Evidence Update Worksheet

Emergency medical services (EMS) experience and exposure
EIT 6104

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Council: UK
Date Submitted: 2 June 2023

PICO / Research Question:
Does EMS practitioner's experience or exposure to out-of-hospital cardiac arrest resuscitation impact on patient outcomes? EIT 6104

Population: Adults and children who are in cardiac arrest in the out-of-hospital setting
Intervention: Resuscitation by experienced emergency medical service practitioners or practitioners with higher exposure to resuscitation
Comparators: Resuscitation by less experienced or lower exposed practitioners
Outcomes: Improved patient outcomes. OHCA patient outcomes include:

1) Good neurological outcome at discharge/30days;
2) Survival to hospital discharge/30days;
3) Survival to hospital (event survival);
4) Return of spontaneous circulation (ROSC)

Study design: RCTs, nonrandomized studies (non-RCTs, interrupted time series, controlled before-and-after studies, cohort studies), original research articles (both prospective and retrospective) were included with no language restrictions. Unpublished studies (eg, conference abstracts, trial protocols) were excluded.
Time frame: All years and all languages were included if there was an English abstract up to October 14, 2019.

PROSPERO Registration: CRD42019153599 submitted to PROSPERO on 9th October 2019.

Publication title: A systematic review of the impact of emergency medical service practitioner experience and exposure to out of hospital cardiac arrest on patient outcomes.[1]
Publication date: 4th August 2020

Type (intervention, diagnosis, prognosis): Intervention
Additional Evidence Reviewer(s): Kathryn Eastwood; Kevin Nation; Ko Ying-Chih
Conflicts of Interest (financial/intellectual, specific to this question): None
Year of last full review: Evidence Update 2021

Last ILCOR Consensus on Science and Treatment Recommendation:
We suggest that EMS systems (1) monitor their clinical personnel's exposure to resuscitation and (2) implement strategies, where possible, to address low exposure or ensure that treating teams have members with recent exposure (weak recommendation, very low-certainty evidence).

2010/2015 Search Strategy: N/A

2020 Search Strategy: (developed by Lorena Romero (The Alfred Hospital, Melbourne, Australia). Database: Ovid MEDLINE(R) ALL <1946 to February 9, 2021>

2023 Search Strategy: Database: Ovid MEDLINE(R) ALL 2021 to May 13,42023>

Search Strategy.:

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1 advanced trauma life support care/
2 emergency medical service*.ti,ab.
3 EMS.ti,ab.

4 exp Emergency Medical Technicians/
5 Emergency Medical Technician*.ti,ab.
6 EMT.ti,ab.
7 "transportation of patients"/
8 ambulance*.ti,ab.
9 paramedic*.ti,ab.
10 prehospital.ti,ab.
11 pre-hospital.ti,ab.
12 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11
13 CPR.ti,ab.
14 exp Heart Massage/
15 exp cardiopulmonary resuscitation/
16 exp Electric Countershock/
17 13 or 14 or 15 or 16
18 exp Heart Arrest/
19 exp Ventricular Fibrillation/
20 exp Tachycardia, Ventricular/
21 18 or 19 or 20
22 exp Intubation, Intratracheal/
23 exp Laryngeal Masks/
24 Noninvasive Ventilation/
25 exp Epinephrine/
26 exp Drug Therapy/
27 22 or 23 or 24 or 25 or 26
28 21 and 27
29 17 or 28
30 experien*.ti,ab.
31 exposure*.ti,ab.
32 exp Health Knowledge, Attitudes, Practice/
33 exp Physician's Practice Patterns/
34 exp professional practice/
35 exp Nurse's Practice Patterns/
36 exp "Practice (Psychology)"/
37 novice*.ti,ab.
38 expert*.ti,ab.
39 exp Workload/
40 exp Professional Competence/
41 exp Benchmarking/
42 exp Psychomotor Performance/

43 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42
44 12 and 29 and 43
45 letter.pt.
46 comment.pt.
47 editorial.pt.
48 45 or 46 or 47
49 44 not 48
50 limit 49 to yr="2021 -Current"

Results 2021 through 14 May 2023 = 149

Database searched: Ovid MEDLINE and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) 1946 to current
Date Search Completed: 14th May 2023
Search Results (Number of articles identified / number identified as relevant): 149(2-150)/ none met the inclusion criteria
Inclusion/Exclusion Criteria: Non-randomised (cohort) studies (prospective and retrospective), prognosis studies based on RCT data, case-control studies, are eligible for inclusion. All original research articles (both prospective and retrospective) will be included with no language restrictions. Unpublished studies (e.g., conference abstracts, trial protocols) will be excluded. Studies will be excluded if they are editorials, commentaries, case studies and case reports.

Link to Article Titles and Abstracts (if available on PubMed): N/A

Summary of Evidence Update:
Evidence Update Process for topics not covered by ILCOR Task Forces
This evidence update process is only applicable to PICOs which are *not* being reviewed as ILCOR systematic and scoping reviews. No studies met the criteria, no new relevant guidelines or systematic reviews, no new RCT, and no new nonrandomized trials or observational studies were found. Therefore no further evidence is available.

Reviewer Comments (including whether meet criteria for formal review):
The search for the previous Evidence Update was run up to February 9, 2021. The current search for this Evidence Update was run from 2021- 14 May 2023 and no further relevant papers were identified. Therefore, the results of this search do not meet the criteria to trigger a formal systematic review and no change in the current CoSTR.

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Evidence Update Worksheet

Patient outcomes of team members attending a CPR course
EIT 6106

Worksheet author(s): Andrew Lockey; Cristian Abelairas-Gómez
Council: ERC
Date Submitted: July 2023
PICO / Research Question: EIT 6106

Question: ***"In patients requiring in-hospital cardiac arrest resuscitation of any age (Population), does prior participation of one or more members of the resuscitation team in an accredited advanced life support course (Intervention), as opposed to no such participation (Control), affect return of spontaneous circulation (ROSC), survival to hospital discharge or to 30 days, survival to one year, survival with favorable neurological outcome, or specifically in neonatal studies: stillbirth rate, neonatal and perinatal mortality (Outcomes)?***

Population: Patients of any age requiring in-hospital cardiac arrest (IHCA) resuscitation
Intervention: Prior participation of ≥1 members of the resuscitation team in an accredited ALS course (eg, ALS, ACLS, PALS, EPALS, EPILS, NRT [including NRP, HBB, NLS, ARNI])
Comparator: No such participation
Outcomes: Critical—ROSC, survival to hospital discharge or to 30 days, survival to 1 year, and survival with favorable neurological outcome; NRT (in addition): stillbirth rate, neonatal and perinatal mortality
Study Designs: Randomized controlled trials (RCTs), non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies, and case series where n ≥ 5) and manikin studies were eligible for inclusion.
Timeframe: The literature was searched from the date of last Systematic Review (01 Nov 2022) to 15 Jun 2023
PROSPERO Registration: CRD42017081667 / CRD42021253673

Outcomes: As above
Type (intervention, diagnosis, prognosis): Intervention
Additional Evidence Reviewer(s): None
Conflicts of Interest (financial/intellectual, specific to this question): None
Year of last full review: 2022

Last ILCOR Consensus on Science and Treatment Recommendation: (2022 EIT International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations)

We recommend the provision of accredited ALS training (ACLS, ALS) for health care providers who provide ALS care for adults (strong recommendation, very low– certainty evidence).
We recommend the provision of accredited courses in NRT (NRT, NRP) and HBB for health care providers who provide ALS care for newborns and babies (strong recommendation, very low–certainty evidence).
We have made a discordant recommendation (strong recommendation despite very low–certainty evidence) because we have placed a very high value on an uncertain but potentially life-preserving benefit, and the intervention is not associated with prohibitive adverse effects.

2023 Search Strategy (01 Nov 2022 to 15 Jun 2023): Database searched: Medline, Embase and CINAHL

Medline
1. exp Resuscitation/
2. exp Advanced Cardiac Life Support/

3. advanced life support.mp
4. ((advanced OR adult) ADJ3 ('life-support OR resuscitation)).tw
5. #1 OR #2 OR #3 OR #4
6. p?ediatric advanced life support.mp
7. newborn resuscitation.mp
8. (newborn AND resuscitation).mp
9. ((neonat* OR newborn OR pediatric) ADJ3 (life support or resuscitation)).mp
10. #6 OR #7 OR #8 OR #9
11. exp Health Personnel/
12. (doctor* OR physician* OR nurs* or midwif* OR midwives OR birth attendant$ OR clinician* OR internist* OR obstetrician* OR surgeon* OR health care assistant* OR healthcare assistant* OR health care professional* OR healthcare professional* OR interprofessional* OR inter professional* OR multi professional*).tw
13. ((resuscitation OR life support OR emergenc*) ADJ3 (team* OR unit$ OR staff OR personnel*)).tw
14. ((medical OR clinical or health* OR health care) ADJ3 (team* OR unit$ or staff OR personnel OR assistant* OR professional$ OR consultant$)).tw
15. #11 OR #12 OR #13 OR #14
16. exp Simulation Training/
17. (computer simulation OR continuing education OR vocational education OR in service training OR problem based learning OR teach* OR clinical competenc* OR train* OR education* or program* OR course$ OR medical education OR clinical education OR physician assistant education).mp
18. #16 OR #17
19. #5 AND #15 AND #18
20. limit 19 to journal article
21. limit 20 to dt=20221101-20230615 [November 1st, 2022 to June 15th, 2023]
22. #10 AND #15 AND #18
23. limit 22 to journal article
24. limit 23 to dt=20221101-20230615 [November 1st, 2022 to June 15th, 2023]

Embase

1. exp Resuscitation/
2. exp Advanced Cardiac Life Support/
3. advanced life support.mp
4. ((advanced OR adult) ADJ3 ('life-support OR resuscitation)).tw
5. #1 OR #2 OR #3 OR #4
6. p?ediatric advanced life support.mp
7. newborn resuscitation.mp
8. (newborn AND resuscitation).mp
9. ((neonat* OR newborn OR pediatric) ADJ3 (life support or resuscitation)).mp
10. #6 OR #7 OR #8 OR #9
11. exp Health Personnel/
12. (doctor* OR physician* OR nurs* or midwif* OR midwives OR birth attendant$ OR clinician* OR internist* OR obstetrician* OR surgeon* OR health care assistant* OR healthcare assistant* OR health care professional* OR healthcare professional* OR interprofessional* OR inter professional* OR multi professional*).tw
13. ((resuscitation OR life support OR emergenc*) ADJ3 (team* OR unit$ OR staff OR personnel*)).tw
14. ((medical OR clinical or health* OR health care) ADJ3 (team* OR unit$ or staff OR personnel OR assistant* OR professional$ OR consultant$)).tw
15. #11 OR #12 OR #13 OR #14
16. exp Simulation Training/

17. (computer simulation OR continuing education OR vocational education OR in service training OR problem based learning OR teach* OR clinical competenc* OR train* OR education* or program* OR course$ OR medical education OR clinical education OR physician assistant education).mp
18. #16 OR #17
19. #5 AND #15 AND #18
20. limit 19 to article
21. limit 20 to dd=20221101-20230615 [November 1st, 2022 to June 15th, 2023]
22. #10 AND #15 AND #18
23. limit 22 to article
24. limit 23 to dd=20221101-20230615 [November 1st, 2022 to June 15th, 2023]

CINHAL

1. (MH "Resuscitation+")
2. "advanced life support"
3. ((advanced OR adult) n3 (life-support OR resuscitation))
4. #1 OR #2 OR #3
5. (MH "Pediatric Advanced Life Support")
6. (MH "Resuscitation+") AND (MH "Child+")
7. ((p#ediatric OR newborn OR neonat* OR infant) N3 (life-support OR resuscitation))
8. #5 OR #6 OR #7
9. (MH "Health Personnel+")
10. (doctor* OR physician* OR nurs* OR midwif* OR midwives OR birth attendant$ OR clinician* OR internist* OR obstetrician* OR surgeon* OR health care assistant* OR healthcare assistant* OR health care professional* OR healthcare professional* OR interprofessional* OR inter professional* OR multi professional*)
11. ((resus* OR life-support OR emergenc*) N3 (team* OR unit* OR staff OR personnel*))
12. ((medical OR clinical OR health* OR health care) N3 (team* OR unit* OR staff OR personnel OR assistant* OR professional* OR consultant*))
13. #9 OR #10 OR #11 OR #12
14. (MH "Education+")
15. train* OR teach* OR educat* OR program* OR course*
16. #14 OR #15
17. #4 AND #13 AND #16
18. #17 AND (PT Journal Article OR Meta Analysis OR Systematic Review)
19. #18 (Limiters - Published Date 20221101-)
20. #8 AND #13 AND #16
21. #20 AND (PT Journal Article OR Meta Analysis OR Systematic Review)
22. #21 (Limiters - Published Date 20221101-)

Summary of 2023 search results		
Database	**Date Searched**	**Results**
Medline	15 Jun 2022	129
Embase	15 Jun 2022	79
CINAHL	15 Jun 2022	5
TOTAL [after removing duplicates (18)]		**195**
Articles meeting inclusion criteria		**2**

Link to Article Titles and Abstracts (if available on PubMed):

PMID	**Title**	**1st Author**	**Journal**

36962548	Assessing the effectiveness of newborn resuscitation training and skill retention program on neonatal outcomes in Madhesh Province, Nepal	Chalise M	PLOS Glob Public Health
37210289	Intraoperative Code Blue: Improving Teamwork and Code Response Through Interprofessional, In Situ Simulation	Lima RO	J Pediatr (Rio J)

Summary of Evidence Update:

Evidence Update Process for topics not covered by ILCOR Task Forces

This evidence update process is only applicable to PICOs which are *not* being reviewed as ILCOR systematic and scoping reviews.

