhag* or haemorrhag* or stroke*) near/2 (ischemic or ischaemic or brain or cerebral or cerebrovascular or intracerebral or Intracranial or Subarachnoid or Lacunar)):ti,ab,kw
- #5 ((acute cerebrovascular accident*) or (cerebral vascular accident)):ti,ab,kw
- #6 ((hemorrhag* or haemorrhag* or acute) near/1 stroke*):ti,ab,kw
- #7 ((transient ischemic attack*) or (transient ischaemic attack*)):ti,ab,kw
- #8 #1 or #2 or #3 or #4 or #5 or #6 or #7
- #9 MeSH descriptor: [Oxygen Inhalation Therapy] explode all trees
- #10 MeSH descriptor: [Hyperoxia] explode all trees
- #11 MeSH descriptor: [Oxygenators] explode all trees
- #12 MeSH descriptor: [Hypoxia] explode all trees
- #13 MeSH descriptor: [Oxygen] explode all trees
- #14 (Oxygen* near/1 (diffusion or supplement* or mask* or cannula or administration* or therap* or nocturnal or treatment or continuous)):ti,ab,kw
- #15 (eubaric hyperoxia)
- #16 (normobaric near/1 (oxygen or hyperoxia or therap* or treatment)):ti,ab,kw
- #17 #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16
- #18 #8 and #17
- #19 (Hyperbaric oxygen):ti
- #20 (Hyperbaric Oxygenation):ti
- #21 #19 or #20
- #22 #18 not #21
- #23 MeSH descriptor: [Child] explode all trees
- #24 MeSH descriptor: [Infant] explode all trees
- #25 #23 or #24
- #26 #22 not #25
- #27 #22 not #25 with Cochrane Library publication date Between Sep 2021 and Oct 2023, in Trials

Embase

#1 'cerebrovascular accident'/exp OR 'lacunar stroke'/exp OR 'brain ischemia'/exp OR 'transient ischemic attack'/exp OR 'brain hemorrhage'/exp
 #2 ((infarct* OR hemorrhag* OR haemorrhag* OR stroke*) NEAR/2 (ischemic OR ischaemic OR brain OR cerebral OR cerebrovascular OR intracerebral OR intracranial OR subarachnoid OR lacunar)):ti,ab,kw
 #3 'acute cerebrovascular accident*':ti,ab,kw OR 'cerebral vascular accident':ti,ab,kw OR 'cerebrovascular accident'/exp
 #4 ((haemorrhage* OR hemorrhage* OR acute) NEAR/2 stroke*):ti,ab,kw
 #5 'transient ischemic attack*':ti,ab,kw OR 'transient ischaemic attack*':ti,ab,kw
 #6 #1 OR #2 OR #3 OR #4 OR #5
 #7 'oxygen therapy'/exp OR 'hyperoxia'/exp OR 'oxygenator'/exp OR 'hypoxia'/exp OR 'brain hypoxia'/exp OR 'oxygen'/exp OR 'oxygen concentration'/exp OR 'oxygenation'/exp
 #8 (oxygen* NEAR/1 (diffusion OR supplement* OR mask* OR cannula OR administration* OR therap* OR nocturnal OR treatment OR continuous)):ti,ab,kw
 #9 'eubaric hyperoxia':ti,ab,kw
 #10 (normobaric NEAR/1 (oxygen OR therapy* OR hyperoxia OR treatment)):ti,ab,kw
 #11 #7 OR #8 OR #9 OR #10
 #12 'hyperbaric oxygen':ti,ab,kw OR 'hyperbaric oxygenation':ti,ab,kw
 #13 #6 AND #11
 #14 #13 NOT #12
 #15 #14 AND [01-01-1946]/sd NOT [01-11-2023]/sd
 #16 #14 AND [01-01-1946]/sd NOT [01-11-2023]/sd AND [animals]/lim
 #17 #14 AND [01-01-1946]/sd NOT [01-11-2023]/sd AND [animal experiment]/lim
 #18 #14 AND [01-01-1946]/sd NOT [01-11-2023]/sd AND [humans]/lim
 #19 #15 NOT ((#16 OR #17) NOT #18)
 #20 #19 AND ([adult]/lim OR [aged]/lim OR [middle aged]/lim OR [very elderly]/lim OR [young adult]/lim)
 #21 #19 AND ([adult]/lim OR [aged]/lim OR [middle aged]/lim OR [very elderly]/lim OR [young adult]/lim) NOT ([cochrane review]/lim OR [systematic review]/lim OR [meta analysis]/lim OR 'case report'/de OR 'conference abstract'/it OR 'conference paper'/it OR 'conference review'/it OR 'editorial'/it OR 'letter'/it OR 'review'/it OR 'case study')

Pubmed

1 #38 not #39
 2 #38 not #39
 3 "Review Literature as Topic"[Mesh]
 4 #29 not #36
 5 #26 not (#27 not #28)
 6 #26 not (#27 not #28)
 7 "Humans"[Mesh]
 8 "Animals"[Mesh]
 9 #22 not ((#23 or #24) not #25)
 10 "Adult"[Mesh]
 11 "Infant"[Mesh]
 12 "Child"[Mesh]
 13 #18 not #21
 14 #19 or #20
 15 Hyperbaric Oxygenation[Title]
 16 Hyperbaric oxygen[Title]
 17 #8 and #17
 18 #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16
 19 (normobaric and (oxygen or hyperoxia or therap* or treatment))
 20 eubaric hyperoxia
 21 (Oxygen*[Title/Abstract] AND (diffusion[Title/Abstract] OR supplement*[Title/Abstract] OR mask*[Title/Abstract] OR cannula[Title/Abstract] OR administration*[Title/Abstract] OR therap*[Title/Abstract] OR nocturnal[Title/Abstract] OR treatment[Title/Abstract] OR continuous[Title/Abstract]))
 22 "Oxygen"[Mesh]
 23 "Hypoxia"[Mesh]
 24 "Oxygenators"[Mesh]
 25 "Hyperoxia"[Mesh]

26 "Oxygen Inhalation Therapy"[Mesh]
 27 #1 or #2 or #3 or #4 or #5 or #6 or #7
 28 (transient ischemic attack*[Title/Abstract]) or (transient ischaemic attack*[Title/Abstract])
 29 ((hemorrhag*[Title/Abstract] OR haemorrhag*[Title/Abstract] OR acute[Title/Abstract]) and stroke*[Title/Abstract])
 36 ((acute cerebrovascular accident*[Title/Abstract]) OR (cerebral vascular accident[Title/Abstract]))
 38 ((Infarct*[Title/Abstract] OR hemorrhag*[Title/Abstract] OR haemorrhag*[Title/Abstract] OR stroke*[Title/Abstract]) AND
 (ischemic[Title/Abstract] OR ischaemic[Title/Abstract] OR brain[Title/Abstract] OR cerebral[Title/Abstract] OR
 cerebrovascular[Title/Abstract] OR intracerebral[Title/Abstract] OR intracranial[Title/Abstract] OR subarachnoid[Title/Abstract] OR
 lacunar[Title/Abstract]))
 39 "Intracranial Hemorrhages"[Mesh]
 40 "Brain Ischemia"[Mesh]
 41 "Stroke"[Mesh]

New Search strategy: (for a new PICOST should be outlined here as per Evidence Update Process): Not applicable

Database searched:

Pubmed, Embase, Cochrane

Time Frame: (existing PICOST) – updated from end of last search (please specify)

2021.09.16-2023.10.31

Time Frame: (new PICOST) – at the discretion of the Task Force (please specify)

Date Search Completed:

2023.11.02.

Search Results (Number of articles identified and number identified as relevant):

Number of articles identified: 1921

Number of articles finally evaluated: 9

Number of relevant articles: 2

Summary of Evidence Update: 2023.11.22.

Relevant Guidelines or Systematic Reviews

Organization (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
J Clin Med; Scudellari A; 2023	Ventilation Targets for Patients Undergoing Mechanical Thrombectomy for Acute Ischemic Stroke: A Systematic Review	Correlation between arterial oxygenation and carbon dioxide partial pressure targets and neurological outcomes in patients undergoing mechanical thrombectomy for acute ischemic stroke	5	Despite encouraging findings in initial pilot studies, large-scale prospective trials have not demonstrated improved functional outcomes	It seems reasonable to administer additional oxygen only if a patient's SpO2 falls below 94%, taking caution to titrate the PaO2 levels carefully to prevent both hypoxemia and excessive hyperoxemia

RCT:

Study Acronym; Author; Year Published	Aim of Study; Study Type; Study Size (N)	Patient Population	Study Intervention (# patients) / Study Comparator (# patients)	Endpoint Results (Absolute Event Rates, P value; OR or RR; & 95% CI)	Relevant 2° Endpoint (if any); Study Limitations; Adverse Events
Normobaric Hyperoxia Combined with Endovascular Treatment for Patients with Acute Ischemic Stroke: A Randomized Controlled Clinical Trial; W. Li; 2022	Study Aim: Safety and efficacy of normobaric hyperoxia (NBO) combined with endovascular treatment (EVT) in patients with acute ischemic stroke (AIS) Study Type: RCT Study Size: N=86	patients with AIS in the acute anterior circulation with large vessel occlusion who had an indication for EVT	Intervention: 100% oxygen through a face mask initiated before vascular recanalization (10L/min for 4 hours) Comparison: room air	The median infarction volume of the NBO + EVT group at 24–48 hours after randomization was significantly smaller than that of the EVT group (median 20.1 vs 37.7 mL, $p < 0.01$). The median mRS score at 90 days was 2 for the NBO + EVT group when compared with 3 for the EVT group (adjusted value 1.8, 95% CI 1.3–4.2; $p =$ 0.038),	Study Limitations: Small sample size Adverse effect Compared with the EVT group, the NBO + EVT group had a lower incidence of symptomatic intracranial hemorrhagic (7% vs 12%), mortality (9% vs 16%), and adverse events (33% vs 42%); however, such a difference was not statistically significant.

Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
Efficacy and safety of normobaric hyperoxia (NBO) combined with intravenous thrombolysis on acute ischemic stroke patients; N. Li; 2021	Study Type: Single-center observational cohort study Study size: n=227	Inclusion Criteria: 1. Diagnosed with acute ischemic stroke in anterior circulation 2. Age 18–80 years within 4.5 h after the stroke onset 3. National Institutes of Health Stroke Scale (NIHSS) score 4–25	1° endpoint: 90-day function independence (mRS 0-2): 80.8% in the NBO group vs. 61.8% in the control group ($p = 0.002$) 2° endpoint: 90-day excellent outcome (mRS<2): 71.2% in the NBO group vs. 46.1% in the control group ($p < 0.001$) NIHSS score at 24h post thrombolysis: 3.7 ± 3.6 in NBO group vs. 3.5 ± 3.8 in control group ($p =$ 0.08) NIHSS score at 7 days post thrombolysis: 3.0 ± 3.7 in the NBO group vs. 3.5 ± 3.8 in the control group ($p = 0.32$) Infarct volume (cm ³) at 24 h:	Conclusion NBO+IVT was independently associated with 90-day functional independence Study Limitations: 1. Observational cohort study 2. Absence of baseline DWI volume, perfusion volume, and information on collaterals 3. Single-center study

			11.2 (2.1-2.8) in NBO group vs. 13.3 (2.5-62.7) in the control group (p = 0.006)	
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mRS: modified rankin scale

Reviewer Comments: (including whether this PICOST should have a systematic or scoping review)

With new papers with positive results included in this latest evidence update, an update to the systematic review is suggested.

Reference list: (List by ILCOR ref standard (last name first author, year of publication, first page number) and insert hyperlink to all articles identified as relevant (if available on PubMed))

1. Scudellari A, et al. (2023) Ventilation targets for patients undergoing mechanical thrombectomy for acute ischemic stroke: A systematic review. *J Clin Med* 12(15):4925. doi: 10.3390/jcm12154925. PMID: 37568327; PMCID: PMC10420130.
2. Li, W., et al. (2022) Normobaric hyperoxia combined with endovascular treatment for patients with acute ischemic stroke: A randomized controlled clinical trial. *Neurology* 99(8):e824. <https://doi.org/10.1212/WNL.0000000000200775>
3. Li, N., et al. (2021) Efficacy and safety of normobaric hyperoxia combined with intravenous thrombolysis on acute ischemic stroke patients. *Neurol Res* 43(10):809. <https://doi.org/10.1080/01616412.2021.1939234>

Evidence Update Worksheet

Dental Avulsion

FA 794

Worksheet author(s): Amy Kule

Task Force: First Aid

Date Submitted to SAC rep for peer review and approval: 2 Nov 2023

SAC rep: Therese Djärv

PICOST / Research Question: *(Attach SAC representative approved completed PICOST template)*

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.

Comparators: Storage in whole milk or the patient's saliva.

Outcomes: Success of replantation and tooth survival or viability (critical outcomes). Color of the tooth, infection rate, malfunction (eating, speech) and pain (important outcomes).

Study Designs: Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) are eligible for inclusion.

Timeframe: All years and all languages were included as long as there was an English abstract; unpublished studies (e.g., conference abstracts, trial protocols) were excluded. Literature search updated to September 2, 2019.

PROSPERO Registration: CRD42020152903

Year of last full review: 2020

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST:

We suggest the use of Hank's Balanced Salt solution (HBSS), 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.

Current Search Strategy: *(for an existing PICOST) included in the attached approved PICOST for using these in the publication please just insert the search strategy here and delete the text about the approved PICOST*

((("Tooth Injuries"[Mesh] OR "Tooth Replantation"[Mesh] OR ((tooth[TIAB] OR teeth[TIAB] OR denta*[TIAB] OR dento*[TIAB] OR "Periodontal Ligament"[Mesh] OR "periodontal ligament"[TIAB]) AND (avuls*[TIAB] OR replant*[TIAB]))) AND ("Tissue Preservation"[Mesh] OR stor*[TIAB] OR preserv*[TIAB] OR transport*[TIAB] OR "Organ Preservation Solutions"[Mesh] OR "Saliva"[Mesh] OR saliva[TIAB] OR "Sodium Chloride"[Mesh] OR saline[TIAB] OR "Milk"[Mesh] OR milk[TIAB] OR "Water"[Mesh] OR water[TIAB] OR solution*[TIAB] OR propolis[TIAB] OR "Propolis"[Mesh] OR tea [TIAB] OR "Tea"[Mesh] OR (egg[TIAB] AND (white[TIAB] OR raw[TIAB] or albumen[TIAB] OR glair[TIAB] OR glaire[TIAB])) OR "Egg White"[Mesh] OR ice[TIAB] OR "Ice"[Mesh] OR "Sodium Fluoride"[Mesh] OR "sodium fluoride"[TIAB] OR ((cling[TIAB] OR plastic[TIAB] OR stretch[TIAB]) AND (wrap[TIAB] OR film[TIAB] OR foil[TIAB])) OR bag[TIAB] OR container[TIAB] OR box[TIAB])) NOT ("Letter"[Publication Type] OR "Comment"[Publication Type] OR "Editorial"[Publication Type] OR "Case Reports"[Publication Type] OR News[Publication Type])) AND (("2019/07/01"[Date - Publication] : "2023/07/01"[Date -

Publication]]))

New Search strategy: Not applicable

Database searched: Pubmed

Time Frame: (existing PICOST) – July 1, 2019 – July 1, 2023

Time Frame: (new PICOST) – Not applicable

Date Search Completed: June 1, 2023

Search Results (Number of articles identified/number identified as relevant): 142/8

Updated Search Completed: December 2, 2023

Search Results (Number of articles identified/number identified as relevant): 36/0

Summary of Evidence Update:

For this evidence update, 4 systematic reviews or guideline documents were identified, all which were related to the 2020 CoSTR on this topic. Results from one meta-analysis were found to be in line with the 2020 CoSTR. For the 1 new RCT, it was found that in general PDFL viability was better at the cooler temperature for all storage media, except HBSS. Milk was the most effective, followed by propolis and HBSS at 5C, but at 20C, HBSS was the most effective, followed by milk. Results from each of the observational studies suggested that propolis, as well as cow and almond milk can be alternative storage mediums.

Organization (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
ILCOR Singletary 2020	2020 International consensus on First Aid Science with Treatment Recommendations (Circulation)	Storage of an Avulsed Permanent Tooth Before Replantation 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 Comparators: Storage in whole milk or the patient's saliva Outcomes: Success of replantation and	33	Media favored over cow's milk to store an avulsed tooth: -HBSS -Propolis -Oral rehydration salts/Ricetral -Cling film -Rice water Cow's milk favored over the following media to store an avulsed tooth: -Tap water -Buttermilk -Castor oil -Turmeric extract -Saline solution -GC tooth mousse Equal efficacy to cow's milk: -Probiotic media -Saliva -Egg white -Epigallocatechin-3-gallate -Dentosafe box	We suggest the use of HBSS; propolis (from 0.04 mg to 2.5 mg per mL of 0.4% ethanol); oral rehydration salt solutions including Ricetral (a commercial form of 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 these choices are available, we suggest the use of cow's milk (with any percent fat or form) compared with tap water, buttermilk, castor oil, turmeric extract, or saline (0.9% sodium chloride) for temporary storage of an avulsed tooth (weak recommendation, very low-certainty evidence).

		<p>tooth survival or viability (critical outcomes); color of the tooth, infection rate, malfunction (eating, speech), and pain (important outcomes)</p> <p>Study design: RCTs and nonrandomized studies (non-RCTs, interrupted time series, controlled before-and-after studies, cohort studies) were eligible for inclusion.</p> <p>Time frame: All years and all languages were included as long as there was an English abstract; unpublished studies (eg, conference abstracts, trial protocols) were excluded.</p> <p>Literature search was updated to September 2, 2019.</p>		<p>Equal efficacy to saliva: -Saline solution -Dentosafe box</p>	<p>There is insufficient evidence to recommend for or against temporary storage of an avulsed tooth in the person's own saliva compared with alternative solutions.</p> <p>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.</p>
ILCOR Singletary 2020	2020 International consensus on First Aid Science with Treatment Recommendations (Resuscitation)	<p>Storage of an Avulsed Permanent Tooth Before Replantation</p> <ul style="list-style-type: none"> • Population: Adults and children in any setting (in-hospital or out-of-hospital) with an 	33	<p>The following media showed greater tooth cell viability compared with milk during storage:</p> <ul style="list-style-type: none"> -HBSS -Saliva and thereafter HBSS -Propolis -Oral rehydration salt solution -Rice water 	<p>We suggest the use of HBSS; propolis (from 0.04mg to 2.5mg/mL of 0.4% ethanol); oral rehydration salt solutions including Ricetral (a commercial form of 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</p>

		<p>avulsed permanent tooth</p> <ul style="list-style-type: none"> • Intervention: Any storage media, container, or technique • Comparator: Storage in whole milk or the patient's saliva • Outcome: Success of replantation and tooth survival or viability (critical outcomes); color of the tooth, infection rate, malfunction (eating, speech), and pain (important outcomes) • Study design: RCTs and nonrandomized studies (non-RCTs, interrupted time series, controlled before-and-after studies, cohort studies) were eligible for inclusion. • Time frame: All years and all languages were included as long as there was an English abstract; unpublished studies (eg, conference abstracts, trial protocols) were excluded. <p>Literature search was</p>		<p>-Cling film</p>	<p>avulsed tooth that cannot be immediately replanted (weak recommendation, very low-certainty evidence).</p> <p>If none of these choices are available, we suggest the use of cow's milk (with any percent fat or form) compared with tap water, buttermilk, castor oil, turmeric extract, or saline (0.9% sodium chloride) for temporary storage of an avulsed tooth (weak recommendation, very low-certainty evidence).</p> <p>There is insufficient evidence to recommend for or against temporary storage of an avulsed tooth in the person's own saliva compared with alternative solutions.</p> <p>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.</p>
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		updated to September 2, 2019.			
ERC Zideman 2021	European Resuscitation Council Guidelines 2021: First aid	Dental Avulsion			<p>1. If the casualty is bleeding from the avulsed tooth socket:</p> <ul style="list-style-type: none"> _ Put on disposable gloves prior to assisting the victim _ Rinse out the casualty's mouth with cold, clean water _ Control bleeding by: <ul style="list-style-type: none"> *Pressing a damp compress against the open tooth socket *Tell the casualty to bite on the damp compress *Do not do this if there is a high chance that the injured person will swallow the compress (for example, a small child, an agitated person or a person with impaired consciousness). <p>2. If it is not possible to immediately replant the avulsed tooth at the place of accident:</p> <ul style="list-style-type: none"> *Seek help from a specialist *Take the casualty and the avulsed tooth to seek expert help from a specialist. <p>3. Only touch an avulsed tooth at the crown. Do not touch the root</p> <p>4. Rinse a visibly contaminated avulsed tooth for a maximum of 10 seconds with saline solution or under running tap water prior to transportation.</p> <p>5. To transport the tooth:</p> <ul style="list-style-type: none"> *Wrap the tooth in cling film or store the tooth temporarily in a small container with Hank's Balanced Salt solution (HBSS), propolis or Oral Rehydration Salt (ORS) solution *If none of the above are available, store the tooth in

