



An expert consensus–based checklist for quality appraisal of educational resources on adult basic life support: a Delphi study

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Objective Given the lack of a unified tool for appraising the quality of educational resources for lay-rescuer delivery of adult basic life support (BLS), this study aimed to develop an appropriate evaluation checklist based on a consensus of international experts.

Methods In a two-round Delphi study, participating experts completed questionnaires to rate each item of a predeveloped 72-item checklist indicating agreement that an item should be utilized to evaluate the conformance of an adult BLS educational resource with resuscitation guidelines. Consensus on item inclusion was defined as a rating of ≥ 7 points from $\geq 75\%$ of experts. Experts were encouraged to add anonymous suggestions for modifying or adding new items.

Results Of the 46 participants, 42 (91.3%) completed the first round (representatives of 25 countries with a median of 16 years of professional experience in resuscitation) and 40 (87.0%) completed the second round. Thirteen of 72 baseline items were excluded, 55 were included unchanged, four were included after modification, and four new items were added. The final checklist comprises 63 items under the subsections "safety" (one item), "recognition" (nine items), "call for help" (four items), "chest compressions" (12 items), "rescue breathing" (12 items), "defibrillation" (nine items), "continuation of CPR" (two items), "choking" (10 items) and "miscellaneous" (four items).

Conclusion The produced checklist is a ready-to-use expert consensus–based tool for appraising the quality of educational content on lay-rescuer provision of adult BLS. The checklist gives content developers a tool to ensure educational resources comply with current resuscitation knowledge, and may serve as a component of a prospective standardized international framework for quality assurance in resuscitation education.

Keywords Cardiopulmonary resuscitation; Education; Checklist; Standards; Airway obstruction

eISSN: 2383-4625

Received: 21 April 2023

Revised: 7 July 2023

Accepted: 28 July 2023

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How to cite this article:

Birkun A, Gautam A, Böttiger BW; the Delphi Study Investigators. An expert consensus–based checklist for quality appraisal of educational resources on adult basic life support: a Delphi study. Clin Exp Emerg Med 2023;10(4):400-409. <https://doi.org/10.15441/ceem.23.049>

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Capsule Summary

What is already known

The educational content of resuscitation-training resources commonly does not adhere to relevant guidelines, which define the state-of-the-art in resuscitation knowledge and recommend evidence-based practices for the management of cardiac arrest. While it is apparent that a standardized framework for systematic quality control and quality assurance for educational resources on resuscitation is necessary, no unified tool for evaluating the quality of educational content on resuscitation currently exists.

What is new in the current study

This study represents the first attempt to generate a checklist for appraising the quality of educational resources on basic life support based on an international expert opinion consensus achieved through the Delphi technique. The checklist could serve as a constituent element of a prospective standardized international framework for quality control and quality assurance in resuscitation education.

INTRODUCTION

A lack of knowledge and skills in cardiopulmonary resuscitation (CPR) and related fears of causing harm are major barriers to attempting to resuscitate a person who has suffered a cardiac arrest [1,2]. Effective education in resuscitation improves levels of confidence and the willingness of bystanders to perform CPR in actual cardiac arrest situations [3]. Interventions aimed at increasing the penetration of CPR training in communities reportedly enhance the likelihood of bystanders performing CPR and improve neurological outcomes and survival rates after an out-of-hospital cardiac arrest [4,5]. Training of laypeople in resuscitation is strongly endorsed by the scientific community [6–8].

In spite of the importance of widespread dissemination of resuscitation training, the prevalence of CPR knowledge among the general public is low in many regions of the world [9]. For people who have no opportunity to attend traditional instructor-led CPR training, self-directed CPR learning is currently recommended as a reasonable alternative [6]. Various digital resuscitation-training resources, including videos, online courses, computer games, and smartphone apps, are available for public use. However, studies have shown that the educational content of such resources often does not adhere to resuscitation guidelines based on state-of-the-art resuscitation knowledge and evidence-based cardiac arrest management practices [10–12]. Suboptimal guideline compliance has been also revealed in certified instructor-led basic life support (BLS) courses [13,14].