Relevant Guidelines or Systematic Reviews: 1

Organisation (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
Patocka; 2023	SyR Impact of accredited advanced life support course participation on in-hospital cardiac arrest patient outcomes: A systematic review	In patients requiring in-hospital cardiac arrest resuscitation of any age (P), does prior participation of one or more members of the resuscitation team in an accredited advanced life support course (I), as opposed to no such participation (C), affect return of spontaneous circulation (ROSC), survival to hospital discharge or to 30 days, survival to one year, survival with favorable neurological outcome, or specifically in neonatal studies: stillbirth rate,	19	Studies demonstrate that accredited advanced life support courses, specifically advanced life support, neonatal resuscitation training and helping babies breathe, improve patient survival outcomes in both adult and neonatal cardiac arrest patients.	-----

		neonatal and perinatal mortality (O)?			

RCT: 0

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
	Study Aim: Study Type:	Inclusion Criteria:	Intervention: Comparison:	1° endpoint:	Study Limitations:

Nonrandomized Trials, Observational Studies: 2

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)**
Newborn Resuscitation in Nepal; Chalise; 2022	**Study Type:** Pre-post Prospective cohort design	Facilities that provided delivery services 24 hours a day, 7 days a week and represented a significant proportion of the births in Madhesh province. 20 facilities. Helping Babies Breath (HBB) training implementation	**1° endpoint:** Primary: intrapartum stillbirths and neonatal deaths within the first 24 hours of life. Secondary: Differences in neonatal deaths post-24 h of life; number of sick newborns transferred from the maternity unit.	
			Outcome measures: Each facility registered monthly the primary and secondary variables. Pre-intervention period refers to Oct-Nov 2020; post-intervention refers to Oct-Nov 2021. **Results:** Intrapartum stillbirths decreased by 57%; from 200 (pre) to 86 (post) ($p<0.001$).	**Conclusion:** HBB program for newborn resuscitation scale-up and skill retention is associated with reductions in neonatal deaths within 24 h, intrapartum stillbirths and sick newborns transferred from the maternity unit, as well as improved clinical practices in Madhesh province.

			Neonatal deaths within the first 24 hours of life decreased by 56%; from 100 (pre) to 44 (post) ($p<0.001$). No differences in neonatal deaths post-24 h of life between pre- and post-intervention. Sick newborns transferred from the maternity unit decreased by 33%, from 1093 in the pre-intervention period to 729 in the post-intervention period ($p<0.001$)	
Neonatal training in Brazil; Lima; 2023	**Study Type:** pre-post	Five secondary healthcare regions in Brazil.	**1° endpoint:** Primary: Meeting of ILCOR-Neonatal Life Support Task Force recommendations regarding supplies needed for delivery room resuscitation. Secondary: Differences in delivery room deaths between pre- (12 months before) and post-intervention (12 months after).	
			Outcome measures: The conditions of delivery rooms were assessed according to the same criteria during pre- and post-intervention. In addition, data on neonatal care were collected. **Results:** Delivery room mortality decrease from 73 (pre-intervention) to 20 (post-intervention) (72.6%; no p value reported).	**Conclusion:** The intervention involving the training of healthcare professionals promoted significant advances in neonatal outcomes by improving the structure of delivery rooms and the knowledge of neonatal resuscitation of professionals involved in neonatal care.

Reviewer Comments (including whether meet criteria for formal review):
There were 195 new articles identified of which 2 were relevant to the PICO.
Chalise et al. aimed to study the implementation of newborn resuscitation trainings and skill retention on perinatal outcomes. This study was conducted in Madhesh province (Nepal). There were there phases: 1) focused on developing newborn resuscitation competencies of facility-based trainers by Nepali trainers using Helping Babies Breathe (HBB) curriculum; 2) an experienced HBB trainer played the role of mentor of the facilities in this scale-up and skill retention

phase, assisting in terms of refresher training, on-site coaching, monitoring key indicators…; 3) the facility-based trainers continued with interventions, but the mentor did not support in doing so. Primary and secondary outcomes were compared between pre- (Oct-Nov 2020) and post-intervention (Oct-Nov 2021) periods. Intrapartum stillbirths decreased from 200 to 86 ($p<0.001$), and neonatal deaths within the first 24 hours of life decreased by from 100 to 44 ($p<0.001$). No differences in neonatal deaths post-24 h of life between pre- and post-intervention. Finally, sick newborns transferred from the maternity unit decreased from 1093 in the pre-intervention period to 729 in the post-intervention period ($p<0.001$)

Lima et al., aimed to analyzed the impact of training healthcare professionals on the conditions of delivery rooms and neonatal outcomes in the south western mesoregion of Piauí (Brazil). 431 healthcare professionals were trained by a pediatrician that was instructor of the Neonatal Resuscitation Program of the Brazilian Society of Pediatrics (March 1, 2018 to June 1, 2018). In the pre-intervention period, delivery rooms met 28.4% items required for neonatal resuscitation, percentage that increased in the post-intervention period (80.6%) and 12 months after intervention (83.0%). A 72.60% reduction in delivery room mortality was registered, from 73 deaths 12 months before intervention to 20 deaths s12 months after intervention.

Based on the limited additional results of this search, with no RCTs identified, this EvUp does not meet the criteria for a formal review, and it is not recommended any changes to the previous CoSTR since the two studies identified support their recommendations.

Reference List

1. Chalise M, Dhungana R, Visick MK, Clark RB. Assessing the effectiveness of newborn resuscitation training and skill retention program on neonatal outcomes in Madhesh Province, Nepal. PLOS Glob Public Health. 2022;2: e0000666. doi: 10.1371/journal.pgph.0000666.
2. de Lima RO, Marba STM, de Almeida MFB, Guinsburg R. Impact of resuscitation training program on neonatal outcomes in a region of high socioeconomic vulnerability in Brazil: an interventional study. J Pediatr (Rio J). 2023. In press. doi: 10.1016/j.jped.2023.04.006.

Evidence Update Worksheet

Willingness to provide CPR and/or defibrillation
EIT 6304

Worksheet author(s): Ying-Chih Ko
Evidence Reviewer(s): Aaron Donoghue (EIT), Andrea Cortegiani (EIT), Tasuku Matsuyama (EIT), Devita Stallings (AHA), Kai-Wei Lin (RCA)
Task Force: EIT
Date Submitted to SAC rep for peer review and approval:
SAC rep:

PICOST / Research Question: ***(Attach SAC representative approved completed PICOST template)***
Population: Bystanders (laypersons) in actual situation of adult or pediatric patients with out-of-hospital cardiac arrest
Intervention (Exposure): Factors (barriers or facilitators) that affected the willingness of bystanders to perform cardiopulmonary resuscitation (CPR) and/or use an automated external defibrillator (AED)
Comparators: No such factor or any other factor that affected the willingness of bystanders to perform CPR and/or use an AED
Outcomes: Bystander CPR rate; rate of bystander defibrillation with an AED; willingness to provide CPR in actual situation; willingness to provide defibrillation with an AED in actual situation
Study Designs: Randomized controlled trials (RCTs) and nonrandomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies, and questionnaire surveys) over all years were eligible for inclusion. Simulation studies, survey data not from actual experience, unpublished studies (e.g., conference abstracts, trial protocols), letters, editorials, comments, case reports, systematic reviews, and grey literature, as well as studies that overlap with other ILCOR systematic reviews or scoping reviews were excluded from this scoping review.
Timeframe: All years and all languages are included as long as there is an English abstract or translation available.

Year of last full review: (*insert year where this PICOST was most recently reviewed)*: Sep 2021
Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST: To increase willingness to perform CPR, laypeople should receive training in CPR. This training should include the recognition of gasping or abnormal breathing as a sign of cardiac arrest when other signs of life are absent. Laypeople should be trained to start resuscitation with chest compressions in adult and pediatric victims. If unwilling or unable to perform ventilation, rescuers should be instructed to continue CCO-CPR. EMS dispatchers should provide CPR instructions to callers who report cardiac arrest. When providing CPR instructions, EMS dispatchers should include recognition of gasping and abnormal breathing.

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*
Pubmed
("Out-of-Hospital Cardiac Arrest"[MeSH Terms] OR ("out of hospital"[All Fields] AND "cardiac"[All Fields] AND "arrest"[All Fields]) OR "Out-of-Hospital Cardiac Arrest"[All Fields] OR ("out"[All Fields] AND "hospital"[All Fields] AND "cardiac"[All Fields] AND "arrest"[All Fields]) OR "Out-of-Hospital Cardiac Arrest"[All Fields] OR "OHCA"[All Fields] OR ("Heart Arrest"[MeSH Terms] OR ("heart"[All Fields] AND "arrest"[All Fields]) OR "Heart Arrest"[All Fields] OR ("cardiac"[All Fields] AND "arrest"[All Fields]) OR "cardiac arrest"[All Fields]) OR "Out-of-Hospital Cardiac Arrest"[MeSH Terms] OR "Heart Arrest"[MeSH Terms]) AND ((("bystander"[All Fields] OR "bystander s"[All Fields] OR "bystanders"[All Fields] OR "bystanding"[All Fields]) AND ("Cardiopulmonary Resuscitation"[MeSH Terms] OR ("cardiopulmonary"[All Fields] AND "resuscitation"[All Fields]) OR "Cardiopulmonary Resuscitation"[All Fields] OR "cpr"[All Fields])) OR "BCPR"[All Fields] OR (("public"[All Fields] OR "public s"[All Fields] OR "publically"[All Fields] OR "publication s"[All Fields] OR "publications"[MeSH Terms] OR "publications"[All Fields] OR "publicity"[All Fields] OR "publicize"[All Fields] OR "publicized"[All Fields] OR "publicizing"[All Fields] OR "publics"[All Fields] OR "publishing"[MeSH Terms] OR "publishing"[All Fields] OR "publication"[All Fields]) AND ("access"[All Fields] OR "accessed"[All Fields] OR "accesses"[All Fields] OR "accessibilities"[All Fields] OR "accessibility"[All Fields] OR "accessible"[All Fields] OR "accessing"[All Fields]) AND ("defibrilator"[All Fields] OR "defibrillate"[All Fields] OR "defibrillated"[All Fields] OR "defibrillates"[All Fields] OR "defibrillating"[All Fields] OR "defibrillations"[All Fields] OR "defibrillator s"[All Fields] OR "Defibrillators"[MeSH Terms] OR "Defibrillators"[All Fields] OR "defibrillator"[All Fields] OR "Electric Countershock"[MeSH Terms] OR ("electric"[All Fields] AND "countershock"[All Fields]) OR "Electric Countershock"[All Fields] OR "defibrillation"[All Fields])) OR (("bystander"[All Fields] OR "bystander s"[All Fields] OR "bystanders"[All Fields] OR "bystanding"[All Fields]) AND ("defibrilator"[All Fields] OR "defibrillate"[All Fields] OR "defibrillated"[All Fields] OR "defibrillates"[All Fields] OR "defibrillating"[All Fields] OR "defibrillations"[All Fields] OR