					cow's milk (any form or fat percentage) *Avoid the use of tap water, buttermilk or saline (sodium chloride).
ILCOR De Brier 2020	Storage of an avulsed tooth prior to replantation: A systematic review and meta-analysis	<p>Population: Included: adults and children with an avulsed or extracted permanent tooth. There were no restrictions on causes of tooth avulsion or tooth extraction, treatments (mouthwash, medication use, or pulp extirpation), and types of replantation procedures. Excluded: studies using cultured cells of the PDL or extracted animal teeth.</p> <p>• Intervention: Included: all solutions, containers, and techniques which can be used to store an avulsed or extracted tooth (following dry storage) and which are available to laypeople. Excluded: solely dry storage of the avulsed or extracted tooth and all solutions or techniques unavailable to laypeople such as cell culture</p>	33	<p>Among the 23 comparisons evaluating the effect of storage on the viability of avulsed or extracted teeth, six showed positive effects on the viability of the PDL cells compared with storage in milk. In addition, six storage interventions had a less beneficial impact on the preservation of cell viability than milk and two interventions suffered from conflicting evidence. Finally, for the other nine comparisons, there was evidence neither in favor of the intervention nor in favor of the control. Several storage techniques were associated with improved preservation of tooth or cell viability. It was reported that storing an avulsed tooth in (saliva and thereafter) HBSS, ORS, propolis solutions, cling film, and rice water resulted in a</p>	<p>If there is access to special storage media such as HBSS or diluted propolis solutions, the evidence supports their use compared with other interventions evaluated in this review. While propolis solutions might be available in African households, most (rural areas) of low- and middle-income countries will have no or limited access to commercial products such as rescue boxes or Tooth Mousse. Cling film may be a simple and readily available choice in many households and has a very limited cost. In Europe and Africa, ORS is available in first aid kits and therefore easily applicable in all settings. Also, evidence-based African first aid recommendations have already taken into account that ORS can be prepared based on local ingredients and, hence, its use might be recommended for storing an avulsed tooth in rural and remote regions.</p> <p>If none of the above choices are available, cow's milk, in any percentage fat or form, could be considered for temporary storage of an avulsed tooth.</p>

		<p>media (eg, Dulbecco's modified Eagle's medium and Ham's F-10).</p> <ul style="list-style-type: none"> • Comparison: Included: patient's saliva and cow's milk with varying fat content. Excluded: other milk types (eg, goat milk, probiotic milk, and buttermilk). Of note, these other milk types were included as intervention solutions for storing an avulsed or extracted tooth. • Outcome: Included: infection rate, tooth survival or viability, pain, malfunction (eating and speech), color of the tooth, and success of replantation. Excluded: financial costs. • Study design: Included: (a) the studies of a systematic review if the search strategy and selection criteria were clearly described and if at least three electronic databases were searched; (b) experimental studies: (quasi- or non-) 		<p>significantly higher PDL cell viability rate compared with storage in milk (Table 3).</p> <ul style="list-style-type: none"> • Milk was shown to extend the periodontal ligament cell viability before replantation compared with saline or tap water. • Hank's balanced salt solution, propolis, oral rehydration salts, rice water, and cling film have also demonstrated efficacy at preserving the cell viability. • There is insufficient evidence to recommend for or against temporary storage of an avulsed tooth in saliva compared with alternative solutions. 	
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		<p>randomized controlled trial (RCT), controlled before and after studies, or controlled interrupted time series; and (c) observational studies: cohort and case-control studies, controlled before and after studies, and controlled interrupted time series. Excluded: cross-sectional studies, case series, qualitative studies, conference abstracts, and PhD theses.</p> <ul style="list-style-type: none"> • Other: No language criteria were used as long as an English abstract was provided. The review did not report on data from studies reporting only means, but no SDs, effect sizes, and P-values. 			
Zhang 2021	Network Meta-Analysis of 10 Storage Mediums for Preserving Avulsed Teeth	Storage mediums for preserving avulsed teeth	20	Direct meta-analysis suggested that HBSS was superior to ORS, milk, saline, and water, ORS was superior to milk but inferior to coconut water and propolis, egg white was superior to milk but inferior to AVG and propolis, propolis was	Concluded that propolis may be the preferred storage media for storing avulsed teeth for the purpose of preserving the viability of PDL cells before replantation when it is available to actual settings. However, given the availability of propolis and HBSS in real settings of occurring traumatic injuries and the hypotonic properties of saline solution, ORS or milk should also be

				<p>superior to AVG, milk, and saline, and coconut water and water was inferior to saline and milk, respectively. Network meta-analysis suggested that AVG was inferior to the other nine mediums, and propolis was superior to HBSS (SMD, -5260.24; 95% CrI, -10447.39 to -70.37) and milk (SMD, -5461.11; 95% CrI, -10574.99 to -328.51). Moreover, ranking probabilities indicated the highest probability for propolis, followed by saline, ORS, HBSS, milk, egg white, water, green tea, and AVG successively. Propolis may be the optimal media for storing avulsed teeth before replantation. However, given the availability of propolis and HBSS and the hypotonic properties of saline, ORS or milk should also be preferentially selected.</p>	preferentially selected to store an avulsed tooth as a media.
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RCT:

Study Acronym; Author; Year Published	Aim of Study; Study Type; Study Size (N)	Patient Population	Study Intervention (# patients) / Study Comparator (# patients)	Endpoint Results (Absolute Event Rates, P value; OR or RR; & 95% CI)	Relevant 2° Endpoint (if any); Study Limitations; Adverse Events
Souza 2020	Study Aim:	Inclusion Criteria:	Intervention:	1° endpoint:	Study Limitations:

Effects of several storage media on viability and proliferation capacity of periodontal ligament cells	<p>To investigate the PDFL cells viability after 24 h of contact with skimmed milk (SMilk), whole milk (WMilk), balanced salt solution Hank (HBSS), Save-A-Tooth (Save), Propolis, egg white (Egg), and natural coconut water (Coconut), at 5 C and 20C.</p> <p>Study Type: experimental</p> <p>Study Size: N=12 96-well culture plates</p>	Incubated human periodontal ligament fibroblasts (PDFL) cells	<p>PDFL cell viability when stored in medium at 5 C (N=6 plates)</p> <p>Comparison: PDFL cell viability when stored in medium at 20 C (N=6 plates)</p>	<p>PDFL cells viability in various storage media after incubation at 5 C and 20 C</p> <p>Milk and HBSS were more effective in maintaining cellular viability and proliferation capacity than any other storage media. In general, the lowest temperature favored the effectiveness of all storage media, except for HBSS.</p> <p>At 5C, the most viable alternative was milk, but effectiveness of propolis and HBSS were similar (p=1.000).</p> <p>At 20C, HBSS had better results, followed by SMilk and WMilk.</p>	Laboratory limitations
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Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
<p>Bunwanna 2020</p> <p>Preservation of the viability and gene expression of human periodontal ligament cells by Thai propolis extract</p>	<p>Study Type: Observational study; N=99</p>	<p>Inclusion Criteria: Human premolars from 18-24 year olds in Thailand.</p>	<p>-Thai propolis -HBSS -Milk</p> <p>Each for 3h, 6h, 12h (N=9)</p> <p>Thai propolis extract at 0.625 mg mL⁻¹ was chosen for the storage medium for the second experiment</p> <p>Average percentage of PDL cell viability after the teeth were left to dry for 30 minutes and stored in Thai propolis extract at 0.625 mg mL⁻¹, HBSS and milk at 3, 6 and 12 hours showed no significant difference</p>	<p>Suggests propolis as an alternative tooth storage medium for up to 12 hours.</p>

<p>Sinpreechanon 2019</p> <p>Comparative evaluation of periodontal ligament fibroblasts stored in different types of milk: effects on viability and biosynthesis of collagen</p>	<p>Study Type:</p> <p>Observational study; N=96</p>	<p>Inclusion Criteria:</p> <p>PDLFs isolated from healthy premolars that had been atraumatically extracted for orthodontic purposes</p>	<p>1° endpoint:</p> <p>Viability of PDLFs after simulated tooth avulsion followed by incubation in different types of storage media for 1 h</p> <p>In whole milk and low-fat milk, viability of PDLFs was 87.8% and 90.4%, respectively, which was almost as high as that of the DMEM control (100%).</p> <p>There were no significant differences between the three milk groups.</p> <p>The lowest number of viable PDLFs (63.4%) was observed in the cells stored in HBSS, which was significantly lower than the number of viable PDLFs in the DMEM control, whole milk, and low-fat milk ($P < 0.001$, $P < 0.01$, and $P < 0.01$, respectively).</p>	<p>Results support low fat cow's milk and almond milk as alternative storage medium.</p>
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Reviewer Comments: (including whether this PICOST should have a systematic or scoping review)

As the findings from the 1 RCT and 2 observational studies were found to be consistent with the previous results, an updated systematic review is not indicated and the existing 2020 treatment recommendations remain valid.

Reference list: (List by ILCOR ref standard (last name first author, year of publication, first page number) and insert hyperlink to all articles identified as relevant (if available on PubMed))

1. Bunwanna 2021, 123.

<https://pubmed.ncbi.nlm.nih.gov/33185962/>

Bunwanna A, Damrongrungruang T, Puasiri S, Kantrong N, Chailertvanitkul P. Preservation of the viability and gene expression of human periodontal ligament cells by Thai propolis extract. Dent Traumatol. 2021 Feb;37(1):123-130. doi: 10.1111/edt.12612. Epub 2020 Dec 5. PMID: 33185962.

2. De Brier 2020, 453.

<https://pubmed.ncbi.nlm.nih.gov/32344468/>

De Brier N, O D, Borra V, Singletary EM, Zideman DA, De Buck E; International Liaison Committee on Resuscitation First Aid Task Force. Storage of an avulsed tooth prior to replantation: A systematic review and meta-analysis. Dent Traumatol. 2020 Oct;36(5):453-476. doi: 10.1111/edt.12564. Epub 2020 Jun 15. PMID: 32344468.

3. Singletary 2020, S284.

<https://pubmed.ncbi.nlm.nih.gov/33084394/>

Singletary EM, Zideman DA, Bendall JC, Berry DC, Borra V, Carlson JN, Cassan P, Chang WT, Charlton NP, Djärv T, Douma MJ, Epstein

JL, Hood NA, Markenson DS, Meyran D, Orkin AM, Sakamoto T, Swain JM, Woodin JA; First Aid Science Collaborators. 2020 International Consensus on First Aid Science With Treatment Recommendations. *Circulation*. 2020 Oct 20;142(16_suppl_1):S284-S334. doi: 10.1161/CIR.0000000000000897. Epub 2020 Oct 21. PMID: 33084394.