Although it is apparent that a standardized framework for systematic quality control and quality assurance for educational resources on resuscitation is necessary [10,15], no unified tool for evaluating the quality of educational content on resuscitation is currently available. This study aimed to develop an expert con-

sensus-based checklist for appraising the quality of educational resources on lay-rescuer delivery of adult BLS.

METHODS

The Delphi survey technique, a method of obtaining general consensus on a particular topic based on expert opinions collected through a series of structured questionnaires or "rounds," was used taking into account published practical guidance [16,17].

Expert recruitment

An informational letter explaining the study design and its aims was sent to experts, who were invited to participate through the European Resuscitation Council (ERC) Research NET, an international, interdisciplinary, and interprofessional group for the study of cardiac arrest and resuscitation [18]. Prospective participants were asked in an online questionnaire to provide data on their field of specialization, highest academic degree, number of years of professional experience in resuscitation, availability of provider or instructor certification(s) in CPR, familiarity with international resuscitation guidelines (self-rated on a 10-point Likert scale from 1 [not familiar at all] to 10 [have a thorough knowledge of]), prior participation in Delphi studies, country of residence, and affirm their willingness to participate by completing an electronic consent form using a Google form (Google LLC). All participating experts were asked if they wished to be acknowledged in the final publication. No limitations to the number or geographic location of participants were applied. Participating experts were blinded to each other's participation throughout the study.

Delphi procedure

A two-round Delphi exercise was carried out to create a consen-

sus-based checklist. Each round was conducted over a 2-week period. Within each round, two email reminders were sent to non-responders (on day 5 and day 11). If no response was received from an expert within the 2-week period, one additional attempt to obtain results was made immediately after the deadline in the form of a third email reminder.

In the first round, experts were asked via email to review a baseline checklist (Supplementary Material 1) and complete an offline questionnaire (Microsoft Excel table, Microsoft Corp), rating each checklist item by answering the following question "How much do you agree that this item should be utilized as part of the checklist for evaluating conformance of an adult BLS educational resource with resuscitation guidelines?" For the rating, a 9-point Likert scale was applied ranging from 1 (totally disagree) to 9 (totally agree). Experts were encouraged to add anonymous free-text comments and suggestions for modifying, removing, or adding new checklist items.

The baseline checklist (Supplementary Material 1) [12] was based on the 2020 International Consensus on CPR [19], ERC Guidelines 2021 [20], and ERC COVID-19 Guidelines [21] as a rework of the original structured 36-item checklist by Jensen et al. [14]. The baseline checklist contained 72 items grouped in 11 thematic subsections, including "safety" (one item), "recognition" (10 items), "call for help" (four items), "chest compressions" (11 items), "rescue breathing" (12 items), "defibrillation" (eight items), "continuation of CPR" (two items), "recovery position" (three items), "choking" (10 items), "COVID-19" (six items), and "miscellaneous" (five items).

Results of the first round were analyzed by applying the following criteria. Items that received the rating of ≥ 7 points from $\geq 75\%$ of experts were considered to have reached the consensus threshold for inclusion. Items on which expert consensus was achieved were subjected to a second round of evaluation without change, even if some suggestions for modification had been made. Items that received the rating of ≤ 3 points from $\geq 75\%$ of experts were considered to have reached a consensus threshold for exclusion and were excluded at this step. Items that did not reach a consensus threshold for either inclusion or exclusion were modified according to experts' comments (if a comment provided clear direction on how to modify an item) and carried forward to the second round. New items were added to the checklist when experts provided clear directions on how to formulate them. After the analysis, all experts received a personalized report with quantitative expert-group results, including each item's median, lowest, and highest ratings, their own ratings, and a summary of all modifications and anonymous comments. In the second round, all experts who completed the first round were contacted by email

with a request to review the adjusted checklist and complete a questionnaire by rating each checklist item (including new items) on the same scale, considering their previous rating, expert-group rating, all comments, and modifications to the checklist in the first round.