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EMBASE
('out of hospital cardiac arrest'/exp OR 'ohca' OR 'out of hospital cardiac arrest' OR 'out of hospital cardiac arrests' OR 'out of hospital cardiopulmonary arrest' OR 'out of hospital cardiopulmonary arrests' OR 'out of hospital heart arrest' OR 'out-of-hospital cardiac arrest' OR 'heart arrest'/exp OR 'cardiac arrest' OR 'heart arrest') AND ('bystander cpr':ti,ab OR bcp:ti,ab OR 'bystander defibrillation':ti,ab OR 'automated external defibrillator'/exp OR aed:ti,ab OR 'public access defibrillation':ti,ab OR 'defibrillator'/exp OR 'cardioverter defibrillator':ti,ab,kw OR 'defibrillator':ti,ab,kw OR 'defibrillator, cardioverter':ti,ab,kw OR 'defibrillators':ti,ab,kw OR 'cardioversion'/exp OR 'cardioconversion':ti,ab,kw OR 'cardioversion':ti,ab,kw OR 'cardioversion, electric':ti,ab,kw OR 'counter shock':ti,ab,kw OR 'countershock':ti,ab,kw OR 'electric cardioversion':ti,ab,kw OR 'electric conversion':ti,ab,kw OR 'electric countershock':ti,ab,kw OR 'electrical cardioversion':ti,ab,kw OR 'electrocardioversion':ti,ab,kw OR 'electroconversion':ti,ab,kw OR 'basic life support'/exp OR 'basic life support':ti,ab,kw OR 'chest compression':ti,ab OR 'cardiopulmonary resuscitation':ti,ab) AND (barrier:ti,ab OR facilitator:ti,ab OR decrease:ti,ab OR increase:ti,ab OR improve:ti,ab OR deter:ti,ab OR frequency:ti,ab OR rate:ti,ab OR proportion:ti,ab OR willingness:ti,ab OR association:ti,ab)

New Search strategy: Not Applicable
Database searched: PubMed, Ovid EMBASE
Time Frame: Jun 1 2021 to Aug 31 2023
Date Search Completed: Sep 19, 2023
Search Results (Number of articles identified/number identified as relevant): 3822/37

Summary of Evidence Update: We searched PubMed, Ovid EMBASE databases to identify studies associated with willingness to provide CPR and/or defibrillation published from Jun 1, 2021 to Aug 30, 2023. After duplicates were removed, there were 3,822 records found. Finally, 37 non-randomized trials were included. Among them, 20 studies were performed in Asia [1-20], 8 in Europe [21-28], 8 in North America [29-36], and 1 in Australia [37]. There were 14 studies related with Coronavirus disease (COVID-19) pandemic [2, 4-6, 8, 11-13, 16, 18, 20, 21, 23, 27] , and the effect of the pandemic on bystander CPR rates varied. Several factors such as location of cardiac arrest [22, 24, 30, 37], age [3, 22], sex [3, 9, 32, 36], race and ethnic [29, 31, 33-35], socioeconomic status [1, 15, 26, 28, 31], prior CPR training [25], not familiar with CPR [19], fear of approaching a collapsed person [14], family-witnessed arrest [10], or large-scale disasters[17] were identified as promoting factors or barrier to bystander CPR.

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
Greif R (2020) [38]	Education, Implementation, and Teams: 2020 International	Willingness to perform bystander CPR (EIT626)	18	The 2010 treatment recommendation remains valid.	To increase willingness to perform CPR, laypeople should receive training in CPR. This training should include the recognition of gasping or abnormal

	Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations				breathing as a sign of cardiac arrest when other signs of life are absent. Laypeople should be trained to start resuscitation with chest compressions in adult and pediatric victims. If unwilling or unable to perform ventilation, rescuers should be instructed to continue compression-only CPR. EMS dispatchers should provide CPR instructions to callers who report cardiac arrest. When providing CPR instructions, EMS dispatchers should include recognition of gasping and abnormal breathing. (ILCOR 2020 CoSTR, unchanged from 2010)
Matsuyama T(2020) [39]	Scoping review	Willingness to perform bystander cardiopulmonary resuscitation: A scoping review	18	Younger bystander, previous CPR training, higher education, multiple bystanders on scene, and compression-only CPR were associated with increased willingness to perform CPR. "Personal factors", "CPR knowledge", and "procedural issues" were associated with reduced willingness to respond to cardiac arrest.	CPR training, regional and national education programs, and dispatch instructions should take these factors into consideration, to improve CPR performance of lay rescuers in the actual settings
Wyckoff MH (2022) [40]	2022 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations	Willingness to perform bystander CPR (EIT626)	12	Three of the studies identified factors identified by prior review. Nine articles depicted the impact of the COVID-19 pandemic on the attitude of bystanders toward performing CPR and AED.	The evidence triggers did not change in the wording and the treatment recommendation for willingness to provide CPR and/or defibrillation (EIT 626) published in ILCOR 2020 CoSTR.

RCT (0):

Nonrandomized Trials, Observational Studies (37):

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)**	**Promote factors/ Barrier factors**
Baldi E (2021) [21]	Observational study N=1,844	OHCA cases in the Swiss Confederation during the COVID-19 period (2020) and for the same time period in 2019	During the pandemic, CPR (2020 vs 2019: 56.5% vs 62.8%, p=0.04) and AED (8.6% vs 13%, p=0.03) use by bystander were less frequent.	COVID-19
Ballesteros-Peña S (2021) [22]	Retrospective observational study N=3,278	All the OHCA situations with assistance from the emergency care system between 2013/06 and 2018/05 in the Basque Country.	Victims of 65 years or older (OR: 1.48; 95%CI, 1.26-1.74, p<0.001) and suburban locations (OR: 1.29; 95%CI, 1.04-1.62, p = 0.023) were associated with absence of bystander CPR prior to the arrival of the first healthcare resource.	Age, remoteness
Damjanovic D (2022) [23]	Observational study N=126	Utstein-style quantitative data on OHCA with CPR initiated, occurring in the first pandemic wave (2020/02-2020/4) and before the pandemic (2016-2019)	Bystander-CPR decreased significantly from 57.7% to 25%(p = 0.043) due to COVID-19.	COVID-19
Garcia RA (2022) [29]	Retrospective cohort study N=110,054	Adults with witnessed out-of-hospital cardiac arrest between 2013 and 2019	Black and Hispanic persons were less likely than White persons to receive bystander CPR at home (38.5% vs. 47.4%; aOR 0.74; 95% CI, 0.72-0.76) and in public locations (45.6% vs. 60.0%; aOR 0.63; 95% CI, 0.60-0.66)	Barrier: race/ethnic

Gregers MCT (2023) [24]	Observational study N=21,385	OHCAs not witnessed by ambulance staff in Denmark from 2016 to 2020.	Odds for bystander cardiopulmonary resuscitation were lower in suburban (0.86; 95% CI, 0.82-0.96) and urban areas (0.87; 95% CI, 0.80–0.95) compared with rural areas, whereas bystander defibrillation was higher in urban areas compared with rural areas (1.15; 95% CI, 1.01-1.31).	Remoteness
Grubic N (2022) [30]	Retrospective cohort study N=325,477	Adult OHCAs within the Cardiac Arrest Registry to Enhance Survival from 2013 to 2019	The provision of bystander CPR alone increased markedly from 35.4% in urban areas to 50.8% in rural areas.	Remoteness
Ho AFW (2023) [1]	Retrospective cohort study N=12,730	OHCA cases within the Singapore cohort of the Pan-Asian Resuscitation Outcomes Study registry between 2010 and 2018.	Compared to patients in the low SHI(Singapore Housing Index) category, those in the medium and high SHI categories were more likely to receive bystander CPR (medium SHI: aOR 1.48; 95% CI, 1.30-1.69; high SHI: aOR 1.93; 95% CI, 1.67-2.24).	Barrier: Lower socioeconomic status
Hosomi S (2022) [2]	Observational study N=63,918	Older adults (aged > 65 years) with bystander-witnessed OHCA in All-Japan Utstein Registy between January 1, 2005, and December 31, 2020.	The proportions of conventional cardiopulmonary resuscitation and shock by public-access automated external defibrillators were lower in 2020 than in 2019 (6.7% vs 5.7%, p < 0.001 and 2.5% vs 2.1%, p < 0.001, respectively).	COVID-19
Huebinger R (2021) [31]	Retrospective cohort study N=18,488	OHCA cases in theTexas-Cardiac Arrest Registry to Enhance Survival (CARES) between 2014 and 2018	Compared with white neighborhoods, black neighborhoods had lower rates of AED use (OR 0.3; 95% CI 0.2-0.4), and Hispanic/Latino neighborhoods had lower rates of bystander CPR (OR 0.7; 95% CI 0.6-0.8), AED use (OR 0.4; 95% CI 0.3-0.6). Lower income was associated with a lower rates of bystander CPR (OR 0.8; 95% CI 0.7-0.8), AED use (OR 0.5; 95% CI 0.4-0.8). Lower high school graduation was associated with a lower rate of bystander CPR (OR 0.8; 95% CI 0.7-0.9) and AED use (OR 0.6; 95% CI 0.4-0.9). Higher unemployment was associated with lower rates of bystander CPR (OR 0.9; 95% CI 0.8-0.94) and AED use (OR 0.7; 95% CI 0.5-0.99).	Barrier: race/ethnic, poor neighborhoods, lower education attainment, and unemployment
Ishii M (2023) [3]	Cohort study N=354,409	Bystander-witnessed OHCA of cardiac origin between 2005 and 2020 in the All-Japan Utstein Registry	The rate of receiving public access defibrillation was significantly higher in males than in females (3.2% vs 1.5%; p < 0.001), while the rate of receiving bystander CPR was significantly lower in males than females (49.2% vs 54.1%; p < 0.001). The rate of receiving public access defibrillation and bystander CPR were higher in the reproductive age groups.	Sex, Age
Jensen TW (2023) [25]	Retrospective observational study N=15,097	OHCAs from the Danish Cardiac Arrest Register from 2016 to 2019.	A 5% increase in BLS course certificates at municipality level was significantly associated with an increased likelihood of bystander CPR prior to ambulance arrival with an aOR of 1.34 (95%CI; 1.02-1.76).	BLS training
Katasako A (2023) [4]	Retrospective cohort study N=21,868	OHCA witnessed by a bystander who had an initial shockable heart rhythm from the All-Japan Utstein Registry between 2017 and 2020	The proportion of patients who received PAD was significantly lower (20.3% vs 22.5%; p <0.001) during the pandemic year. There were no differences in the proportion of patients who received bystander-initiated chest compressions (67.0% vs 66.8%; p = 0.74)	COVID-19
Kim YS (2023) [5]	Retrospective observational study N=51,921	Adult OHCA cases recorded in the EMS-assessed cardiac arrest registry from 2019/01 to 2021/01.	The bystander CPR rate was higher in the COVID-19 period than in the non-COVID-19 period (60.8% vs 59.6%, p = 0.005)	COVID-19
Kurosaki H (2023) [6]	Retrospective cohort study N=751,617	OHCA cases from the All-Japan Utstein Registry between 2017 and 2020	The rates of bystander cardiopulmonary resuscitation (CPR) slightly increased in the pandemic year (54.1% vs. 55.3%, OR 1.05; 95%CI, 1.04-1.06), while the incidence of public access defibrillation (PAD) slightly decreased (1.8% vs. 1.6%, OR 0.89; 95%CI, 0.86–0.93)	COVID-19
Lee G (2023) [7]	Retrospective cohort study N=24,919	Adult bystander-witnessed OHCA patients with presumed cardiac etiology from January 2016 to December 2020 in the Korea national OHCA registry	Female bystanders were less likely to perform bystander CPR than male bystanders (68.0% vs. 78.8%, aOR 0.62; 95%CI, 0.58-0.66).	Barrier: female bystander
Leung KY (2023) [8]	Retrospective cohort study N=3,687	OHCA cases during pre-pandemic (2018 to 2019), low-incidence pandemic (2020 to 2021) and high-incidence pandemic (Jan to Mar 2022) from the New Territories West Cluster in Hong Kong	During the pandemic, there were more indoor OHCA (89.3% vs 92.6% vs 97.4%, p < 0.001), fewer witnessed arrest (38.5% vs 38.3% vs 29.6%, p = 0.001). There was a higher proportion of OHCA cases with bystander-CPR (26.1% vs 31.3% vs 35.3%, p < 0.001).	COVID-19
Liu N (2022) [9]	Cohort study N=56,192	Adult non-traumatic OHCA patients (≥18 years) in the Pan-Asian Resuscitation Outcomes Study (PAROS) registry between 2009 and 2018	In multivariable logistic regression, females less likely to receive BCPR than males in public locations (OR 0.89; 95% CI, 0.70-0.99), but more likely to receive BCPR at home (OR 1.16; 95% CI, 1.11-1.21).	Female sex