4. Singletary 2020, A240.

<https://pubmed.ncbi.nlm.nih.gov/33098920/>

Singletary EM, Zideman DA, Bendall JC, Berry DA, Borra V, Carlson JN, Cassan P, Chang WT, Charlton NP, Djärv T, Douma MJ, Epstein JL, Hood NA, Markenson DS, Meyran D, Orkin A, Sakamoto T, Swain JM, Woodin JA, De Buck E, De Brier N, O D, Picard C, Goolsby C, Oliver E, Klaassen B, Poole K, Aves T, Lin S, Handley AJ, Jensen J, Allan KS, Lee CC; First Aid Science Collaborators. 2020 International Consensus on First Aid Science With Treatment Recommendations. *Resuscitation*. 2020 Nov;156:A240-A282. doi: 10.1016/j.resuscitation.2020.09.016. Epub 2020 Oct 21. PMID: 33098920.

5. Sinpreechanon 2019, 323.

<https://pubmed.ncbi.nlm.nih.gov/31185144/>

Sinpreechanon P, Boonzong U, Sricholpech M. Comparative evaluation of periodontal ligament fibroblasts stored in different types of milk: effects on viability and biosynthesis of collagen. *Eur J Oral Sci*. 2019 Aug;127(4):323-332. doi: 10.1111/eos.12621. Epub 2019 Jun 11. PMID: 31185144.

6. Souza 2020, 53.

<https://pubmed.ncbi.nlm.nih.gov/31104259/>

Souza BDM, Garcia LFR, Bortoluzzi EA, Felipe WT, Felipe MCS. Effects of several storage media on viability and proliferation capacity of periodontal ligament cells. *Eur Arch Paediatr Dent*. 2020 Feb;21(1):53-59. doi: 10.1007/s40368-019-00450-8. Epub 2019 May 18. PMID: 31104259.

7. Zhang 2021, 749278.

<https://pubmed.ncbi.nlm.nih.gov/34708058/>

Zhang N, Cheng Y, Li F, Kang Q. Network Meta-Analysis of 10 Storage Mediums for Preserving Avulsed Teeth. *Front Med (Lausanne)*. 2021 Oct 11;8:749278. doi: 10.3389/fmed.2021.749278. PMID: 34708058; PMCID: PMC8542672.

8. Zideman 2021, 270.

<https://pubmed.ncbi.nlm.nih.gov/33773828/>

Zideman DA, Singletary EM, Borra V, Cassan P, Cimpoesu CD, De Buck E, Djärv T, Handley AJ, Klaassen B, Meyran D, Oliver E, Poole K. European Resuscitation Council Guidelines 2021: First aid. *Resuscitation*. 2021 Apr;161:270-290. doi: 10.1016/j.resuscitation.2021.02.013. Epub 2021 Mar 24. PMID: 33773828.

Evidence Update Worksheet

Second Dose Epinephrine for Anaphylaxis

FA7111

Worksheet author(s): Jestin Carlson

Task Force: First Aid

Date Submitted to SAC rep for peer review and approval: 1 June 2023

SAC rep: Nici Singletary

PICOST / Research Question: *(Attach SAC representative approved completed PICOST template)*

Population: Among adults and children experiencing severe anaphylaxis requiring the use of epinephrine

Intervention: does administration of a second dose of epinephrine

Comparators: compared with administration of only one dose

Outcomes: change resolution of symptoms, adverse effects, complications

Study Designs: Included - randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, uninterrupted time series, controlled before-and-after studies, cohort studies).

Excluded - studies not reporting on our selected outcomes and those without an English language abstract

Timeframe: Last Review – 3 January 2021 1; updated search dates – 3 June 2020 to 1 June 2023

Year of last full review: *(insert year where this PICOST was most recently reviewed)*

2021

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST:

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-quality evidence).

Current Search Strategy (for an existing PICOST) included in the attached approved PICOST

(((((("multiple dose"[TI] or "multiple doses"[TI] or repeat[TI] or second dose[TI] or second doses[TI]) AND epinephrine[TI]))) OR ((((((("Epinephrine"[Mesh] OR Epinephrine[TIAB] OR Adrenaline[TIAB] or adrenalin[TIAB]))) AND (("administration and dosage" [Subheading] OR "therapeutic use" [Subheading:NoExp] OR "repeat epinephrine"[TIAB] OR dose[TIAB] OR dosage[TIAB] or doses[TIAB] or "second injection"[TIAB] or "next injection"[TIAB] or "2 injections"[TIAB] or "two injections"[TIAB] or Twinject[TIAB] or "additional injection"[TIAB] or "additional injections"[TIAB] OR "repeated injection"[TIAB] or "repeated injections"[TIAB] or "repeat injection"[TIAB] or "repeat injections"[TIAB] or multiple[TIAB]))) AND (((("Anaphylaxis"[Mesh] OR Anaphylaxis[TIAB] or anaphylactic[TIAB] or "severe allergic reaction"[TIAB] or "severe allergic reactions"[TIAB]) AND ("therapy" [Subheading:NoExp] OR "drug therapy" [Subheading] OR "prevention and control" [Subheading])))))))) NOT ((animals[mh] NOT humans[mh]) NOT ("letter"[pt] OR "comment"[pt] OR "editorial"[pt] or Case Reports[ptyp]))

New Search strategy: (for a new PICOST should be outlined here as per Evidence Update Process)

Not applicable

Database searched:

Pubmed

Time Frame: (existing PICOST) – updated from end of last search (please specify)

Last Review – 3 January 2021 1; updated search dates – 3 June 2020 to 1 June 2023

Time Frame: (new PICOST) – at the discretion of the Task Force (please specify)

Not applicable

Date Search Completed:

1 June 2023

Search Results (Number of articles identified and number identified as relevant):

Results – 188; Relevant – 2

Summary of Evidence Update:**Relevant Guidelines or Systematic Reviews**

Organization (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
Patel, 2021, 1307	Systematic Review	Report proportion of anaphylaxis reactions treated with multiple doses of epinephrine	86	7.7% are treated with > 1 dose of epinephrine	No impact on treatment recommendation. Many studies not from the first aid setting.

RCT: N/A

Study Acronym; Author; Year Published	Aim of Study; Study Type; Study Size (N)	Patient Population	Study Intervention (# patients) / Study Comparator (# patients)	Endpoint Results (Absolute Event Rates, P value; OR or RR; & 95% CI)	Relevant 2° Endpoint (if any); Study Limitations; Adverse Events
	<u>Study Aim:</u> <u>Study Type:</u>	<u>Inclusion Criteria:</u>	<u>Intervention:</u> <u>Comparison:</u>	<u>1° endpoint:</u>	<u>Study Limitations:</u>

Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
Correa, 2021, 0142	<u>Study Type:</u> Retrospective chart review N=38	<u>Inclusion Criteria:</u> Patients at one of two outpatient allergy clinics treated with at least one dose of epinephrine for subcutaneous allergen immunotherapy	<u>1° endpoint:</u> Counts of patients receiving epinephrine. Eleven patients (29%) received second dose of epinephrine. Two patients (5%) received a third dose of epinephrine.	No impact on treatment recommendation.

Reviewer Comments: (including whether this PICOST should have a systematic or scoping review)

Insufficient literature to impact previous treatment recommendations.
Additional reviews (systematic or scoping review) not recommended at this time.

Reference list: (List by ILCOR ref standard (last name first author, year of publication, first page number) and insert hyperlink to all articles identified as relevant (if available on PubMed))

1. Patel, 2021, 1307

<https://pubmed.ncbi.nlm.nih.gov/33862009/>

Patel N, Chong KW, Yip AYG, Ierodiakonou D, Bartra J, Boyle RJ, Turner PJ.

Use of multiple epinephrine doses in anaphylaxis: A systematic review and meta-analysis. *J Allergy Clin Immunol.* 2021 Nov;148(5):1307-1315. doi:

10.1016/j.jaci.2021.03.042. Epub 2021 Apr 20. PMID: 33862009; PMCID: PMC8588837.

2. Correa, 2021, 0142

<https://pubmed.ncbi.nlm.nih.gov/34612079/>

Correa N, Quidwai A, Jeimy S, Rondilla N, White F, Moote W, Kuprowski M, Kim

H. Multicenter real-world experience with epinephrine 0.5 mg dosing for anaphylaxis with allergen immunotherapy. *Immunotherapy.* 2021

Nov;13(16):1325-1331. doi: 10.2217/imt-2021-0142. Epub 2021 Oct 6. PMID: 34612079.

Evidence Update Worksheet

Resuscitation care for suspected opioid-associated emergencies

FA7442

Worksheet author(s): Aaron Orkin

Task Force: First Aid

Date Submitted to SAC rep for peer review and approval: 9th Jan 2023

SAC rep: Terese Djärv

PICOST / Research Question: *(Attach SAC representative approved completed PICOST template)*

FA7442: Resuscitation care for suspected opioid-associated emergencies

The PICOST (Population, Intervention, Comparator, Outcome, Study Designs and Timeframe)

Population: Adults and children with suspected opioid-associated cardio / respiratory arrest in the pre-hospital setting

Intervention: Bystander naloxone administration (intramuscular or intranasal), in addition to standard CPR

Comparators: Standard CPR only

Outcomes: Any clinical outcome

Study Designs: Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) are eligible for inclusion. Unpublished studies (e.g., conference abstracts, trial protocols) are excluded.

Timeframe: All years and all languages were included as long as there was an English abstract. Unpublished studies (e.g., conference abstracts, trial protocols), animal studies, manikin studies, cadaver studies were excluded. Literature searched to 12 December 2023.

Year of last full review: *(insert year where this PICOST was most recently reviewed)*

2022 (1 December 2022)

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST:

We suggest that 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 (weak recommendation based on expert consensus).