The results were analyzed after the second round was closed. Items that received a rating of ≥ 7 points from $\geq 75\%$ of experts were considered to have reached the consensus threshold for inclusion and were added to the final checklist. All other items were excluded. After the analysis, all experts received a report with the final results.

Data that support findings of this study, including tables with a summary of anonymized expert ratings and comments, calculated quantitative expert-group results, modifications to the checklist, and blank questionnaire forms, are openly available in the Mendeley Data repository as a dataset [22]. As the study used nonsensitive and anonymized data, it did not require ethical approval and received an institutional review board exemption.

Statistical analysis

Data analysis was carried out with IBM SPSS ver. 26 (IBM Corp) and involved descriptive statistics (median, interquartile range [IQR], and absolute and relative values).

RESULTS

A total of 46 individuals initially agreed to participate in the study. Of these, 42 (91.3%) completed the first round (in November 2022) and 40 (87.0%) completed the second round (in December 2022). Characteristics of participants who completed the first round are provided in Table 1. The expert group represented 25 countries on six continents. Most participants ($n = 35$, 83.3%) reported specializing in anesthesiology and/or intensive (critical) care and/or emergency medicine. Almost a third (31.0%) held a research doctoral degree ($n = 12$) or a higher-level doctorate ($n = 1$). The number of years of professional experience in resuscitation varied from 2 to 40 years (median, 16 years; IQR, 10–28 years). Most participants ($n = 35$, 83.3%) were certified as BLS providers and 30 (71.4%) were BLS instructors. The median self-rating of familiarity with international resuscitation guidelines (American Heart Association Guidelines, ERC Guidelines, International Consensus on CPR) on a 10-point scale was 9 (IQR, 9–10). Previous participation in a Delphi study was reported by 22 participants (52.4%).

In the first round, the median percentage of experts who assigned an item a rating of ≤ 3 points was 5% (IQR, 2%–7%; range, 0%–38%) and the median percentage of experts who gave an item ≥ 7 points was 83.0% (IQR, 76%–90%; range, 40%–100%).

Table 1. Characteristics of experts participating in the first round of the Delphi survey (n=42)

Characteristic	No. (%)
Country of residence	
Australia	1 (2.4)
Austria	1 (2.4)
Belgium	1 (2.4)
Canada	1 (2.4)
Cyprus	2 (4.8)
Denmark	1 (2.4)
France	2 (4.8)
Germany	5 (11.9)
Greece	4 (9.5)
India	1 (2.4)
Italy	3 (7.1)
Malta	1 (2.4)
Norway	1 (2.4)
Peru	1 (2.4)
Poland	1 (2.4)
Russia	3 (7.1)
Saudi Arabia	1 (2.4)
Serbia	1 (2.4)
Slovenia	2 (4.8)
South Africa	1 (2.4)
Spain	1 (2.4)
Sri Lanka	1 (2.4)
Switzerland	2 (4.8)
UK	3 (7.1)
USA	1 (2.4)
Field of specialization	
Anesthesiology	6 (14.3)
Anesthesiology and emergency medicine	1 (2.4)
Anesthesiology and intensive care	3 (7.1)
Anesthesiology, intensive care, and emergency medicine	1 (2.4)
Anesthesiology, intensive care, and medical education	1 (2.4)
Anesthesiology and medical education	1 (2.4)
Anesthesiology, resuscitation, and emergency medicine	1 (2.4)
Cardiac anesthesia and resuscitation education	1 (2.4)
Cardiology	2 (4.8)
Critical care nursing education	1 (2.4)
Critical care and prehospital emergency medicine	1 (2.4)
Emergency medicine	7 (16.7)
Emergency medicine and intensive care nursing	1 (2.4)
Emergency medicine and intensive care	1 (2.4)
Health economics	1 (2.4)
Intensive care	5 (11.9)
Intensive care and pedagogy	1 (2.4)
Internal medicine	1 (2.4)
Internal medicine, intensive care, emergency medicine	1 (2.4)
Lifesaving, BLS, and physical education	1 (2.4)
Medical education and emergency medicine	1 (2.4)
Nursing	1 (2.4)
Nursing, science, and education	1 (2.4)
Prehospital care and critical care retrieval	1 (2.4)