Lo CYZ (2023) [10]	Retrospective cohort study N=10,016	Adult, layperson witnessed, non-traumatic OHCA cases within the Singapore cohort of the Pan-Asian Resuscitation Outcomes Study registry between 2010 and 2020.	Bystander CPR administration was less likely for non-family witnessed OHCA (OR 0.83; 95% CI, 0.75-0.93). After location stratification, non-family witnessed OHCAs were less likely to receive bystander CPR in residential settings (OR 0.75; 95% CI, 0.66-0.85).	Barrier: non-family witnessed
Matsuyama T (2022) [11]	Observational study N=78,302	OHCA cases in the All-Japan Utstein Registry between 2005 and 2020	The proportion of patient who had PAD were 17.7% in 2019 and 15.1% in 2020, respectively. A significant reduction in the proportion of PAD was observed compared to that in 2019 (aOR, 0.86; 95% CI, 0.76–0.97)	COVID-19
Mody P (2021) [32]	Cohort study N=4,875	Patients successfully resuscitated from out-of-hospital cardiac arrest enrolled in the CCC trial (Trial of Continuous or Interrupted Chest Compressions during CPR)	Among OHCA cases, women received less bystander cardiopulmonary resuscitation (49.1% versus 54.9%, p<0.001).	Barrier: female sex
Munot S (2022) [37]	Cohort study N=16,914	OHCA cases in New South Wales between 2017 and 2019	Bystander CPR rates were lower (38%) in the most disadvantaged quintile and highest (42%) in the most advantaged SES quintile, while the association between area-level SES and bystander CPR rate was not significant. Regional and remote areas had lower odds of bystander response compared with urban areas (aOR 0.74; 95%CI, 0.62-0.90, p<0.002)	Remoteness
Nishiyama C (2022) [12]	Cohort study N=4,791	OHCA cases treated by EMS personnel in Osaka City in 2019 and 2020	Bystander CPR was initiated significantly less frequently in 2020 than in 2019 (2019: 48.0%, 2020: 42.7%, p<0.001), particularly during the first and second wave, but not during the third wave of COVID-19. The public-access automated external defibrillator was less frequently applied during the first wave (2019: 12.6%, 2020: 9.9%, p=0.043), with no significant difference during the second wave and third wave.	COVID-19
Reuter PG (2021) [26]	Cohort study N=23,979	Adult OHCA patients from July 2011 to July 2018 form the OHCA French national registry.	The higher the area-level deprivation (using the French version of the European Deprivation Index), the less the proportion of bystander-initiated CPR (56% in Quintile 1 versus 48% in Quintile 5). In the multivariable analysis, bystander less often began CPR in areas with the highest deprivation level, compared to those with the lowest deprivation level (OR=0.69; 95%CI, 0.63-0.75).	Barrier: lower socioeconomic status
Shibahashi K (2022) [13]	Retrospective study N=6,343	OHCA cases from 2019 to 2020 in Tokyo, Japan	The witnessed arrest rates before and after the declaration of a state of emergency in 2020 were 42.5% and 45.1%, respectively. The bystander CPR rates before and after the declaration periods significantly increased from 34.4% to 43.9% in 2020, an 8.3% increase after adjusting for the trend in 2019.	COVID-19
Shida H (2022) [14]	Questionnaire survey N=1,220	Laypersons who had encountered emergency situations during the last 5 years	Among the psychological barriers, “fear of approaching a collapsed person” (adjusted odds ratio (aOR) 0.50; 95% CI, 0.32–0.79) and “difficulties in judging whether to perform any rescue actions” (aOR 0.63; 95% CI, 0.40– 0.99) were significantly associated with the performance of any rescue actions.	Barrier: Fear of approaching a collapsed person, difficulty in judging the condition
Souers A (2021) [15]	Retrospective study N=149,734	OHCA cases from National Emergency Medical Services Information System (NEMSIS) database	Compared to males, females received less bystander CPR (51.6% vs 53.2%, p < 0.001), and less AED placement (22.9% vs 24.6%, p<0.001).	Barrier: female sex
Stirparo G (2022) [27]	Retrospective observational cohort study N=25,512	Cardiac arrest cases in the Lombardy region between 2019 and 2020	During 2020, there was a reduction in CPRs performed by bystanders (OR = 0.94; 95% CI, 0.88–0.99, p = 0.029). Cardiac arrests occurred in public places with a mandatory PAD were strongly reduced (OR = 0.49; 95% CI, 0.44-0.55, p < 0.001).	COVID-19
Sutton TS (2023) [33]	Cross-sectional study N=2,809	OHCA patients submitted from Connecticut to the Cardiac Arrest Registry to Enhance Survival (CARES) between 2013 and 2021	Minorities had lower rates of bystander CPR (31.4% vs 39.1%, p = 0.002) and bystander AED placement with attempted defibrillation (10.5% vs 14.4%, p = 0.004)	Barrier: race/ethnic
Tanaka Y (2023) [16]	Retrospective study N=563,100	Emergency medical service-unwitnessed OHCA cases in elderly (≥65 years) in the All-Japan Utstein-style Registry between 2017 and 2020	During the pandemic year, the rates of bystander CPR (OR 1.04; 95% CI 1.03-1.06), while the incidence of public access defibrillation decreased (OR 0.88; 95%CI, 0.83-0.93).	COVID-19
Toy J (2023) [34]	Cross-sectional retrospective study N=207,134	OHCA cases from National Emergency Medical Services Information System (NEMSIS) database from the year 2021	The odds of AED use were lowest for American Indian/Alaskan Native persons (OR 0.62; 95% CI, 0.54-0.72) followed by Asian (OR 0.66; 95% CI, 0.60-0.72), Hispanic (OR 0.66; 95% CI, 0.63-0.69) and Native Hawaiian/Pacific Islander patients (OR 0.69; 95% CI, 0.57-	Barrier: race/ethnic

			0.83) when compared to White patients. Black patients had the highest odds of AED use (OR 1.10; 95% CI, 1.07-1.12).	
Toy J (2023) [35]	Cross-sectional retrospective study N=64,007	Adult witnessed non-traumatic OHCA cases from National Emergency Medical Services Information System (NEMSIS) database in 2021	Bystander CPR rates were 60% and 67% for the Black/Hispanic and White groups, respectively. The Black/Hispanic group had a decreased odds of receiving bystander CPR compared to the White group both in the home (aOR 0.77; 95% CI, 0.74-0.81) and in public (aOR 0.69; 95% CI, 0.64–0.76).	Barrier: race/ethnic
Ushimoto T (2022) [17]	Retrospective study N=74,684	Family-witnessed and friend/colleague-witnessed OHCA cases from the nationwide OHCA registry between 11 March 2010 and 1 March 2013	Bystander CPR rate during the disaster impact phase in the tsunami-affected prefectures in 2011 was significantly lower than that in 2010/2012 (42.5% vs 48.2%; aOR 0.82; 95% CI, 0.68-0.99).	Barrier: Large-scale disasters (The Great East Japan Earthquake in 2011)
Ushimoto T (2023) [18]	Retrospective study N=149,300	OHCA cases between 2017 and 2020 from the All-Japan Utstein-style Registry	Compared with pre-pandemic years (2017–2019), home-based OHCAs in 2020 increased (64.8% vs 62.3% (OR 1.12; 95% CI, 1.09-1.14), and bystander CPR rate was higher (52.3% vs 50.7% (OR 1.07; 95%CI, 1.04-1.09).	COVID-19
van Dongen LH (2022) [28]	Cross-sectional cohort study N=5,395	OHCA patients (aged ≥25) from the Dutch community-based OHCA registry	Increasing household income was associated with increased bystander CPR (Q4 (highest) vs Q1: 82.4% vs 75.6%, p<0.001)	Barrier: lower household income
Vogelsong MA (2021) [36]	Retrospective observational study N=2,407	Adult OHCA patients treated at 24 centers in Europe and the United States from 2012 to 2017. (The INTernational Cardiac Arrest Registry (INTCAR))	Compared to males, females received less bystander CPR (57.5% vs 63.2%, p = 0.01).	Barrier: female sex
Vu DH (2022) [19]	Prospective observational study N=101	OHCA patients admitted to five tertiary hospitals in the Hanoi area from 2018/06 through 2019/01	The reasons bystanders did not conduct CPR at the scene included "not recognizing the ailment as cardiac arrest" (60%), "not knowing how to perform CPR" (33%), and "being afraid of doing harm to patients" (7%)	Barrier: Not familiar with CPR
Yu JH (2021) [20]	Retrospective observational study N=1,192	OHCA cases from the Taichung OHCA registry system during the pandemic (2020) and the same period in 2019	Bystander cardiopulmonary resuscitation and defibrillation with automated external defibrillators were more common in 2020 (52.81% vs 65.76%, p<0.001%, and 23.51% vs 31.67%, p=0.001, respectively)	COVID-19

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

This evidence update revealed 37 new observational studies. Among them, 23 studies explored factors linked to bystander CPR or the use of AEDs. These factors had already been identified in the initial scoping review and the evidence update conducted in 2021. The remaining fourteen studies focused on aspects related to the COVID-19 pandemic. After reviewing these newly published studies, the evidence found does not trigger a change the treatment recommendation for willingness to provide CPR and/or defibrillation.

However, given the new evidence identified over the last years, a systematic review should be conduct, but the PICOST needs to be refined: In the past, this PICOST was about bystanders in real-life OHCA exploring factors linked to the likelihood or rate at which bystanders are engage in CPR. On the other hand, this review also included patients with OHCA who receive bystander CPR (e.g. during COVID-19 pandemic) with the thought that bystanders were less likely to perform CPR during the COVID-19 pandemic. Including such studies is acceptable in a broad evidence update to get as much evidence as possible.

To further investigate this issue, the TF needs to separate in a systematic review factors associated with OHCA patients receiving CPR (e.g. community level) and factors associated with bystanders performing CPR and AED use (e.g. personal level).

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2023 Evidence Update Worksheet

Implementation of guidelines in communities
EIT 6306

Worksheet author(s):Tasuku Matsuyama
Council: Japan Resuscitation Council
Date Submitted: 16/12/2023

PICO / Research Question:
Implementation of guidelines in communities (EIT 6306)

***Population*:** Within the general population of children and adults suffering an OHCA
***Intervention*:** Community initiatives to promote BLS implementation
***Comparison*:** Current practice
***Outcomes*:** Survival to hospital discharge with good neurological outcome, survival to hospital discharge, ROSC, time to first compressions, bystander CPR rate, and proportion of population trained
***Study design*:** RCTs and nonrandomized studies (non-RCTs, interrupted time series, controlled before-and-after studies, cohort studies) are eligible for inclusion.
***Time Frame*:** January 1, 2022 to November 14, 2023

Outcomes: As above
Type (intervention, diagnosis, prognosis): Intervention
Additional Evidence Reviewer(s): Kevin Nation, Ming-Ju Hsieh
Conflicts of Interest (financial/intellectual, specific to this question): None

Year of last full review: October 11, 2019
Last ILCOR Consensus on Science and Treatment Recommendation:
The treatment recommendation remains unchanged from 2015. We recommend implementation of resuscitation guidelines within organizations that provide care for patients in cardiac arrest in any setting (strong recommendation, very low quality of evidence).