Current Search Strategy (for an existing PICOST) included in the attached approved PICOST

Pubmed:

(((((("Narcotics"[Mesh] OR "Narcotics" [Pharmacological Action] OR Oxycodone[TIAB] or hydrocodone[TIAB] or heroin[TIAB] or morphine[TIAB] or methadone[TIAB] or codeine[TIAB] or fentanyl[TIAB] or opiate[TIAB] or opiates[TIAB] or opioid[TIAB] or opioids[TIAB] OR Hydromorphone[TIAB] or vicodin[TIAB] or Demerol[TIAB] or oxycontin[TIAB] or Tramadol[TIAB] or Meperidine[TIAB] or opium[TIAB] or narcotic[TIAB] OR narcotics[TIAB] OR "Opioid-Related Disorders"[Mesh]) AND ("Drug Overdose"[Mesh] or "poisoning" [Subheading] or "Poisoning"[Mesh:NoExp] or "toxicity" [Subheading] or overdose[TIAB] OR overdosed[TIAB] or overdosing[TIAB] or toxicity[TIAB] or poisoning[TIAB]))) AND (("Resuscitation"[Mesh] OR "cardiopulmonary resuscitation"[TIAB] or "cardio-pulmonary resuscitation"[TIAB] or CPR[TIAB] or "chest compression"[TIAB] or "chest compressions"[TIAB] OR "basic life support"[TIAB] or BLS[TIAB] or "cardiac massage"[TIAB] or "heart massage"[TIAB] OR "Naloxone"[Mesh] OR "Narcotic Antagonists"[Mesh] or naloxone[TIAB] or naloxon[TIAB] or narcan[TIAB] or "narcotic antagonist"[TIAB] or "narcotic antagonists"[TIAB] OR "opioid antagonist"[TIAB] OR "opioid antagonists"[TIAB]))) NOT ((animals[mh] NOT humans[mh]) NOT ("letter"[pt] OR "comment"[pt] OR "editorial"[pt] or Case Reports[ptyp]))

New Search strategy: (for a new PICOST should be outlined here as per Evidence Update Process)

Not applicable

Database searched: eg Medline Embase Cochrane
PubMed

Time Frame: (existing PICOST) – updated from end of last search (please specify)
1 December 2022 to 12 December 2023

Time Frame: (new PICOST) – at the discretion of the Task Force (please specify)
Not applicable.

Date Search Completed: 12 December 2023

Search Results (Number of articles identified and number identified as relevant): 0/356 titles. None relevant.

Summary of Evidence Update: This evidence update process is only applicable to PICO s which are not being reviewed as ILCOR systematic and scoping reviews.

Relevant Guidelines or Systematic Reviews

Organization (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
Dezfulian C, Orkin AM, Maron BA, Elmer J, Girotra S, Gladwin MT, Merchant RM, Panchal AR, Perman SM, Anderson Starks M, van Diepen S, Lavonas EJ; on behalf of the American Heart Association Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Cardiovascular and Stroke Nursing; Council on Quality of Care and Outcomes Research; and Council on Clinical Cardiology 2021	Scientific Statement	Opioid-associated out-of-hospital cardiac arrest management.	N/A	Broadly supportive of relevant treatment recommendation.	“If the patient is definitely pulseless and receiving standard resuscitation, including assisted ventilation, naloxone is unlikely to be beneficial. Because there is a theoretical basis for harm, standard resuscitation alone is indicated. Opioid antagonism to prevent OA-OHCA in patients with OA central nervous system and respiratory depression is always reasonable and should be delivered along with CPR when it is uncertain whether the patient is pulseless.”

Eric J. Lavonas, Peter D. Akpunonu, Ann M. Arens, Kavita M. Babu, Dazhe Cao, Robert S. Hoffman, Christopher O. Hoyte, Maryann E. Mazer-Amirshahi, Andrew Stolbach, Maude St-Onge, Trevonne M. Thompson, George Sam Wang, Amber V. Hoover, Ian R. Drennan and on behalf of the American Heart Association	Guideline focussed update.	Multiple	N/A	Supportive of existing guidance.	For patients known or suspected to be in cardiac arrest, in the absence of a proven benefit from the use of naloxone, standard resuscitative measures should take priority over naloxone administration, with a focus on high-quality CPR (compressions plus ventilation).
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RCT:

Study Acronym; Author; Year Published	Aim of Study; Study Type; Study Size (N)	Patient Population	Study Intervention (# patients) / Study Comparator (# patients)	Endpoint Results (Absolute Event Rates, P value; OR or RR; & 95% CI)	Relevant 2° Endpoint (if any); Study Limitations; Adverse Events
	<u>Study Aim:</u> <u>Study Type:</u>	<u>Inclusion Criteria:</u>	<u>Intervention:</u> <u>Comparison:</u>	<u>1° endpoint:</u>	<u>Study Limitations:</u>

Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
	<u>Study Type:</u>	<u>Inclusion Criteria:</u>	<u>1° endpoint:</u>	

Reviewer Comments: (including whether this PICOST should have a systematic or scoping review)

No new evidence was identified. An update to the systematic review is not indicated and the current treatment recommendation remains unchanged. New guidelines and focussed updates published since the last review do not reflect new evidence.

Evidence Update Worksheet

Exertion-related dehydration and rehydration

FA 7241

Worksheet author(s): Jorien Laermans

Task Force: First Aid

Date Submitted to SAC rep for peer review and approval: 25 August 2023

SAC rep: Matthew Douma

PICOST / Research Question: FA 7241 Exertion-related dehydration and rehydration (*Attach SAC representative approved completed PICOST template*)

Population	Adults and children with exertion-related dehydration
Intervention	Drinking oral carbohydrate-electrolyte or alternative rehydrating liquids
Comparison	Drinking water
Outcomes	Any relevant clinical outcome
Study Design	Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) are eligible for inclusion. Unpublished studies (e.g., conference abstracts, trial protocols), editorials, case series and animal studies are excluded.
Timeframe	The update of the ILCOR 2015 PICOST will be performed between Jan 1, 2014 and Sept 2019, while studies on alternative storage media, containers or techniques (materials such as cling film, containers, ...) will be included from inception to Sept 2019.

Year of last full review: 2022

Two systematic reviews (Part I on carbohydrate-electrolyte drinks (CEDs) and Part II on alternative solutions) have been accepted for publication at the Journal of Athletic Training. During the revisions, searches were last updated by Vere Borra and Niels De Brier on 1 June 2022.

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST:

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% CED. Alternative rehydration options include 0% to 3.9% CEDs, 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).

Current Search Strategy: (*for an existing PICOST*) included in the attached approved PICOST for using these in the publication please just insert the search strategy here and delete the text about the approved PICOST

1. "Dehydration"[MeSH] OR dehydrat*[TIAB] OR hypohydrat*[TIAB] OR "Hyponatremia"[MeSH] OR hyponatremia[TIAB] OR "Water Intoxication"[MeSH] OR water intoxication[TIAB] OR fluid loss[TIAB]
2. "Physical Exertion"[MeSH] OR exertion[TIAB] OR "Exercise"[MeSH] OR exercise[TIAB] OR "Sports"[MeSH] OR sport*[TIAB] OR "Athletes"[MeSH] OR athlete*[TIAB]
3. "Fluid Therapy"[Mesh:NoExp] OR fluid therap*[TIAB] OR "Rehydration Solutions"[MeSH] OR rehydrat*[TIAB] OR oral fluid replacement*[TIAB] OR treatment*[TIAB] OR "Beverages"[MeSH] OR beverage* [TIAB] OR "Drinking"[MeSH] OR drink*[TIAB] OR carbonated[TIAB] OR water[TIAB] OR milk[TIAB] OR tea[TIAB]
4. Date - Publication: 2022/01/01 to Present
5. 1-4 AND

New Search strategy: Not applicable

Database searched: PubMed

Time Frame: (existing PICOST) – updated from end of last search (1 June 2022) with a 6-month overlap (1 January 2022)

Time Frame: (new PICOST) – Not applicable

Date Search Completed: 1 December 2023

Search Results (Number of articles identified/number identified as relevant): 120/2

Summary of Evidence Update:

No additional guidelines or systematic reviews have been identified. Two additional RCTs were identified: one comparing Gatorade sports drink to water (Ly, 2023), and one comparing green tea to water (Takamata, 2023). In the RCT by Ly, the percentage of fluid retained at 3.5 hours after ingestion of the rehydration beverage was statistically significantly higher in the participants who consumed the sports drink, compared to water. In the RCT by Takamata, no differences in body fluid balance and cumulative urine output were observed between green tea and water.

Relevant Guidelines or Systematic Reviews

Organization (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
/					

RCT:

Study Acronym; Author; Year Published	Aim of Study; Study Type; Study Size (N)	Patient Population	Study Intervention (# patients) / Study Comparator (# patients)	Endpoint Results (Absolute Event Rates, P value; OR or RR; & 95% CI)	Relevant 2° Endpoint (if any); Study Limitations; Adverse Events
Ly, 2023	Study Aim: To compare beverages that varied in both sodium (Na) and carbohydrate (CHO) content within the range found in sports drinks for rehydration properties following exercise-induced dehydration in male athletes. The main outcome variable used to define completeness of rehydration was the percentage of fluid retained during a 3.5-hour period following beverage ingestion. To explore the effect	Inclusion Criteria: - Physically fit males of ages from 18 to 30 years. Females were excluded to avoid the potential effects of estrogen fluctuations on water retention that might confound rehydration comparisons for the duration of testing a given subject. - The subject sample consisted of intercollegiate athletes, club sport athletes, several personal trainers, and several former military personnel, all of whom had to train regularly, i.e., >60 min a day	During the 24-hour period prior to each 8-hour experiment, participants ate the exact same diet and did not exercise. To induce dehydration, participants exercised during a ~90 min session composed of three 25 min periods of intermittent-intensity exercise (walking, jogging and running, or the equivalent perceived intensities on the bike or elliptical machine) performed indoors after a 2 min warm-up, to	1° endpoint: Cumulative % fluid retained (at 3.5 hours): 73.9±10.9 vs 58.1±12.6; P<0.05	Study Limitations: The use of commercial products prevented isolated comparisons of single functional ingredients, and not all ingredients were compared