(Continued on the next)

Table 1. (Continued)

Characteristic	No. (%)
Highest academic (professional) degree	
Bachelor of Medicine and Bachelor of Surgery	2 (4.8)
Critical care assistant	1 (2.4)
Doctor of Medical Science	1 (2.4)
Doctor of Medicine	19 (45.2)
Doctor of Philosophy	12 (28.6)
Master of Medical Education	2 (4.8)
Master of Science	3 (7.1)
Master of Science in Nursing	1 (2.4)
Registered nurse	1 (2.4)
Provider certification	
BLS	35 (83.3)
ALS	35 (83.3)
PALS	11 (26.2)
Absent	4 (9.5)
Instructor certification	
BLS	30 (71.4)
ALS	31 (73.8)
PALS	8 (19)
Absent	6 (14.3)
Experience of participation in Delphi studies	
Yes	22 (52.4)
No	20 (47.6)

BLS, basic life support; ALS, advanced life support; PALS, pediatric advanced life support.

No items reached the consensus threshold for exclusion in the first round, 57 items reached the consensus threshold for inclusion and were carried forward to the second round unchanged, and 15 items did not reach the consensus threshold for inclusion or exclusion and were subjected to the second round. Of those 15 items, nine items were modified according to experts' comments (see dataset [22]). Following experts' suggestions, seven new items were added to the checklist.

The second round began with 79 items. In that round, the median percentage of experts who assigned an item a rating of ≤ 3 points was 5% (IQR, 0%–10%; range, 0%–28%) and the median percentage of experts who gave an item ≥ 7 points was 85% (IQR, 78%–93%; range, 45%–100%). The participating experts agreed to accept the majority of the items covering essential components of adult BLS, including safety considerations, recognition of cardiac arrest, call for help, chest compressions and rescue breathing techniques, use of an automated external defibrillator, help in choking, and miscellaneous questions. In the second round, 66 items reached the consensus threshold for inclusion (Table 2) (see dataset [22]) and the other 13 items did not reach the consensus threshold for inclusion and were excluded. Of these 13 items, two and four items represented essential elements and the majority