2010/2015 Search Strategy:
2019 Search Strategy:
PubMed
• ((((("Heart Arrest"[Mesh] OR "heart arrest*"[TIAB] OR "cardiac arrest*"[TIAB] OR "cardiovascular arrest*"[TIAB] OR "cardiopulmonary arrest*"[TIAB] OR "cardio-pulmonary arrest*"[TIAB] OR "Out-of-Hospital Cardiac Arrest*"[Mesh] OR OHCA OR "Out of Hospital Cardiac Arrest*"[TIAB] OR "out-of-hospital cardiac arrest*" [TIAB] OR "Outside-of-Hospital Cardiac Arrest"[TIAB]) OR (resuscitation [Mesh] OR resuscitation* [TIAB] OR "cardiopulmonary resuscitation"[Mesh] OR "cardiopulmonary resuscitation"[TIAB] OR "Cardio-Pulmonary Resuscitation" OR "Cardio Pulmonary Resuscitation" OR CPR [TIAB] OR "Life Support Care"[Mesh] OR "Basic Cardiac Life Support" OR "basic life support" OR "Cardiac Life Support" [TIAB] OR "cardiorespiratory resuscitation"[TIAB] OR "Heart Massage*"[Mesh] OR “heart massage*”[TIAB] OR “cardiac massage*” [TIAB] OR “chest compression*”[TIAB] OR “cardiac compression*”[TIAB]) OR (defibrillators [Mesh] OR defibrillator* [TIAB] OR “automated external defibrillator*” OR AED OR “External Defibrillator*” OR “Electric Shock Cardiac Stimulator*” OR “Electric Defibrillation” OR Electric Countershock [Mesh] OR “Electrical Cardioversion*” [TIAB] OR “Cardiac Electroversion*”))AND (bystander*[TIAB] OR "first responder*"[TIAB] OR "first-responder*"[TIAB] OR Layperson*[TIAB] OR “lay people”[TIAB] OR “lay rescuer*”[TIAB] OR “lay public” OR witness*[TIAB] OR “non-healthcare professional” [TIAB])) AND (((community OR public OR local OR social OR population* OR citizen*) AND (initiative* OR intervention* OR action* OR participation OR involvement* OR engagement OR preparation* OR implement* OR project* OR strategy* OR program OR programs OR network* OR training* OR campaign* OR education OR coaching OR information* OR learning OR instruction* OR guidance* OR response* OR responsiveness OR reply OR reaction OR awareness OR alertness OR realization OR sensibility OR sensitivity OR consciousness) OR “community-based initiative*” OR “community-driven initiative*”)) • Search performed on 10/11/2019 • Filters: Only humans

Database searched: Pubmed
Date Search Completed: November 14, 2023

Search Results (Number of articles identified / number identified as relevant): 371/ 3 (1 SyR, none RCT, 2 observational Studies)

Inclusion Criteria:
1) Studies were eligible if they addressed the research question, reporting the impact of community initiatives (i.e. training, video-based CPR courses, media broadcasts, etc.) involving laypersons on OHCAs outcomes,
2) Peer reviewed journal papers,
3) Written in English
4) Involving human participants,
5) All study designs
Exclusion Criteria:
1) Studies not addressing the research question
2) Abstract only studies, To avoid overlapping with other PICOs:
3) PAD programs or other AED dissemination and deployment programs including use of drones,
4) Dispatched and/or Telephone CPR including use of Apps for FR dispatch and/or AED localization,
5) Impact of social or economic factors in bystander's engagement, including geographical areas, neighborhoods differences, ethnic background,
6) Effect of different CPR Techniques or protocols including changes in resuscitation guidelines

Link to Article Titles and Abstracts (if available on PubMed):
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8722303/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10060744/
<Systematic Review>
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10290111/

Summary of Evidence Update:
Evidence Update Process for topics not covered by ILCOR Task Forces
This evidence update process is only applicable to PICOs which are *not* being reviewed as ILCOR systematic and scoping reviews.

Relevant Guidelines or Systematic Reviews

Organisation (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
Simmons, 2020 [1]	Systematic Review	P: OHCA patients I: Community-based interventions defined as initiatives with a goal of increasing rates of bystander-CPR or bystander-AED use among the lay population C: None O: survival to hospital discharge or 30 days and bystander CPR.	16	The meta-analysis showed that, community-based interventions with and without health system interventions were consistently associated with improved OCHA outcomes, rates of bystander-CPR, bystander-AED use, survival, and survival with a favorable neurological outcome. Bystander CPR in 14 studies showed a significant increase in post-intervention bystander-CPR rates (n = 285 752; OR 2.26 [1.74, 2.94]; I^2 = 99%), and bystander AED use (n = 37 882; OR 2.08 [1.44, 3.01]; I^2 = 54%). Survival in 10 studies: pooling survival to hospital discharge and survival to 30 days (n = 79 206; OR 1.59 [1.20, 2.10]; I^2 = 95%).	NA

Nonrandomized Trials, Observational Studies

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Patient Population Inclusion Criteria	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
Tiwari, 2023 [2]	**Cross sectional**	The participating councils and organizations self-reported their major online and in-person activities with the number of people trained and reached through social media, television, radio and print media.	International Liaison Committee on Resuscitation launched the World Restart a Heart initiative on October 16, 2018. In 2021 more than 2,200,000 persons were trained and at least 302,000,000 people were reached by WRAH global collaboration through print and digital media making it the highest-impact year since its inception.	2021 was the highest-impact year since WRAH day inception. Although 16th October is WRAH day, the real success of WRAH is when it becomes a year-round activity in all countries.
Findlay, 2022 [3]	**Retrospective cohort study** **I**: the implementation of a lay neonatal resuscitation program **C**: no program **Study setting and period**: the Arcahaie region of Haiti from July 2015 to May 2019.	Women coming through clinic in the second half of their pregnancy, after 20 weeks by last menstrual period. Additional participants were recruited as the community health workers checked on the population who they are charged for looking after.	Analysis included 536 births of which 84.3 % (n=452) were attended by someone trained in adapted Helping Babies Breathe (HBB). The odds of neonatal mortality was not significantly different among the two groups with or without programs (aOR=0.48 [0.16-1.44]). Composite outcome of neonatal health as reported by the mother (subjective morbidity and mortality) was significantly lower in adapted HBB attended births (aOR=0.31 [0.14-0.70]).	The aHBB program indicates that community training to laypersons in low resource settings may reduce neonatal ill-health but not neonatal mortality.

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

In 2021, ILCOR performed scoping review[4]. This EvUp focusing on articles published in 2022 and 2023 identified two relevant articles[2,3]. We found no randomized controlled trials in our search. The second article focused on neonatal resuscitation in low-resource settings. It reported a positive impact of community interventions on bystander responses, but found no significant effect on critical outcomes such as survival rates[2]. The other article, published by the International Liaison Committee on Resuscitation (ILCOR), investigated the effects of the World Restart a Heart (WRAH) initiative. This study demonstrated that the WRAH campaign enabled at least 302 million people to receive CPR training[3]. However, these additional pieces of evidence do not warrant a systematic review or lead to a modification of current ILCOR recommendations.

Reference list

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Evidence Update Worksheet

Debriefing of resuscitation performance
EIT 6307

Worksheet author(s): Taylor Sawyer, Alexander Olaussen, Natalie Anderson
Task Force: EIT
Date Submitted to SAC rep for peer review and approval:
SAC rep:

PICOST / Research Question: ***(Attach SAC representative approved completed PICOST template)***
EIT 6307: Debriefing of Resuscitation Performance

- Population: Among healthcare providers performing resuscitation in any setting
- Intervention: does clinical event debriefing
- Comparator: compared with no debriefing
- Outcome: improve resuscitation skills performance in actual resuscitations, quality of resuscitation skill, quality of resuscitation (e.g., reduce hands-off time, allowing for continuous compressions), and cognitive knowledge, or survival outcomes in actual resuscitation).

Year of last full review: (*insert year where this PICOST was most recently reviewed)* 2020

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

EIT 645: Debriefing of Resuscitation Performance (SysRev, 2020):
Consensus on Science: There were no studies comparing briefing as an intervention. For debriefing, data from 3 in-hospital observational before-and-after studies (2 in adults {Edelson 2008 1063; Couper 2016 130} and 1 in pediatrics {Wolfe 2014 1688}), involving a total of 591 patients, and data from 1 out-of-hospital observational before-and-after study in adults{Bleijenberg 2017 1}, involving a total of 124 patients, was analyzed. All studies included data-driven debriefing interventions using CPR quality metrics such as chest compression depth, chest compression rate, or CCF.

For the critical outcome of survival with favorable neurological outcome, we identified very low-certainty evidence (downgraded for inconsistency, indirectness, and imprecision) from 2 observational studies {Wolfe 2014 1688; Couper 2016 130} including 367 patients. One study {Wolfe 2014 1688} demonstrated significantly increased survival with favorable neurological outcome from the use of the intervention compared with no debriefing, while the other {Couper 2016 130} demonstrated no significant improvement from the use of the intervention compared with no debriefing. Meta-analysis demonstrates no significant effect from the use of debriefing compared with no debriefing on this outcome (RR, 1.41; 95% CI, 0.86–2.32; P=0.18; I2=28%).

For the critical outcome of survival to discharge, we identified very low-certainty evidence (downgraded for indirectness and imprecision) from 4 observational studies {Edelson 2008 1063; Wolfe 2014 1688; Couper 2016 130; Bleijenberg 2017 1} including 715 patients. One study {Wolfe 2014 1688} reported a trend toward improved survival to hospital discharge from the use of the intervention compared with no debriefing, while 3 other studies {Edelson 2008 1063; Couper 2016 130; Bleijenberg 2017 1} demonstrated no improvement in survival to hospital discharge from the use of the intervention compared with no debriefing. Meta-analysis demonstrates a significant effect from the use of debriefing compared with no debriefing on this outcome (RR, 1.41; 95% CI, 1.03–1.93; P=0.03; I2=0%).

For the critical outcome of ROSC, we identified very low-certainty evidence (downgraded for inconsistency, indirectness, and imprecision) from 3 observational studies {Edelson 2008 1063; Wolfe 2014 1688; Couper 2016 130} including 591 patients. One study {Edelson 2008 1063} reported improved ROSC from the use of the intervention compared with no debriefing, while the other 2 studies {Wolfe 2014 1688; Couper 2016 130} reported no improvement in ROSC from the use of the intervention compared with no debriefing. Meta-analysis demonstrates a significant effect from the use of debriefing compared with no debriefing on this outcome (RR, 1.18; 95% CI, 1.03–1.44; P=0.02; I2=0%).

For the critical outcome of chest compression depth (mean depth), we identified very low-certainty evidence (downgraded for inconsistency and indirectness) from 3 observational studies {Edelson 2008 1063; Wolfe 2014 1688; Couper 2016 130} including 591 patients. One study {Edelson 2008 1063} reported improved mean chest compression depth from the use of the intervention

compared with no debriefing, and a second study {Couper 2016 130} demonstrated no improvement in mean chest compression depth from the use of the intervention compared with no debriefing. A third study {Wolfe 2014 1688} that reported improved compliance with chest compression depth targets from the use of the intervention compared with no debriefing was not included in the meta-analysis because of differing outcome measures. Meta-analysis of 2 studies {Edelson 2008 1063; Couper 2016 130} demonstrated a significant effect from the use of debriefing compared with no debriefing on this outcome (mean difference, 4.00 mm; 95% CI, 0.18–7.82; I2=79%).

For the critical outcome of chest compression rate (mean rate), we identified very low-certainty evidence (downgraded for inconsistency and indirectness) from 4 observational studies {Edelson 2008 1063; Wolfe 2014 1688; Couper 2016 130; Bleijenberg 2017 1} including 715 patients. Two studies {Edelson 2008 1063; Bleijenberg 2017 1} reported improved mean chest compression rate from the use of the interventions compared with no debriefing, while a third study {Couper 2016 130} demonstrated no improvement in mean chest compression rate from the use of the intervention compared with no debriefing. The last study {Wolfe 2014 1688} reported improved compliance with chest compression rate targets from the use of the intervention compared with no debriefing but was not included in meta-analysis because of differing outcome measures. Meta-analysis of 3 studies {Edelson 2008 1063; Couper 2016 130; Bleijenberg 2017 1} demonstrates no significant effect from the use of the intervention compared with no debriefing on this outcome (mean difference, 5.81 bpm; 95% CI, -0.08 to 11.70; I2, 91%).

For the critical outcome of CCF, we identified very low-certainty evidence (downgraded for risk of bias, inconsistency, indirectness, and imprecision) from 2 observational studies {Couper 2016 130; Bleijenberg 2017 1} including 397 patients. Whereas one study {Bleijenberg 2017 1} demonstrated improved CCF from the use of debriefing compared with no debriefing, the other {Couper 2016 130} did not. Meta-analysis of these studies demonstrates no significant effect from the use of the intervention compared with no debriefing on this outcome (mean difference, 4.11%; 95% CI, -1.17 to 9.39; I2, 89%).

Treatment Recommendations

- We suggest data-driven, performance-focused debriefing of rescuers after IHCA for both adults and children (weak recommendation, very low-certainty evidence).
- We suggest data-driven, performance-focused debriefing of rescuers after OHCA in both adults and children (weak recommendation, very low-certainty evidence).