	<p>of inversely varying Na and CHO, two commercially available and commonly used rehydration beverages were administered in volumes that replaced 100% of the acute body weight loss. A water placebo was compared to an ORS containing 2.5% CHO and 45 mmol/L Na and a standard sports drink containing 6% CHO and 18 mmol/L Na. We hypothesized that the higher Na, lower CHO beverage would promote the greatest rehydration.</p> <p><u>Study Type:</u> Crossover randomized controlled trial</p> <p>N=26</p>	<p>at moderate to vigorous intensity, ≥ 3 days per week.</p> <ul style="list-style-type: none"> - All participants had to be free of any cardiovascular, metabolic, endocrine, or renal disease or dysfunction. - Participants had to answer no to all seven questions on the PAR-Q, and each had to have a peak oxygen uptake (peak VO₂) of ≥ 50 mL/kg/min. 	<p>elicit a 2.5–3% reduction in body mass. This was followed by a 45-minute rest.</p> <p>Thereafter, participants consumed a volume of the beverage that replaced 100% of body mass lost. Beverages were ingested in six aliquots over a 1 h period given at the end of the trial. Specifically, 25% of the total volume was ingested every 10 min for the first 20 min; thereafter, 12.5% of the volume was ingested at four 10 min intervals.</p> <p><u>Intervention</u> <u>(N=26</u> <u>participants):</u> Sports drink (Gatorade®, Chicago, IL, USA): 240 Cal/L 330-380 mOsm/kg 6 g% carbohydrate (sucrose and glucose) 18 mmol/L Na 11 mmol/L Cl 3 mmol/L K 0 mmol/L Zn</p> <p><u>Comparison</u> <u>(N=same 26</u> <u>participants):</u> Water placebo: ~2.5 Cal/L 330-380 mOsm/kg 0 g% carbohydrate (sucrose and</p>		
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			glucose) 0.33 mmol/L Na 0 mmol/L Cl 0 mmol/L K 0 mmol/L Zn		
Takamata, 2023	<p><u>Study Aim:</u> To examine the effect of fluid replacement with green tea on body fluid balance and renal water and electrolyte handling in mildly dehydrated individuals</p> <p><u>Study Type:</u> Crossover randomized controlled trial</p> <p>N=13</p>	<p><u>Inclusion Criteria:</u></p> <ul style="list-style-type: none"> - Male and female; experiments were performed during the follicular phase in two women and during the luteal phase in five women - Aged > 20 years - Free from medication, and had no known cardiovascular, renal or metabolic disease 	<p>Subjects refrained from heavy exercise for 24 hours and alcohol and caffeinated beverages and salty food for 16 hours before the experiment. They took a light breakfast and a bottle of mineral water before reporting to the laboratory. To induce dehydration, participants performed 3 bouts of intermittent step up and down exercise for 20 min separated by a 10-min resting period. This was followed by a 30-minute rest.</p> <p>Next, the subjects were asked to ingest the beverages (room temperature) equal to the volume of fluid loss during the dehydration protocol within 10 min.</p> <p><u>Intervention (N=13 participants):</u> Commercially available bottled sencha green tea (Oi Ocha, ITO EN, Japan): 0.1 mEq/L Na ~3.1 mEq/L K</p>	<p><u>1° endpoint:</u> Fluid balance (g/kg body weight) at 30 min, 60 min and 120 min: The time course of the body fluid balance after the ingestion of green tea and water were similar</p> <p>Cumulative urine output (ml/kg/min) at 30 min, 60 min and 120 min: No differences between green tea and water</p>	<p><u>Study Limitations:</u> All young participants, except for one middle-aged man (mean age 25 years)</p>

			14-20 mg/100 ml caffeine ~40 mg/100 ml tea catechin Comparison (N=same 13 participants): Mineral water: 0 mEq/L Na <0.1 mEq/L K 0.36 mEq/L Ca 0.18 mEq/L Mg		
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Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
/	<u>Study Type:</u>	<u>Inclusion Criteria:</u>	<u>1° endpoint:</u>	

Reviewer Comments: (including whether this PICOST should have a systematic or scoping review)

The newly identified RCTs are in line with the existing treatment recommendations. These therefore remain valid.

The systematic review on alternative solutions by Vere Borra and Niels De Brier that was just accepted for publication only included rehydration drinks for which more than one study was identified. Therefore, it did not include a non-RCT on green tea that was identified during the 2015 ILCOR review (Miccheli, 2009). Given that this Evidence Update identified a second relevant green tea study (Takamata, 2023), it might be worth to widen the scope when updating this systematic review.

Reference list: (List by ILCOR ref standard (last name first author, year of publication, first page number) and insert hyperlink to all articles identified as relevant (if available on PubMed))

Ly NQ, Hamstra-Wright KL, Horswill CA. Post-exercise rehydration in athletes: Effects of sodium and carbohydrate in commercial hydration beverages. *Nutrients* 2023 Nov 12;15(22):4759. doi: 10.3390/nu15224759. <https://pubmed.ncbi.nlm.nih.gov/38004153/>

Miccheli A, Marini F, Capuani G, et al. The influence of a sports drink on the postexercise metabolism of elite athletes as investigated by NMR-based metabolomics. *J Am Coll Nutr* 2009;28:553. doi: 10.1080/07315724.2009.10719787. <https://pubmed.ncbi.nlm.nih.gov/20439551/>

Takamata A, Oka A, Nagata M, et al. Effect of fluid replacement with green tea on body fluid balance and renal responses under mild thermal hypohydration: a randomized crossover study. *Eur J Nutr* 2023 Dec;62(8):3339-3347. doi: 10.1007/s00394-023-03236-3. <https://pubmed.ncbi.nlm.nih.gov/37594507/>

Evidence Update Worksheet

First Aid Interventions for the Prevention of Syncope- Counter Pressure Maneuvers
FA 7550 (FA 798)

Short title: FA 7550 (old FA 798) Presyncope

Worksheet author(s): Singletary, E. M. (Nici)

Task Force: First Aid

Date Submitted to SAC rep for peer review and approval: Dec 6, 2023

SAC rep: Djärv

PICOST / Research Question: (Attach SAC representative approved completed PICOST template) (From 2018)

Among adults and children with signs and symptoms of faintness or pre-syncope of suspected vasovagal or orthostatic origin (P), does an intervention such as physical counter pressure maneuvers (PCM), body positioning, hydration or other (I), compared with no intervention or with each other (C), change (O)?

Population: Adults and children with signs and symptoms of faintness or pre-syncope of suspected vasovagal or orthostatic origin

Intervention: interventions such as PCM, body positioning, hydration or other

Comparison: no intervention or each other

Outcomes:

- avoid/prevent syncope or transient loss of consciousness (T-LOC),
- resolution of symptoms or symptoms response,
- hemodynamic status, including: systolic and diastolic blood pressure, change in heart rate, or other indicators of same (cardiac output, stroke volume, blood flow velocity)
- recurrences of presyncope and/or syncope,
- time to resolution of symptoms,
- adverse events,
- admission to hospital,
- quality of life

Study Designs: Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) are eligible for inclusion. If there are insufficient studies from which to draw a conclusion, case series of 4 or more cases may be included. Unpublished studies (e.g., conference abstracts, trial protocols) are excluded.

Timeframe and Languages: All years and all languages are included as long as there is an English abstract

Year of last full review: 2019; Last Evidence Update: 2021

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST:

Treatment Recommendations

- 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 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).

Current Search Strategy (for an existing PICOST) included in the attached approved PICOST

See Separate attachment -Existing Search Strategy by St. Michael's Hospital 2018 (10 pages)

New Search strategy: Not applicable

Database searched: Medline, Cochrane

Time Frame: (existing PICOST) – updated from end of last search, December 2021 – December 1, 2023

Time Frame: (new PICOST) – at the discretion of the Task Force (please specify): N/A

Date Search Completed: December 2, 2023

Search Results (Number of articles identified and number identified as relevant): 749 articles identified in PubMed

Summary of Evidence Update:

Since the 2021 Evidence Update, 2 systematic reviews identified on the use of physical counterpressure maneuvers for the prevention of syncope and one trial RCT assessing counterpressure maneuvers during dental extraction in patients with a history of dental anxiety and previous syncope. The systematic reviews and single RCT support the findings/conclusions of the 2019 ILCOR Systematic Review and CoSTR. Other studies evaluating the use of hydration and other interventions were applied prior to the onset of symptoms of presyncope and for the purpose of preventing syncope during blood donation. Some blood donation studies {Thijssen 2020 918; Goldman 2021 1764} included physical tensioning maneuvers with onset of symptoms but this was in conjunction with pre-treatment with oral fluids. These studies were excluded.

Relevant Guidelines or Systematic Reviews

Organization (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
Dockx 2019	Systematic review	Physical manoeuvres as a preventive intervention to manage vasovagal syncope	11 trials; 688 participants with vasovagal syncope	The total body of evidence (GRADE) was considered to be low or very low. PCM were found to improve syncope as compared to control (OR: 0.52, 95% CI [0.33;0.81], $p = 0.004$). Similarly, before-and-after studies without a control group showed a significant reduction in syncope following PCM (OR: 0.01, 95%CI [0.00;0.01], $p < 0.001$). No studies investigated PCMOL. PCMHC increased SBP, DBP, MAP, SV, and CO, and decreased HR. PCMMC increased SBP, DBP, and MAP.	PCM may reduce syncope and increase SBP, DBP, and MAP. The effects on other outcomes are less clear. Additional high-quality studies are needed.
Williams 2022	Quasi systematic review and meta analysis	Counter pressure maneuvers for syncope prevention	<u>45 studies included;</u> Articles considered various syncopal conditions (vasovagal = 12, orthostatic hypotension = 8, postural orthostatic tachycardia syndrome = 1, familial dysautonomia = 2, spinal	CPM improved standing systolic blood pressure (+ 14.8 ± 0.6 mmHg, $p < 0.001$) and heart rate (+ 1.4 ± 0.5 bpm, $p = 0.006$), however, responses of total peripheral resistance, stroke volume, or cerebral blood flow were not widely documented. Most patients experienced symptom improvement following CPM use (laboratory:	Physical CPM were successful in improving syncopal symptoms and producing cardiovascular responses that may bolster against syncope; however, practical limitations may restrict applicability for use in daily living.

			<p>cord injury = 1, blood donation = 10, healthy controls = 11). Maneuvers assessed included hand gripping, leg fidgeting, stepping, tiptoeing, marching, calf raises, postural sway, tensing (upper, lower, whole body), leg crossing, squatting, "crash" position, and bending forward. CPM were assessed in laboratory-based studies ($N = 28$), the community setting ($N = 4$), both laboratory and community settings ($N = 3$), and during blood donation ($N = 10$)</p>	<p>$60 \pm 4\%$, community: $72 \pm 9\%$). Patterns of postural sway may also recruit the skeletal muscle pump to enhance cardiovascular control, and its potential as a discrete, proactive CPM needs further evaluation.</p>	

RCT:

Study Acronym; Author; Year Published	Aim of Study; Study Type; Study Size (N)	Patient Population	Study Intervention (# patients) / Study Comparator (# patients)	Endpoint Results (Absolute Event Rates, P value; OR or RR; & 95% CI)	Relevant 2° Endpoint (if any); Study Limitations; Adverse Events
Bhagat M, Sr 2023	Study Aim: Effectiveness of Leg Raise and Leg Fold Maneuver to Prevent Syncope	Inclusion Criteria: Patients undergoing dental extraction with a previous history of	Intervention: Syncope; 0/15 in test group, Comparison:	1° endpoint:	Study Limitations: Unblinded, small sample size.