Table 2. Checklist items based on results of the second round

Checklist item	Experts who rated ≥ 7 points (%)
Safety	
Does the resource state that the rescuer should make sure that he/she, victim, and any bystanders are safe?	100
Does the resource instruct to use personal protective equipment (e.g., face mask, gloves) if available? ²⁾	70
Recognition	
Is cardiac arrest defined as a state when a person is unresponsive with absent or abnormal (agonal) breathing?	93
Response check: does the resource instruct to shake gently by shoulders and ask loudly to examine if the victim is responsive?	95
Victim's position: does the resource instruct to position the victim on their back if unresponsive?	83
Airway opening	
Is there instruction for head tilt maneuver?	90
Is there instruction for chin lift maneuver?	90
Breathing check	
Does the resource instruct to look for breathing?	93
Is it clear that the rescuer should use a maximum of 10 sec to check breathing?	88
Agonal breathing	
Does the resource state that agonal breathing should be interpreted a sign of cardiac arrest?	93
Does the resource describe agonal breathing pattern (e.g., infrequent, slow, noisy gasps, labored breathing)?	83
Seizure-like activity: does the resource state that seizure-like activity could be a sign of cardiac arrest? ²⁾	58
Call for help	
Call EMS	
Does the resource state that the rescuer should immediately ask a helper to call EMS or call themselves when recognising cardiac arrest?	98
Does the resource instruct to use speaker function (hands-free) on a telephone to start CPR whilst talking to a dispatcher?	88
Send for AED	
Does the resource instruct to ask a helper to collect nearest AED?	93
Does the resource state that the rescuer should not leave the victim to collect AED themselves (excepting cases when the rescuer is alone and AED is located close at hand)?	80
Chest compression	
Does the resource instruct to start compressions as soon as possible?	98
Rescuer's position	
Does the resource instruct the rescuer to position themselves next to (by the side of) the victim?	83
Does the resource instruct to keep arms straight?	100
Does the resource instruct the rescuer to position themselves vertically above the victim's chest?	100
Firm surface: does the resource instruct to perform compressions on a firm surface if it is possible and not time-demanding?	78
Hand position	
Does the resource instruct to place the heel of one hand at the centre of the chest (lower half of the breastbone)?	98
Does the resource instruct to place the heel of other hand on top of the first hand and interlock fingers?	80
Compressions depth: does the resource state the correct depth is 5–6 cm?	95
Compressions rate: does the resource state the correct rate is 100–120 per minute?	100
Chest recoil: does the resource instruct to ensure chest recoil after each compression (release pressure on the chest without losing contact with the chest)?	95
Minimization of pauses: does the resource state that any pauses in chest compressions should be minimized?	98
Rescuer change: does the resource state that if possible rescuers should change over about every 2 minutes (without interrupting chest compressions) to prevent a decrease in compression quality due to rescuer fatigue?	83
Rescue breathing	
Compression to ventilation ratio: does the resource instruct to use compression to ventilation ratio of 30:2?	98
Airway opening	
Is it clear that the rescuer should open airways again prior to ventilation?	90
Does the resource instruct to maintain head tilt and chin lift during rescue breathing?	83
Nasal pinch: does the resource instruct to pinch the nose prior to ventilation?	80
Sealing: does the resource instruct to place lips around the victim's mouth ensuring airtight seal?	80
Ventilations	
Does the resource state that each rescue breath should last about 1 second?	75

(Continued on the next page)

Table 2. (Continued)