Search Strategy:

PubMed (222)
(resuscitation[mesh] OR resuscitat*[tiab] OR cardiopulmonary resuscitation[Mesh] OR "cardiopulmonary resuscitation*"[tw] OR "cardio-pulmonary resuscitation*"[tw] OR CPR[TIAB] OR heart arrest[Mesh] OR "heart arrest"[TIAB] OR "cardiac arrest"[TIAB] OR “cardiopulmonary arrest” OR “cardio-pulmonary arrest” OR "asystole"[TW] OR "pulseless electrical activity"[TW] OR "ventricular fibrillation"[TIAB] OR Ventricular Fibrillation[Mesh] OR "mouth to mouth"[tiab] OR "advanced cardiac life support"[TIAB] OR "advanced life support"[TIAB] OR "basic life support"[TIAB] OR ACLS[TIAB] OR “ALS”[tiab] OR "BLS"[tiab] OR "BCLS"[tiab]) AND (debrief*[TW] OR feedback[Mesh] OR "formative feedback"[Mesh] OR feedback*[tiab] OR "after action review"[TW] OR "performance evaluation"[TW] OR "performance review"[TW]) NOT (animals[Mesh] NOT humans[Mesh]) NOT (training[ti] OR simulation[ti] OR “amyotrophic lateral sclerosis”) AND 2021/11/05:2024/01/04[dp]

Database searched: PubMed
Time Frame: Nov. 5 2021 to Jan 4, 2024
Date Search Completed: Jan 4, 2024
Search Results (Number of articles identified and number identified as relevant): 222 articles identified, 216 studies were irrelevant, 6 full texts assessed, 6 excluded (wrong outcome, study design, intervention), no studies included. No RCT was identified.

Summary of Evidence Update:

This EvUp search found no relevant studies published since the last 2021 EIT and NLS reviews.

Relevant Guidelines or Systematic Reviews

Author; Year Published 1st page number	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations

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)

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

Treatment Recommendations: No change in ILCOR treatment recommendations resulted from this EvUp. This EvUp did not find substantial new evidence to recommend consideration of a SysRev.

There continue to be several knowledge gaps in the published literature, which include:

- Effects of debriefing in isolation from other interventions.
- Effects of debriefing on important short- and long-term clinical outcomes of resuscitation including return of spontaneous circulation, survival-to-discharge, or favorable neurological outcome at discharge.
- Effects of debriefing facilitator training on outcomes of resuscitation.
- Effects of various specifications of debriefing, such as the format (group configuration, location, etc.), the timing (immediately after the event (hot debriefing) versus remote from event (cold debriefing), use of quality metrics (data-driven vs. non-data-driven), optimal length of debriefing, and facilitation (facilitated vs. non-facilitated debriefings).
- Emotional and psychological side effects of clinical event debriefing, including their incidence and nature.

Evidence Update Worksheet

CPR feedback devices during resuscitation training

EIT 6404 (former 648)

Worksheet author(s): Yiqun Lin (Jeffrey)
Task Force: EIT
Date Submitted to SAC rep for peer review and approval: Dec 4, 2023
SAC rep: Judith Finn, Joyce Yeung

PICOST / Research Question: ***(****EIT 6404 (former 648) – CPR feedback devices during resuscitation training****)***
Population: People who are receiving resuscitation training
Intervention: Use of CPR feedback/guidance device during resuscitation training
Comparison: No use of CPR feedback/guidance device during resuscitation training
Outcomes:

1. Patient survival [CRITICAL]
2. Quality of performance in actual resuscitations [CRITICAL]
3. Skill retention (performance after course conclusion) [IMPORTANT]
4. Skill acquisition (performance at course conclusion) [IMPORTANT]
5. Knowledge at course conclusion [IMPORTANT]

Study design: Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) were eligible for inclusion. Unpublished studies (e.g., conference abstracts, trial protocols), animal studies, and case series, were excluded.
Timeframe: All languages were included if there is an English abstract. The search was run to include studies published between 3 Oct 2022 and Oct 30, 2023.
Year of last full review: 2020 SyR (Search run in Jul 2019)

Current ILCOR Consensus on Science and Treatment Recommendation for this PICOST:
We suggest the use of feedback devices that provide directive feedback on compression rate, depth, release, and hand position during CPR training (weak recommendation, low certainty evidence). If feedback devices are not available, we suggest the use of tonal guidance (examples include music or metronome) during training to improve compression rate only (weak recommendation, low-certainty evidence).

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

1. exp Feedback/
2. exp Feedback, Sensory/
3. feedback.tw,kf.
4. guidance.tw,kf.
5. prompt*.tw,kf.
6. real-time.tw,kf.
7. qcpr.tw,kf.
8. "Q-CPR".tw,kf.
9. "audiovisual aids".tw,kf.
10. metronome.tw,kf.
11. "audio-visual aids".tw,kf.
12. exp Smartphone/
13. smartphone.kf,tw.
14. apps.tw,kf.
15. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14
16. exp Cardiopulmonary Resuscitation/
17. CPR.kf,tw.
18. "cardiopulmonary resuscitation".tw,kf.
19. exp Resuscitation/
20. resuscitation.kf,tw.
21. "life support".kf,tw.
22. BLS.kf,tw.

23. ACLS.tw,kf.
24. PALS.kf,tw.
25. exp Heart Arrest/
26. "cardiac arrest".kf,tw.
27. "mock code".kf,tw.
28. 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27
29. exp Learning/
30. course.kf,tw.
31. exp Teaching/
32. exp Education, Medical/
33. exp Simulation Training/
34. exp High Fidelity Simulation Training/
35. simulat*.kf,tw.
36. train*.kf,tw.
37. learn*.kf,tw.
38. 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37
39. 15 and 28 and 38

Database searched: Medline on OVID platform
Search strategy developed by Jeffrey Lin with support from Caitlin McClurg (Librarian, Health Science Library at University of Calgary)

Time Frame: (new PICOST) – Last search conducted on Oct 3, 2022**. Current search** From Oct 2022 to Oct 2023
Date Search Completed: Oct 30, 2023
Search Results (Number of articles identified and number identified as relevant): 541 identified / 5 relevant

Summary of Evidence Update:
Of the 5 relevant papers, 4 randomized trials and 1 observational study was identified.

Two of the randomized trials examined the effect of feedback devices used in BLS training in healthcare providers and no feedback was available during the assessment of learning (Lee 2023, Ghaderi 2023). Both studies examine the CPR quality at the conclusion of the course and favored the use of CPR feedback device during training. Lee et al examined the long-term skill retention at 3 months and concluded that nurses trained with CPR feedback devices were superior to those who were trained with instructor-based feedback. Both studies indicated that CPR skills trained with feedback devices were transferred when feedback was not available.
In the other three studies, feedback devices were used during simulation-based training (i.e. simulated cardiac arrest and mock codes). Jeffers et al compared the CPR performance using augmented reality (AR) assisted feedback to CPR performance without feedback and concluded that AR-assisted feedback result in significantly better performance in all metrics of CPR quality (Jeffers et al 2022). The other RCT showed that infant CPR performance with real-time feedback in a simulated infant cardiac arrest was similar to the performance when CPR feedback was absent. (Ghazali 2023).

In an observational study, Frazier showed that when a defibrillator with CPR feedback features, code teams managed to achieve higher proportion of adherence to AHA guidelines for chest compression rate and chest compression fraction (Frazier 2022).

RCT: 5

Study Acronym; Author; Year Published, 1st page number	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
Lee et al. 2023: 124: 105755	Aims: To compred the effects of real-time device-based visual feedback and conventional instructor-based	Registered nurses	Intervention: BLS training with CPR feedback devices (n=49) Comparator:	Skill Acquisition (At conclusion of course) Mean difference (95%CI): CC rate compliance: 24.47 (16.55, 32.40) %	Conclusion: Compared to instructor-based feedback, real-time feedback device improved chest compression quality

	feedback on chest compression skills Type: RCT Size: N = 98		BLS training with instructor feedback (n=49)	CC depth compliance: 19.63 (11.13, 28.14) % CC recoil compliance: 11.52 (4.49, 18.54) % Compression score: 32.02 (23.60, 40.44) % All p-values < 0.001 Skill Retention (12 weeks) Mean difference (95%CI): CC rate compliance: 21.66 (13.19, 30.13) %, p < 0.001 CC depth compliance: 21.32 (12.59, 30.05) %, p < 0.001 CC recoil compliance: 7.83 (0.36, 15.30) %, p = 0.04 Compression score: 28.06 (18.94, 37.20) %, p < 0.001	both at the conclusion of the training and 3-month retention. Limitations: -No major concerns Adverse Events: -No adverse events reported
Ghaderi et al 2023: 23: 62	Aims: To compare the effect of real-time feedback and debriefing by video recording on basic life support skill in nursing students Type: RCT Size: N=74	Nursing students	Intervention: BLS training and practice with real-time feedback devices (n = 37) Comparator: BLS training and practice with video-assisted debriefing. (n=35)	Skill Acquisition: CC depth compliance: Control vs intervention: 49.05±37.22% vs 76.66±22.65, p = 0.003 CC rate compliance Control vs intervention: 48.08 ±32.04 vs 60.54±19.60, p =0.139 CC recoil compliance Control vs Intervention: 71.52±25.86 vs 78.06±19.65	Conclusion: Compared to video assisted debriefing, training with CPR feedback device led to better chest compression depth compliance. Limitations: -Risk of bias due to lack of randomization details. -Small sample size Adverse events: -No Adverse events reported.
Ghazali 2023 (p36-44)	Aims: To evaluate the effectiveness of a performance aid (feedback device) on CPR quality during pediatric CPR Type: RCT	Pediatric nurses	Intervention: Pediatric CPR in an infant cardiac arrest scenario with feedback device (n=16) Comparator: Pediatric CPR in an infant cardiac	Skill performance: No feedback vs with feedback: Mean Rate: 118.9 ± 9.6 vs 111.8 ± 8.6 Mean Depth: 40.9±2.6 vs 41.1±3.2	Conclusion: The use of feedback device improves the pediatric (infant) CPR performance in simulated pediatric cardiac arrest. Limitations -Small sample size

	Size: N = 46 (3 groups) Only 2 groups (n=32) relevant to the research question reviewed		arrest sceanrio without feedback device (n=15)	Depth compliance: 84.1±25.4 vs 88.6±23.1 Recoil Compliance: 80.1±25.7vs 90.8±10.8 p-values: NA	-Risk of bias due to lack of randomization details -Two groups not treated equally. Intervention group assessed with feedback available.
Jeffers et al. 2022	Aims: To compare the use of AR-assisted CPR feedback versus CPR training with no feedback Type: RCT N = 34	Healthcare providers and HCP students	Intervention: 2-min CPR with AR-assisted feedback N=16 Comparator: 2-min CPR on manikin with no feedback (N=18)	Percentage of excellent rate: Control vs intervention: 76% vs 90%, p = 0.056 Percentage of good depth: Control vs intervention: 21% vs 79%, p < 0.001 Percentage of excellent CC: control vs intervention: 17% vs 73%, p < 0.001	AR-assisted feedback improved the CPR performance. Limitation: -Small Sample size -Risk of bias (no description of randomization process) -Brief training session -Two groups not treated equally, One groups assessed with feedback available, the other groups assessed without feedback
Frazier et al 2022 (e993)	Aims: To assess the effectiveness of a defibrillators with real-time feedback during code team training to improve adherence to AHA resuscitation guideline. Type Observational (pre-post comparison) N=54 (simulations)	Population: Pediatric code teams	Intervention: Mock pediatric codes managed with defibrillators with CPR feedback features. (n=36) Comparators: Mock pediatric codes managed with regular defibrillators (no CPR feedback) (n=18)	Sessions meeting AHA compression rate guidelines: Control vs intervention: 72% vs 100%, p = 0.003 Sessions meeting AHA CCF guidelines: Control vs intervention: 77,8% vs. 97.2%, p = 0.04	Conclusion: The use of real-time feedback defibrillators improved the adherence AHA guidelines Limitations -Non-randomization -small sample size -generalizability Adverse effects -No adverse effects reported.

Reviewer Comments: *(including whether this PICOST should have a systematic or scoping review*)
Overall, the studies are consistent with the previous literature review and continue to support the use of CPR feedback devices during resuscitation training. This EvUp triggers a new systematic review and a formal systematic review with meta-analysis is working in progress.