	<p>During Extraction of Teeth: A Pilot Study</p> <p>RCT, 15 patients per group</p> <p>Study Type: RCT, unblinded.</p>	<p>syncope and dental anxiety; Group I patients educated about physical maneuvers (leg raise, leg fold) and instructions given preoperatively about when to perform them. Group II, control, underwent extraction conventionally</p>	<p>5/15 (33.3%) developed syncope in control group</p>		<p>Physical counterpressure maneuvers are a risk-free, effective, and low-cost treatment method in patients with vasovagal syncope. Leg raise and leg fold maneuvers improved the hemodynamics of the patients.</p>
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Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
	Study Type:	Inclusion Criteria:	1° endpoint:	

Reviewer Comments: (including whether this PICOST should have a systematic or scoping review)

The 2 systematic reviews and one new RCT support the use of physical counterpressure maneuvers for prevention of syncope. An updated systematic review is not indicated at this time and the current treatment recommendations are unchanged.

Reference list: (List by ILCOR ref standard (last name first author, year of publication, first page number) and insert hyperlink to all articles identified as relevant (if available on PubMed))

M JAB Sr, S S Jr, B N Sr, D D Sr, A R T Jr. Effectiveness of Leg Raise and Leg Fold Maneuver to Prevent Syncope During Extraction of Teeth: A Pilot Study. *Cureus*. 2023;15(2):e34488. Published 2023 Feb 1. doi:10.7759/cureus.34488

Williams EL, Khan FM, Claydon VE. Counter pressure maneuvers for syncope prevention: A semi-systematic review and meta-analysis. *Front Cardiovasc Med*. 2022 Oct 13;9:1016420. doi: 10.3389/fcvm.2022.1016420. PMID: 36312294; PMCID: PMC9606335.

Dockx K, Avau B, De Buck E, Vranckx P, Vandekerckhove P. Physical manoeuvres as a preventive intervention to manage vasovagal syncope: a systematic review. *PLoS One*. (2019) 14:e0212012. 10.1371/journal.pone.0212012 - [DOI](#) - [PMC](#) - [PubMed](#)

Thijssen A, Masser B, Davison TE. Reduced risk of vasovagal reactions in Australian whole blood donors after national implementation of applied muscle tension and water loading. *Transfusion*. (2020) 60:918–21. 10.1111/trf.15701 - [DOI](#) - [PubMed](#)

Goldman M, Uzicanin S, Marquis-Boyle L, O'Brien SF. Implementation of measures to reduce vasovagal reactions: donor participation and results. *Transfusion*. (2021) 61:1764–71. 10.1111/trf.16375 - [DOI](#) - [PubMed](#)

Evidence Update Worksheet

Recovery Position

FA 7040

Worksheet author(s): E.M. (Nici) Singletary

Task Force: First Aid

Date Submitted to SAC rep for peer review and approval:

SAC rep:

PICOST / Research Question: (Attach SAC representative approved completed PICOST template)

PICOST	Description (with recommended text)
Population	Adults and children in the first aid setting, with a reduced level of responsiveness of non-traumatic etiology, who have been assessed as not needing resuscitative interventions (chest compressions, rescue breathing, defibrillation)
Intervention	Any specific positioning
Comparison	Any other positioning
Outcomes	Any relevant clinical outcomes including but not limited to: Critical - survival, - delayed detection of apnoea and cardiac arrest, - need for airway opening maneuvers (i.e. head tilt chin lift and jaw thrust), - incidence of aspiration Important - complications (venous occlusion, arterial insufficiency, discomfort/pain, aspiration pneumonia)
Study Design	Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) are eligible for inclusion. Case series and case reports will also be considered for inclusion. As it is anticipated that there will be insufficient studies from which to draw a conclusion, the minimum number of cases for a case series to be included has been reduced for the default of 5 to 1 by the TFSR team.
Timeframe	All years and all languages are included as long as there is an English abstract.

Year of last full review: 2021

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST:

Consensus on Science

The review identified a lack of comparative studies of positional interventions (including the recovery position) examining critical outcomes such as survival, incidence of cardiac arrest or delayed detection of apnoea and cardiac arrest, which precluded comparisons or meta-analyses. In total, 3 prospective observational studies (n= 1003) {Adnet 1999 745; Julliard 2016 521; Wagner 2020 e037676}, and 4 case series (n=251) {Freire-Tellado 2016 e1; Kloster 1999 439; Ryvlin 2013 966; Verducci 2019 e227} were included.

Observational studies

The observational studies enrolled a total of 450 adults and 553 children experiencing poisoning, febrile seizures, non-febrile seizure, vasovagal symptoms or out of hospital cardiac arrest resulting in activation of emergency medical services. {Adnet 1999 745; Julliand 2016 521; Wagner 2020 e037676}

In an observational descriptive study of body position and suspected aspiration pneumonia in 205 acutely poisoned patients, 112 patients (54%) were found supine, 30 (15%) left lateral decubitus, 25 (12%) prone group, 20 (10%) right lateral decubitus, and 18 (9%) in a semi-recumbent position. The prone position and semi-recumbent positions were associated with a decreased rate of suspected aspiration pneumonia ($p < 0.05$); whereas there was no significant difference between left lateral decubitus, right lateral decubitus, and supine groups with respect to the incidence of pulmonary infiltrates. {Adnet 1999 745}

The use of the recovery position in 145 of 553 (26.2%) paediatric patients with a decreased level of responsiveness, cared for at European emergency departments, was associated with decreased admission rate (adjusted odds ratio (aOR)= 0.28; 95% CI 0.17 to 0.48, $p < 0.0001$). {Julliand 2016 521}

In a prospective observational study of 200 cases of out-of-hospital cardiac arrest attended by bystanders, only 64 (32%) patients were found by the emergency services to have been placed in a supine position suitable for the performance of chest compressions. Of the remainder, 37 (18.5%) were found to be in the recovery position, which was more likely to have been the case if bystanders had recently attended a CPR course. Although there was no statistically significant difference in favourable neurological outcome between patients placed in the recovery position compared with those placed in a position suitable for chest compression ($p > 0.05$), it was suggested that knowledge of the recovery position might distract bystanders from performing CPR. {Wagner 2020 e037676}

Case series and case reports

Three included case series (n=244) described the position of persons with sudden unexpected death in epilepsy {Freire-Tellado 2016 e1; Kloster 1999 439; Ryvlin 2013 966; Verducci 2019 e227}, one case series, in the form of a research letter, identified seven cases believed to be missed out-of-hospital cardiac arrest {Freire-Tellado 2016 e1}, were included.

A retrospective analysis of deaths in an outpatient population of a tertiary referral centre identified 140 patients with epilepsy who died between 1965 and 1996, of which 24 patients experienced sudden unexpected death in epilepsy. Of these, 17 (71%) were in the prone position, 1 was supine position (4%) and 6 (25%) were in unclassified positions. When an equal likelihood of prone or the supine positioning is assumed, the difference was found to be statistically significant ($p = 0.001$; two tailed test). {Kloster 1999 439}

In a systematic retrospective survey of international epilepsy monitoring units, 29 cardiorespiratory arrests were reported by 27 units from 11 countries. Among the 16 sudden unexpected deaths in epilepsy and fatal near sudden unexpected death in epilepsy cases in which the position of the patient could be assessed, 14 were prone at the time of cardiorespiratory arrest, often with the face partly tilted to one side. {Ryvlin 2013 966}

A retrospective review including death scene investigation, autopsy and next of kin interviews identified 237 definite and probable cases of sudden unexpected death in epilepsy. The majority (128/186, 69%) were found in the prone position ($p < 0.05$). {Verducci 2019 e227}

Meta-analysis Not Possible Option:

For the critical outcomes of survival, incidence of cardiac arrest and delayed detection of apnoea and cardiac arrest, no comparative evidence were identified that met inclusion criteria. The overall quality of evidence was rated as very low for all outcomes primarily due to a very serious risk of bias. The individual studies were all at a critical risk of bias due to confounding, indirectness and imprecision. Because of this and a high degree of heterogeneity, no meta-analyses could be performed, and individual studies are difficult to interpret.

Treatment Recommendations

When providing first aid to a person with a decreased level of responsiveness of non-traumatic 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 re-assessed. (Good Practice Statement)

Persons found in positions associated with aspiration and positional asphyxia such as face down, prone, or in neck and torso flexion positions should be repositioned supine for reassessment. (Good Practice Statement)

Technical remarks:

Resuscitative interventions may include opening and maintaining an open airway, rescue breathing, chest compressions and the application of an automated external defibrillator.

Various recovery positions have been described and there remains little evidence to suggest an optimal position. The recommended recovery position, (lateral recumbent positioning with arm nearest the first aid provider at right angle to the body and elbow bent with palm up and far knee flexed), remains unchanged from the 2015 CoSTR.

Justification and Evidence to Decision Framework Highlights

The task force discussed that normally we would not generate treatment recommendations based on so few studies and a level of evidence of low certainty. However, the opioid crisis and the large increase in the number of individuals requiring first aid, and being treated with the recovery position, has made this an important question for review. Furthermore, this PICOST was prioritized by the ILCOR First Aid Task Force because of concerns citing evidence from healthy volunteers simulating apnea using breath holding to suggest that placing individuals in the recovery position may impair the detection of cardiac arrest and that supine positioning with a head-tilt-chin-lift should be adopted instead {Freire-Tellado 2017 173; Navarro-Paton 2019 104}. However, these studies did not meet inclusion criteria for this review, and it remains unknown, how well the head-tilt-chin-lift is performed or whether it can be maintained for prolonged periods by first aid providers, including lay persons. Moreover, the observation of the subject may be more complete when they are supine, but a patent airway and unencumbered breathing may be easier to obtain in the recovery position.

The task force discussed weighing the possible risk of abandoning the recovery position in favour of the supine position and application of the head-tilt-chin-lift; however, but the result of such a change was unclear and not justified by the evidence identified.

In situations where a sole first aid responder is unable to remain at the side of a casualty and monitor their responsiveness and breathing, the task force agreed that the use of a recovery position is appropriate. Likewise, if a sole responder finds it necessary to maintain an open airway while in a supine position and is unable to call for help or perform other immediate first aid, such as administering naloxone for suspected opioid overdose, a recovery position may be useful.

The task force discussed the importance of first aid provider safety when accessing and changing the position of an individual. The difficulty and risk of physically turning the individual may vary based on provider and subject size, depth of unresponsiveness, additional first aid providers immediately available, and settings such as an enclosed space, private and public settings. First aid provider safety was seen as a priority by the task force.

The task force discussed how individual body habitus as well as head, face, spine, and other structural characteristics may determine the suitability and effectiveness of different individual positions for the maintenance of airway patency and adequate ventilation. For example, the supine position in an obese person with a decreased level of responsiveness may be associated with airway obstruction and inadequate ventilation, whereas it may be more suitable for a person of lean body habitus. In the balance of these considerations, recommending the recovery position is believed to have the potential to benefit most individuals with a decreased responsiveness in the first aid setting.