Checklist item	Experts who rated ≥ 7 points (%)
Does the resource instruct to give a normal breath volume (avoid excessive ventilation)?	78
Does the resource instruct to look for chest rise?	90
Does the resource state that the rescuer should take mouth away and turn their head towards the victim's chest to allow and check for passive exhalation?	78
Does the resource instruct to give a total of two rescue breaths?	90
Resume compressions: does the resource instruct to resume compressions immediately after the second breath (even if breaths are ineffective)?	93
Minimum pause: does the resource state that compressions shouldn't be interrupted for more than 10 sec to deliver two rescue breaths?	85
Defibrillation	
Turn AED on: does the resource instruct to turn on AED as soon as it arrives?	95
Attach electrodes: does the resource instruct to attach electrodes to the victim's bare chest?	93
Remove electrodes protection: does the resource instruct to remove protective film from electrodes before attaching them to the victim's chest? ^{2a)}	45
Electrodes position: does the resource describe correct position for electrodes on the victim's chest?	85
Continue CPR: does the resource instruct to continue CPR whilst AED is prepared if more than one rescuer is present?	95
Follow instructions: is it clear that rescuers should follow spoken and visual instructions of AED?	95
Do not touch	
Analysis: it is clear that bystanders cannot be in physical contact with the victim during analysis?	93
Shock: it is clear that bystanders cannot be in physical contact with the victim when applying shock?	93
Resume CPR: does the resource state that after shock (or if no shock is advised) the rescuer should immediately resume CPR and continue as directed by AED?	98
Minimum pause: does the resource state that long pauses in compressions should be avoided when applying and using AED?	88
Continuation of CPR	
Does the resource state that CPR should be continuous until a professional tells to stop, the rescuer is exhausted or the victim recovers?	93
Does the resource describe signs of victim's recovery (waking up, moving, opening eyes and for sure breathing normally)?	75
Recovery position	
Does the resource instruct to place the victim in recovery position if the victim is breathing normally but unresponsive? ^{2a)}	73
Does the resource describe correct technique for placing the victim in recovery position? ^{2a)}	68
Does the resource instruct to continuously monitor normal breathing for the victim placed in recovery position?	88
Choking	
Recognition	
Does the resource instruct to suspect choking if someone is suddenly unable to speak or talk, particularly if eating?	78
Does the resource instruct to ask the conscious victim "Are you choking?" ^{2a)}	63
Call for help: does the resource state that the rescuer should immediately ask a helper to call EMS or call themselves when recognising severe choking?	80
Coughing: does the resource instruct to encourage coughing when the victim is conscious and able to cough?	85
Back blows	
Does the resource instruct to give up to five back blows if coughing fails to clear the obstruction or the victim starts to show signs of fatigue?	88
Does the resource describe correct technique for back blows?	85
Abdominal thrusts	
Does the resource instruct to give up to five abdominal thrusts if back blows are ineffective?	80
Does the resource describe correct technique for abdominal thrusts?	78
Continue blows and thrusts: does the resource instruct to continue series of five back blows followed by five abdominal thrusts if prior measures are ineffective? ^{2a)}	73
Start CPR: does the resource instruct to start CPR when the victim is unconscious with absent or abnormal breathing?	95
Look for and remove foreign material: does the resource instruct to look for a foreign material in the victim's mouth and if visible, remove it? ^{2a)}	73
Avoid blind finger sweep: does the resource state that blind finger sweep should be avoided?	88
Aftercare: is it clear that the victim successfully treated with abdominal thrusts or chest compressions should be examined by a qualified healthcare practitioner?	75
Epidemic outbreak situation (e.g., COVID-19)	
Does the resource provide guidance on CPR in epidemic outbreak situations (e.g., during COVID-19 pandemic)?	75
Recognition: does the resource instruct to avoid opening airways and placing face next to the victims' mouth or nose for breathing check? ^{2a)}	63
Compression-only CPR: does the resource state that lay rescuers should consider compression-only CPR and AED?	83

(Continued on the next page)

Table 2. (Continued)

Checklist item	Experts who rated ≥ 7 points (%)
Ventilations: does the resource state that lay rescuers who are willing, trained and able to do so, may deliver rescue breaths in addition to compressions? ^{a)}	73
Face covering: does the resource instruct to place a cloth, towel, or face mask over the victim's mouth and nose before performing compressions and using AED? ^{a)}	58
Disinfection: does the resource state that after providing CPR, lay rescuers should wash or disinfect their hands? ^{a)}	68
Miscellaneous	
Concerns of harm: does the resource state that lay rescuers should initiate CPR for presumed cardiac arrest without concerns of harm to victims not in cardiac arrest?	90
Other concerns: does the resource address other barriers to bystanders' willingness to perform CPR (e.g., fear of prosecution, infection, etc.)?	78
Compression-only CPR: does the resource state that bystanders who are untrained, unable or unwilling to give rescue breaths should give continuous chest compressions without rescue breaths?	95
Dispatcher-assisted CPR: does the resource address the concept of dispatcher-assisted CPR (in particular, that lay rescuer can actively ask for the assistance)?	85
Excessive actions: does the resource instruct to perform any superfluous actions that are noncompliant with current guidelines on BLS? (If yes, please include corresponding citation(s) from the resource below) ^{a)}	58

EMS, emergency medical services; AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; BLS, basic life support.