Reference list:

Lee et al. 2023: 124: 105755 Using real-time device-based visual feedback in CPR recertification programs: A prospective randomised controlled study - PubMed (nih.gov)

Ghaderi et al 2023: 23: 62 Comparison of real-time feedback and debriefing by video recording on basic life support skill in nursing students - PubMed (nih.gov)

Ghazali 2023: 36 Effect of real-time feedback device compared to use or non-use of a checklist performance aid on post-training performance and retention of infant cardiopulmonary resuscitation: A randomized simulation-based trial - PubMed (nih.gov)

Jeffers 2022: 100273 Paediatric chest compression performance improves via novel augmented-reality cardiopulmonary resuscitation feedback system: A mixed-methods pilot study in a simulation-based setting - PubMed (nih.gov)

Frazier 2022: e993 Improving CPR Quality by Using a Real-Time Feedback Defibrillator During Pediatric Simulation Training - PubMed (nih.gov)

Evidence Update Worksheet

Blended Learning Approach
EIT 6409

Worksheet author(s): Cristian Abelairas-Gómez; Andrew Lockey

Council: ERC

Date Submitted: October 2023

PICO / Research Question: EIT 6409

Question: ***Does blended learning approach, as opposed to a non-blended learning approach, affect knowledge and skills acquisition and retention, participants satisfaction and resource outcomes?***

Population: Participants undertaking an accredited life support course (e.g. BLS, ALS, PALS, ATLS)
Intervention: Blended learning approach
Comparator: Non blended learning approach (stratified to subgroups of online only and face-to-face only)
Outcomes: Knowledge acquisition (end of course, 6 months, 1 year), skills acquisition (end of course, 6 months, 1 year), participant satisfaction (end of course), patient survival, implementation outcomes (cost, time needed)
Study Designs: Randomized controlled trials (RCTs), non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies, and case series where n ≥ 5) and manikin studies were eligible for inclusion.
Timeframe: The literature was searched from Aug 1, 2021 to Sept 22, 2023

PROSPERO Registration: CRD42022274392 (Last SyR; Elgohary et al. 2022)

Outcomes: As above
Type (intervention, diagnosis, prognosis): Intervention
Additional Evidence Reviewer(s): None
Conflicts of Interest (financial/intellectual, specific to this question): None
Year of last full review: SyR 2021

Last ILCOR Consensus on Science and Treatment Recommendation: (2022 EIT International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations)

Blended-learning is recommended as opposed to non-blended approach for life support training when resources and accessibility permit its implementation (strong recommendation, very low–certainty evidence).

2021 Search Strategy (SysRev): Database searched: EMBASE.com (which includes all journals in Medline), CINAHL, Cochrane Reviews, and Cochrane Central Register of Controlled Trials (CENTRAL). Date Search Completed: 6 Aug 2021 Literature search was from January 1, 2000.

1. 'advanced life support':ti,ab OR 'advanced cardiac life support':ti,ab OR 'advanced trauma life support':ti,ab OR 'basic life support':ti,ab OR cpr:ti,ab OR resuscitation:ti,ab OR 'life saving':ti,ab OR (((neonatal OR newborn OR pediatric OR paediatric) NEXT/3 'life support'):ti,ab)
2. (acls:ti OR als:ti OR arni:ti OR atls:ti OR bls:ti OR epals:ti OR epls:ti OR nls:ti OR nrp:ti OR pals:ti) AND ('life saving':ti,ab,kw,de OR 'life support':ti,ab,kw,de)

3. ‘advanced cardiac life support’/de OR ‘advanced life support’/de OR ‘advanced trauma life support’/de OR ‘basic life support’/de OR ‘pediatric advanced life support’/de OR ‘newborn resuscitation’/de
4. ‘resuscitation’/de AND (train*:de OR learn*:de OR course$:de OR teach*:de OR program*:de OR educat*:de OR student:de)
5. #1 OR #2 OR #3 OR #4
6. train*:ti OR pretrain*:ti OR ‘pre-train*’:ti OR learn*:ti OR prelearn*:ti OR ‘pre-learn*’:ti OR course$:ti OR precourse$:ti OR ‘pre-course$’:ti OR teach*:ti OR program*:ti OR educat*:ti
7. ‘continuing education’/de OR ‘education program’/de OR ‘education’/de OR ‘learning’/de OR ‘outcome of education’/de OR ‘teaching’/de OR ‘vocational education’/de
8. ‘allied health education’/de OR ‘clinical competence’/de OR ‘clinical education’/de OR ‘emergency medical services education’/de OR ‘medical education’/de OR ‘nursing education’/de OR ‘paramedical education’/de
9. #6 OR #7 OR #8
10. #6 AND (computer:ti,ab OR ‘educational technology’:ti,ab OR ‘e learning’:ti,ab OR electronic:ti,ab OR game$:ti,ab OR gamified:ti,ab OR online:ti,ab OR simulation:ti,ab OR video:ti,ab OR virtual:ti,ab OR ‘web course’:ti,ab OR ‘web-based’:ti,ab)
11. ‘educational technology’/de OR ‘e-learning’/de OR ‘patient simulation’/exp OR ‘simulation training’/exp OR ‘computer assisted learning’/de OR ‘computer simulation’/de OR ‘virtual learning environment’/de
12. #10 OR #11
13. classroom:ti,ab OR ‘face-to-face’:ti,ab OR ‘in person’:ti,ab OR ‘self-directed’:ti,ab OR ‘self-learning’:ti,ab OR (((distance OR remote) NEAR/2 (learn* OR class OR classes)):ti,ab)
14. ‘classroom’/de OR ‘distance learning’/exp OR ‘self-directed learning’/de OR ‘face to face training’/de
15. #13 OR #14
16. blend*:ti,ab OR flip*:ti,ab OR invert*:ti,ab OR hybrid:ti,ab
17. ‘blended learning’/de OR ‘flipped classroom’/de
18. #16 OR #17
19. ‘educational model’:ti,ab OR ‘educational theory’:ti,ab OR ‘learning style’:ti,ab OR ‘learning theory’:ti,ab OR ‘teaching model’:ti,ab
20. ‘educational model’/de OR ‘educational theory’/de OR ‘learning style’/de OR ‘learning theory’/de OR ‘teaching model’/de
21. #19 OR #20
22. #5 AND #9 AND (#12 OR #15 OR #18 OR #21)
23. #22 NOT ([conference abstract]/lim OR [conference review]/lim OR [editorial]/lim OR [erratum]/lim OR [letter]/lim OR [note]/lim OR [book]/lim OR ‘case report’/de)
24. #23 AND [2000-2021]/py

Summary of 2021 search results (SyR)		
Database	**Date Searched**	**Results**
EMBASE	6 Aug 2021	1401
Cochrane Reviews	6 Aug 2021	41
Cochrane Central	6 Aug 2021	688
CINAHL	6 Aug 2021	819
	TOTAL after duplicates removed	**2420**

2023 Search Strategy (EvUp): Database searched: EMBASE and Medline: 22 Sept 2023

Literature search was from January 1, 2021.[1]

1. ("advanced life support" or "advanced cardiac life support" or "advanced trauma life support" or "basic life support" or cpr or resuscitation or "life saving" or ((neonatal or newborn or pediatric or paediatric) adj3 "life support")).ti,ab.
2. (acls or als or arni or atls or bls or epals or epls or nls or nrp or pals).ti. and ("life saving" or "life support").ti,ab,kw,hw.
3. "advanced cardiac life support"/ or "advanced life support"/ or "advanced trauma life support"/ or "basic life support"/ or "pediatric advanced life support"/ or "newborn resuscitation"/
4. "resuscitation"/ and (train* or learn* or course? Or teach* or program* or educat* or student).hw.
5. 1 or 2 or 3 or 4
6. (train* or pretrain* or "pre train*" or learn* or prelearn* or "pre learn*" or course? Or precourse? Or "pre course?" or teach* or program* or educat*).ti.
7. "continuing education"/ or "education program"/ or "education"/ or "learning"/ or "outcome of education"/ or "teaching"/ or "vocational education"/
8. "allied health education"/ or "clinical competence"/ or "clinical education"/ or "emergency medical services education"/ or "medical education"/ or "nursing education"/ or "paramedical education"/
9. 6 or 7 or 8
10. 6 and (computer or "educational technology" or "e learning" or electronic or game? Or gamified or online or simulation or video or virtual or "web course" or "web based").ti,ab.
11. "educational technology"/ or "e-learning"/ or exp "patient simulation"/ or exp "simulation training"/ or "computer assisted learning"/ or "computer simulation"/ or "virtual learning environment"/
12. 10 or 11
13. (classroom or "face to face" or "in person" or "self directed" or "self learning" or ((distance or remote) adj2 (learn* or class or classes))).ti,ab.
14. "classroom"/ or exp "distance learning"/ or "self-directed learning"/ or "face to face training"/
15. 13 or 14
16. (blend* or flip* or invert* or hybrid).ti,ab.
17. "blended learning"/ or "flipped classroom"/
18. 16 or 17
19. ("educational model" or "educational theory" or "learning style" or "learning theory" or "teaching model").ti,ab.
20. "educational model"/ or "educational theory"/ or "learning style"/ or "learning theory"/ or "teaching model"/
21. 19 or 20
22. 5 and 9 and (12 or 15 or 18 or 21)
23. 22 not ("conference abstract" or "conference review" or congress or editorial or erratum or "published erratum" or letter or note or book or "case report" or "case reports").pt.
24. limit #23 to yr="2021 -Current"
25. from #24 keep 1-488 [EMBASE records]
26. from #24 keep 489-935 [MEDLINE records]

Summary of 2023 search results (SyR)		
Database	**Date Searched**	**Results**
EMBASE	22 Sept 2023	488
Medline	22 Sept 2023	447
	TOTAL after duplicates removed	**597**

[1] The full year for 2021 was used to account for possible time delay in indexing and record entry into the databases.

Link to Article Titles and Abstracts (if available on PubMed):

PMID	Title	1st Author	Journal
37018023	The Effectiveness of Online-Only Blended Cardiopulmonary Resuscitation Training: Static-Group Comparison Study	Chong KM	Journal of Medical Internet Research (J Med Internet Res)

Summary of Evidence Update:

Evidence Update Process for topics not covered by ILCOR Task Forces

This evidence update process is only applicable to PICOs which are *not* being reviewed as ILCOR systematic and scoping reviews.

Relevant Guidelines or Systematic Reviews: 2

Organisation (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
ILCOR; Wyckoff; 2022	2022 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations: Summary From the BLS; ALS; PLS; NLS; EIT; and FA Task Forces	Blended learning for life support education (SysRev)	23	A blended-learning approach enables ongoing training in life support skills for those in remote locations and lower-resource settings and in times of pandemic. It may not be feasible in areas where access to online learning is limited or unavailable. Blended learning enables consistent messaging about content, which can be particularly beneficial for precourse preparation, and it reduces participant and stakeholder costs.	Blended-learning is recommended as opposed to non-blended approach for life support training when resources and accessibility permit its implementation (strong recommendation, very low–certainty evidence).

Elgohary; 2022	Blended learning for accredited life support courses – A systematic review	In participants undertaking an accredited life support course (P), does a blended learning approach (I), as opposed to a non-blended learning approach (C), affect the following outcomes: knowledge acquisition and retention, skills acquisition, and retention, participant satisfaction, and resource outcomes (O).	22	A blended learning approach to life support education is at least as effective as traditional face-to-face training regarding educational outcomes.	Combined with the lower ongoing costs for learners and stakeholders, the evidence suggests that a blended learning approach is a more efficient means of delivery for life support education

RCT: 0

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
	Study Aim: Study Type:	Inclusion Criteria:	Intervention: Comparison:	1° endpoint:	Study Limitations:

Nonrandomized Trials, Observational Studies: 1

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)**
Chong; 2023	**Study Type:** Cross-sectional cohort study; remote practice blended	**Inclusion Criteria:** No specified. Both healthcare and non-healthcare providers.	**Endpoint:** Primary: Little Anne QCPR manikin–rated chest compression score Secondary: The number of retakes of the final assessment	

	learning (BL) (n=52) vs Classroom-based blended learning (n=104)			
			Outcome measures: Performance of the BLS sequence and CPR in a manikin able to provide compression, release, depth, and rate data. Remote group carried out the assessment virtually and Classroom group in-situ **Results:** Remote BL and Classroom BL did not have significant differences in their QCPR manikin–rated chest compression release, depth, or rate scores: p=0.61, p=0.27, and p=0.83, respectively. The number of retakes of the final assessment was significantly higher in the Remote BL than the Classroom BL group (p<0.001)	**Conclusion:** Remote learning might be considered a reasonable alternative CPR training method when Blended Learning is not feasible.