Patient deterioration including cardiac arrest can occur after the patient has been put in recovery position (possibly because of the ongoing pathophysiological process). Therefore, continuous monitoring or reassessment at fixed interval (e.g. every 2 minutes if continuous monitoring is not possible) after putting the patient in recovery position should be emphasized and included in the education and training.

Knowledge Gaps

The Task Force discussed that additional studies would be very useful. These could include randomized controlled trials, prospective cohort studies or even larger case series representing the total experience of a center or centers, or even case reports that report airway patency and ventilation adequacy in persons experiencing opioid toxicity or emergency call takers randomizing callers to place individuals with non-traumatic decreased level of responsiveness to either the recovery position or the supine position.

Future studies are also required to understand the role of positioning in patient assessment, how best to monitor for deterioration and what position is best relative to individual characteristics.

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Zideman DA, Singletary EM, De Buck ED, Chang WT, Jensen JL, Swain JM, Woodin JA, Blanchard IE, Herrington RA, Pellegrino JL, Hood NA, Lojero-Wheatley LF, Markenson DS, Yang HJ and First Aid Chapter C. Part 9: First aid: 2015 International Consensus on First Aid Science with Treatment Recommendations. *Resuscitation*. 2015;95:e225-61

Current Search Strategy (for an existing PICOST) included in the attached approved PICOST

PubMed as of May 2021 - Oct 5 2023

((posture[mesh] OR "patient positioning"[mesh]) OR ("recovery position"[Title/Abstract] OR "body position"[Title/Abstract] OR "supine position"[Title/Abstract] OR "postural change"[Title/Abstract] OR "head tilt"[Title/Abstract] OR "chin lift"[Title/Abstract] OR "positional therapy"[Title/Abstract])) AND (("Emergency Treatment"[mesh] OR Emergencies[mesh]) OR (emergency[Title/Abstract] OR emergencies[Title/Abstract] OR accident*[Title/Abstract] OR "semi conscious"[Title/Abstract] OR "semiconscious"[Title/Abstract] OR unconscious[Title/Abstract] OR "airway patency"[Title/Abstract] OR "airway management"[Title/Abstract] OR "airway obstruction"[Title/Abstract] OR apnea[Title/Abstract] OR "cardiac arrest"[Title/Abstract] OR "resuscitation"[Title/Abstract] OR drown*[Title/Abstract] OR "first aid"[Title/Abstract])) AND (2021/5/28:3000/12/12[pdat])

Embase via Embase.com as of May 2021 - Oct 6 2023

No.	Query	Results
#6.	#8 AND ('Article'/it OR 'Editorial'/it OR 'Letter'/it OR 'Review'/it)	1,464
#5.	#3 AND #4 AND [2021-2023]/py AND [english]/lim	1,952
#4.	#1 AND #2 AND [2021-2023]/py	1,989
#3.	#1 AND #2	10,783
#2.	'emergency treatment'/exp OR 'emergency'/mj OR emergency:ti,ab,kw OR emergencies:ti,ab,kw OR accident*:ti,ab,kw OR 'semi conscious':ti,ab,kw OR semiconscious:ti,ab,kw OR unconscious:ti,ab,kw OR 'airway patency':ti,ab,kw OR 'airway management':ti,ab,kw OR 'airway obstruction':ti,ab,kw OR apnea:ti,ab,kw OR 'cardiac arrest':ti,ab,kw OR resuscitation:ti,ab,kw OR drown*:ti,ab,kw OR 'first aid':ti,ab,kw	1,135,432
#1.	'body position'/exp OR 'patient positioning'/exp OR 'recovery position*':ti,ab,kw OR 'body position*':ti,ab,kw OR 'supine position*':ti,ab,kw OR 'postural change*':ti,ab,kw OR 'head tilt':ti,ab,kw OR 'chin lift*':ti,ab,kw OR 'positional therapy':ti,ab,kw	215,694

New Search strategy: (for a new PICOST should be outlined here as per Evidence Update Process): N/A
Database searched: PubMed, Embase

Time Frame: (existing PICOST) – updated from end of last search (March 15, 2022): May 1, 2021 – October 6, 2023

Time Frame: (new PICOST) – at the discretion of the Task Force (please specify): N/A

Date Search Completed: October 6, 2023

Search Results (Number of articles identified and number identified as relevant):

PubMed: n=483

EMBASE: n=1,464

Total result before de-duping: 1,947

Total results after de-duping: **1,692**

Number of relevant articles identified: 5

Summary of Evidence Update:

No new RCTs or observational studies involving the use of a recovery position were identified.

One ILCOR Systematic Review {Douma 2022 100236} that accompanied the original CoSTR on Recovery Position for the Maintenance of Adequate Ventilation and Prevention of Cardiac Arrest was identified.

The original ILCOR CoSTR{Wyckoff 2022 e483; Wyckoff 2022 208; Wyckoff 2023 e2022060463} on Recovery Position was identified in three 2022-23 co-publications (*Circulation, Resuscitation, Pediatrics*).

One Guidelines document from the European Resuscitation Council{Zideman 2021 270} described use of the Recovery Position in First Aid.

Relevant Guidelines or Systematic Reviews

Organization (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
ILCOR; Douma; 2022	Systematic Review	The recovery position for maintenance of adequate ventilation and the prevention of cardiac arrest: A systematic review.	3	We identified a limited number of observational studies and case series comparing outcomes following use of the recovery position with outcomes when other patient positions were used.	There was limited evidence to support or revise existing first aid guidance; however, greater emphasis on the initial assessment of responsiveness and need for CPR, as well as the detection and management of patient deterioration of a person identified with decreased responsiveness, is recommended.
ILCOR; Wyckoff; 2022	Consensus on Science with Treatment Recommendations	The recovery position for maintenance of adequate ventilation and the prevention of cardiac arrest	3	The review identified a lack of comparative studies of positional interventions (including the recovery position) examining critical outcomes such as survival, incidence of cardiac arrest or delayed detection of apnoea and cardiac arrest, which precluded comparisons or meta-analyses.	<p>When providing first aid to a person with a decreased level of responsiveness of non-traumatic etiology and who does not require immediate resuscitative interventions, we suggest the use of the recovery position. (Weak recommendation, very low certainty evidence)</p> <p>When the recovery position is used, monitoring should continue for signs of airway occlusion, inadequate or agonal breathing and unresponsiveness. (Good Practice Statement)</p> <p>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</p>

					<p>and re-assessed. (Good Practice Statement)</p> <p>Persons found in positions associated with aspiration and positional asphyxia such as face down, prone, or in neck and torso flexion positions should be repositioned supine for reassessment. (Good Practice Statement)</p>
ERC; Zideman; 2021	Guidelines	First Aid			<p>For adults and children with a decreased level of responsiveness due to medical illness or non-physical trauma, who do NOT meet the criteria for the initiation of rescue breathing or chest compressions (CPR), the ERC recommends they be placed into a lateral, side-lying, recovery position</p> <p>Overall, there is little evidence to suggest an optimal recovery position, but the ERC recommends the following sequence of actions:</p> <ul style="list-style-type: none"> -Kneel beside the victim and make sure that both legs are straight -Place the arm nearest to you out at right angles to the body with the hand palm uppermost -Bring the far arm across the chest, and hold the back of the hand against the victim's cheek nearest to you -With your other hand, grasp the far leg just above the knee and pull it up, keeping the foot on the ground -Keeping the hand pressed against the cheek, pull on the far leg to roll the victim towards you onto their side -Adjust the upper leg so that both hip and knee are bent at right angles -Tilt the head back to make sure the airway remains open -Adjust the hand under the cheek if necessary, to keep the head tilted and facing downwards to allow liquid material to drain from the mouth -Check regularly for normal breathing -Only leave the victim unattended if absolutely necessary, for example to attend to other victims. -It is important to stress the importance of maintaining a close check on all unresponsive

					individuals until the EMS arrives to ensure that their breathing remains normal. In certain situations, such as resuscitation-related agonal respirations or trauma, it may not be appropriate to move the individual into a recovery position.
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RCT:

Study Acronym; Author; Year Published	Aim of Study; Study Type; Study Size (N)	Patient Population	Study Intervention (# patients) / Study Comparator (# patients)	Endpoint Results (Absolute Event Rates, P value; OR or RR; & 95% CI)	Relevant 2° Endpoint (if any); Study Limitations; Adverse Events
	<u>Study Aim:</u> <u>Study Type:</u>	<u>Inclusion Criteria:</u>	<u>Intervention:</u> <u>Comparison:</u>	<u>1° endpoint:</u>	<u>Study Limitations:</u>

Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Patient Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
	<u>Study Type:</u>	<u>Inclusion Criteria:</u>	<u>1° endpoint:</u>	

Reviewer Comments: (including whether this PICOST should have a systematic or scoping review)

No new studies were identified for this PICOST and the findings from the 2021 ILCOR CoSTR on Use of a Recovery Position remain unchanged. The 2021 ILCOR Treatment Recommendations remain valid and an update to the 2022 systematic review is not indicated.

When providing first aid to a person with a decreased level of responsiveness of non-traumatic 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)

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Resuscitative interventions may include opening and maintaining an open airway, rescue breathing, chest compressions and the application of an automated external defibrillator.

Various recovery positions have been described and there remains little evidence to suggest an optimal position. The recommended recovery position, (lateral recumbent positioning with arm nearest the first aid provider at right angle to the body and elbow bent with palm up and far knee flexed), remains unchanged from the 2015 CoSTR.

Reference list: (List by ILCOR ref standard (last name first author, year of publication, first page number) and insert hyperlink to all articles identified as relevant (if available on PubMed))

Douma MJ, Handley AJ, MacKenzie E, et al. The recovery position for maintenance of adequate ventilation and the prevention of cardiac arrest: A systematic review. *Resusc Plus*. 2022;10:100236. Published 2022 Apr 29. doi:10.1016/j.resplu.2022.100236

Wyckoff MH, Greif R, Morley PT, et al. 2022 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations: Summary From the Basic Life Support; Advanced Life Support; Pediatric Life Support; Neonatal Life Support; Education, Implementation, and Teams; and First Aid Task Forces. *Circulation*. 2022;146(25):e483-e557. doi:10.1161/CIR.0000000000001095

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Zideman DA, Singletary EM, Borra V, et al. European Resuscitation Council Guidelines 2021: First aid. *Resuscitation*. 2021;161:270-290. doi:10.1016/j.resuscitation.2021.02.013