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

There were 597 new articles identified of which 1 was relevant to the PICO.

Chong et al. 2023 aimed to study to types of BLS training: Classroom Blended Learning (CBL) and Remote Blended Learning (RBL). Both learning methods were composed by 3 parts: A) an online lecture session (same for both groups); B) instructor-led practice (CBL) and self-directed practice at home (RBL); C) final assessment (CBL: on-site; RBL: online). Fifty-two participants were included in RBL and 104 in CBL. CBL and RBL groups did not have significant differences in their QCPR manikin–rated chest compression release, depth, or rate scores: p=0.61, p=0.27, and p=0.83, respectively. The number of retakes of the final assessment was significantly higher in the RBL than the CBL group (p<0.001). In RBL, the participants' time spent on deliberate practice was significantly and positively correlated with their QCPR chest compression rate score (p=0.047).

On the basis of this one additional non-randomized study, we do not believe there is any justification for a fresh systematic review at this time. We recommend that the existing treatment recommendations for this PICO remain unchanged.

Reference List

3. Chong KM et al. The Effectiveness of Online-Only Blended Cardiopulmonary Resuscitation Training: Static-Group Comparison Study. J Med Internet Res. 2023;25:e42325. Doi: https://doi.org/10.2196/42325.

Evidence Update Worksheet

High-fidelity training for advanced life support courses

EIT 6410

Worksheet author(s): Sebastian Schnaubelt, Andy Lockey
Council: ERC
Date Submitted: 30 June 2023

PICO / Research Question:
High-fidelity training for advanced life support courses? EIT 6410

Population: For participants undertaking advanced life support training in an education setting
Intervention: does the use of high-fidelity manikins
Comparators: compared with the use of low-fidelity manikins
Outcomes: change improve patient outcomes, skill performance in actual resuscitations, skill/knowledge at 1 year, skill/knowledge at time between course conclusion and 1 year, skill/knowledge at course conclusion
Study design: Screening of and data extraction from: Guidelines, reviews, meta-analyses, randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies). Unpublished studies (e.g., conference abstracts, trial protocols) were excluded.
Time frame: All years (from 25 January 2021 – date of the last search) and all languages were included as long as there was an English abstract. The search was performed on 19 June 2023.

PROSPERO Registration:

Publication title: The use of high-fidelity manikins for advanced life support training--A systematic review and meta-analysis. Cheng A, Lockey A, Bhanji F, Lin Y, Hunt EA, Lang E. Resuscitation. 2015 Aug;93:142-9. doi: 10.1016/j.resuscitation.2015.04.004.
Publication date: 14 April 2015

Type (intervention, diagnosis, prognosis): Intervention
Additional Evidence Reviewer(s): none
Conflicts of Interest (financial/intellectual, specific to this question): None
Year of last full review: 2019

Last ILCOR Consensus on Science and Treatment Recommendation:
We suggest the use of high-fidelity manikins when training centers/organizations have the infrastructure, trained personnel, and resources to maintain the program (weak recommendations based on very-low-quality evidence). If high-fidelity manikins are not available, we suggest that the use of low-fidelity manikins is acceptable for standard ALS training in an educational setting (weak recommendations based on low-quality evidence).

Last Evidence Update Summary:
A systematic review of studies up until 2015 found a moderate benefit of high-fidelity training for skill improvement immediately following course completion. An Evidence Update in 2019 found additional RCTs with either no difference or improved knowledge retention. Since then, two RCTs strengthen the evidence towards slightly improved learning outcomes in high-fidelity groups. However, another RCT suggested possible over-confidence induced in participants. This evidence does not trigger another systematic review or a change in the wording / strength of recommendation or level of evidence.

2010/2015 Search Strategy: N/A
2019 Search Strategy: ((("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) AND (("resuscitation"[MeSH Terms] OR "resuscitation"[All Fields]) OR (("life"[MeSH Terms] OR "life"[All Fields]) AND support[All Fields]))) AND (simulator[All Fields] OR ("manikins"[MeSH Terms] OR "manikins"[All Fields] OR "mannequin"[All Fields]) OR ("manikins"[MeSH Terms] OR "manikins"[All Fields] OR "manikin"[All Fields]))) AND (fidelity[All Fields] OR high-fidelity[All Fields] OR (("physical examination"[MeSH Terms] OR ("physical"[All Fields] AND "examination"[All Fields]) OR "physical examination"[All Fields] OR "physical"[All Fields]) AND ("World AIDS Day Features"[Journal] OR "features"[All Fields])))

2021 Search Strategy:
((("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) AND (("resuscitation"[MeSH Terms] OR "resuscitation"[All Fields]) OR (("life"[MeSH Terms] OR "life"[All Fields]) AND support[All Fields]))) AND (simulator[All Fields] OR ("manikins"[MeSH Terms] OR "manikins"[All Fields] OR "mannequin"[All Fields]) OR ("manikins"[MeSH Terms] OR "manikins"[All Fields] OR "manikin"[All Fields]))) AND (fidelity[All Fields] OR high-fidelity[All Fields] OR (("physical examination"[MeSH Terms] OR ("physical"[All Fields] AND "examination"[All Fields]) OR "physical examination"[All Fields] OR "physical"[All Fields])))

2023 Search Strategy:
((("education"[Subheading] OR "education"[All Fields] OR "educational status"[MeSH Terms] OR ("educational"[All Fields] AND "status"[All Fields]) OR "educational status"[All Fields] OR "education"[All Fields] OR "education"[MeSH Terms]) AND (("resuscitation"[MeSH Terms] OR "resuscitation"[All Fields]) OR (("life"[MeSH Terms] OR "life"[All Fields]) AND support[All Fields]))) AND (simulator[All Fields] OR ("manikins"[MeSH Terms] OR "manikins"[All Fields] OR "mannequin"[All Fields]) OR ("manikins"[MeSH Terms] OR "manikins"[All Fields] OR "manikin"[All Fields]))) AND (fidelity[All Fields] OR high-fidelity[All Fields] OR (("physical examination"[MeSH Terms] OR ("physical"[All Fields] AND "examination"[All Fields]) OR "physical examination"[All Fields] OR "physical"[All Fields])))----------

Database searched: PubMed, Scopus, Embase
Date Search Completed: 19 June 2023
Search Results (Number of articles identified / number identified as relevant): 196, of which 2 are relevant
Inclusion/Exclusion Criteria: RCTs and nonrandomized studies (non-RCTs, interrupted time series, controlled before-and-after studies, cohort studies). Reviews were screened for additional literature were included. Letters, editorials, comments, case reports, studies not comparing high-fidelity training with lower-fidelity models (e.g., high-fidelity vs. no additional training) were excluded.

Link to Article Titles and Abstracts (if available on PubMed):
(1) https://pubmed.ncbi.nlm.nih.gov/33501814/
(2) https://pubmed.ncbi.nlm.nih.gov/34934879/

Summary of Evidence Update:
PubMed, Scopus and Embase were searched to identify eligible studies providing new information between 25/01/2021 and 19/06/2023. The same search strategy was used as in the last Evidence Update 2021. There were no duplicates, and 196 abstracts were independently screened by two reviewers. Most studies did not meet inclusion criteria, either due to not reporting on advanced life support, due to not comparing high-fidelity with low-fidelity training, or not being comparative at all. Two randomized controlled trials (1,2) were identified, whereas one was classified a “pilot study” by the authors (1). The pilot study concluded that no significant differences in CPR performance or participant confidence could be seen with a higher fidelity of surroundings. (1) The second RCT revealed higher competency in certain subcategories (checking airway, checking breathing, checking pulses, checking capillary refill) in working through a pediatric advanced life support scenario after training with a high-fidelity simulator as compared to a standard manikin. In terms of gained confidence between the two groups, the high-fidelity one showed higher confidence levels after the training in the questions concerning knowing the ALS algorithm, the ability to supervise/run a code, and the ability to treat respiratory arrest. (2)

Evidence Update Process for topics not covered by ILCOR Task Forces
Relevant Guidelines or Systematic Reviews (0)

Organisation (if relevant); Author; Year Published	Guideline or systematic review	Topic addressed or PICO(S)T	Number of articles identified	Key findings	Treatment recommendations
No new ones.					

RCT (2)

Study Acronym; Author;	Aim of Study;	Population	Study Intervention (# patients) /	Endpoint Results (Absolute Event Rates, P value; OR or RR; & 95% CI)	Relevant 2° Endpoint (if any);

Year Published	Study Type; Study Size (N)		Study Comparator (# patients)		Study Limitations; Adverse Events
Mather 2021 (1)	Total n=15	First-year undergraduate adult nursing students	Intervention (n=7): Scenario training (2 full cycles of chest compressions and bag-valve-mask ventilation) with increased fidelity (clothed manikin, props such as drips, immersive interactive technology involving video and sound projections to depict a real-life environment in a hospital) Controls (n=8): Same cenario training as in intervention group, but with a standard "blank" manikin and without additional surroundings	• Pre- and post-intervention self-report confidence questionnaire (numerical rating scale from 1 to 10 with 10 being most confident) – no significant differences between controls and intervention in the various questions (t=1.79, p=0.096; t=2.52, p=0.025; t=4.7, p=0646) • Manikin QCPR data on quality of compressions and ventilation (time to chest compression initiation: 28±6.9 seconds [controls] vs. 35±10.4 seconds [intervention], p not given but "not significant" // "quality of CPR score" 45±13.7 % [controls] vs. 40±? [SD not given] % [intervention], p=0.711 // "compression quality score" 33±19.9 % [controls] vs. 28±35 % [intervention], p=0.744 // "ventilation quality score" 82±19.6 % [controls] vs. 79±28.3 % [intervention], p=0.77).	• Secondary outcome: Additional statements to be rated (self-assessment of performance), no statistics reported • Small sample size ("pilot study") • Previous experience not taken into consideration
Tufts 2021 (2)	Total n=50	ACLS-certified third-year medical students	Intervention (n=27): High-fidelity simulator used during "code-training" (1-hour pediatric code lecture followed by 1-hour hands-on mock-code training; included chest compressions, intubation, and intraosseous line placement)	• Standardized code scenario after training, 11-item checklist of actions. Higher scores in checking the airway (27 vs. 12, p<0.0001), checking breathing (27 vs. 19, p=0.0384), checking pulses (26 vs. 11, p=0.0002), and checking capillary refill (21 vs. 5, p=0.0002) in the intervention group. *SDs not given.* • Pre- and post intervention confidence questionnaire (14 questions, 5-point Likert scale): Higher values post-training in the intervention	Different teaching styles not addressed, heterogenous instructor group.

			Controls (n=23): Traditional manikin used.	group in "I know the pediatric advanced life support algorithm" (4[4-4] vs. 1[1-2], p=0.0334), "Ability to supervise/run code" (3[3-4] vs. 1[1-2], p=0.0239), and "Ability to treat respiratory arrest" (4[4-4] vs. 2[1-3], p=0.0125).	

Nonrandomized Trials, Observational Studies (0)

Study Acronym; Author; Year Published	Study Type/Design; Study Size (N)	Population	Primary Endpoint and Results (include P value; OR or RR; & 95% CI)	Summary/Conclusion Comment(s)
No new ones.				

Abbreviations: RCT = randomized controlled trial; CPR = cardiopulmonary resuscitation; EMS = emergency medical services.

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

A systematic review of studies up until 2015 found a moderate benefit of high-fidelity training for skill improvement immediately following course completion. An Evidence Update in 2019 found additional RCTs with either no difference or improved knowledge retention. An Evidence Update in 2021 found additional literature reporting slightly improved learning outcomes in high-fidelity groups, but also potential over-confidence of participants. Since then, one RCT with limited quality suggested no difference, and another, slightly larger RCT showed higher competency and confidence levels after having trained with high-fidelity manikins. **This evidence does not trigger another systematic review or a change in the wording / strength of recommendation or level of evidence.**

References

1. Mather C, McCarthy R. Exploring the effects of a high-fidelity environment on nursing students' confidence and performance of CPR. Nurs Stand. 2021 Feb 3;36(2):76–82.

2. Tufts LM, Hensley CA, Frazier MD, Hossino D, Domanico RS, Harris JK, et al. Utilizing High-fidelity Simulators in Improving Trainee Confidence and Competency in Code Management. Pediatr Qual Saf. 2021;6(6):e496.