^{a)}Checklist items that did not reach expert consensus for inclusion based on results of the second round.

of items of the "recovery position" and "epidemic outbreak situations" (originally, COVID-19) subsections of the checklist, respectively. A decision was therefore made to exclude these subsections (including three items that reached consensus for inclusion). Consequently, 63 items were retained for the final checklist (Supplementary Material 2), including 55 unchanged baseline items, four modified items and four new items, under the subsections "safety" (one item), "recognition" (nine items), "call for help" (four items), "chest compressions" (12 items), "rescue breathing" (12 items), "defibrillation" (nine items), "continuation of CPR" (two items), "choking" (10 items), and "miscellaneous" (four items).

DISCUSSION

Educational efficiency and implementation of resuscitation science are key determinants of survival after cardiac arrest [23]. Turning scientific evidence into practice, in turn, depends on the effectiveness of translating knowledge drawn from resuscitation guidelines through education [8,24].

Although considerable efforts are being made by resuscitation researchers to improve educational efficiency by implementing optimal instructional designs and strategies for teaching resuscitation [6,8], relatively little attention has been paid to quality control of the educational content [15]. Studies have shown that training programs and educational resources on resuscitation commonly do not comply with relevant guidelines, omit core evidence-based recommendations, or incorrectly present essential learning elements [10–14]. This suggests a need to address the issue systematically by establishing a standardized international framework

for quality control and quality assurance in resuscitation education [10].

The current study is a step toward realizing this goal. It represents the first attempt to generate a checklist for appraising the quality of educational resources on BLS using an international expert opinion consensus achieved through the Delphi technique. The use of a validated consensus-generating method, involvement of a large number of experts with extensive experience in resuscitation, and high participation rate support the robustness of the study results.

A blank template for "The ERC Research NET structured checklist for quality appraisal of educational resources on adult basic life support" is available online [22]. We propose using the checklist to ensure full coverage of essential issues of lay-rescuer delivery of adult BLS in a syllabus of resuscitation-training resources and to guarantee adherence of educational content to state-of-the-art understanding of effective techniques for resuscitation. The checklist could be utilized by resource developers designing new educational programs and materials, or to bring existing resources into agreement with current evidence-based resuscitation knowledge. The checklist is a ready-to-use tool for conducting research involving expert-led systematic evaluation of the quality of face-to-face courses or electronic training resources on BLS (including online courses, videos, and mobile apps) in terms of compliance with resuscitation guidelines. In particular, such research could help create a collection of reliable, free-of-charge, web-based, or downloadable multimedia resources that could be recommended for mass distribution and therefore contribute to improve worldwide availability and dissemination of high-quality

public education on resuscitation.

Future steps include testing of the checklist for interrater and intrarater reliability, translation of the checklist into different languages, and updating the checklist as new resuscitation research evidence becomes available. The expert consensus procedure employed in this study could be used to produce similar instruments for appraising educational programs and resources on pediatric BLS, adult and pediatric ALS, and various aspects of first aid.

This study has limitations to be acknowledged. Given that the checklist was based on the International Consensus on CPR [19] and the ERC Guidelines [20,21], its content may not correspond fully with national guidelines that have country-specific peculiarities. Therefore, before using the checklist to evaluate conformance of adult BLS educational resources with national guidelines, the checklist may need to be adjusted accordingly.

In summary, this study utilized a validated expert consensus technique to create a 63-item structured checklist for appraising the quality of educational content on lay-rescuer delivered adult BLS. Widespread use of the checklist by developers of educational programs and resources on BLS should improve compliance with current evidence-based knowledge on resuscitation and contribute to enhanced educational efficiency. The checklist could be incorporated into a standardized international framework for quality control and quality assurance in resuscitation education.

SUPPLEMENTARY MATERIALS

Supplementary Material 1. Baseline checklist for evaluating educational resources on lay rescuer adult BLS in terms of compliance with international resuscitation guidelines.

Supplementary Material 2. Final expert consensus-based checklist for evaluating educational resources on lay rescuer adult BLS in terms of compliance with international resuscitation guidelines. Supplementary materials are available from <https://doi.org/10.15441/ceem.23.049>

ETHICS STATEMENT

Not applicable.

CONFLICT OF INTEREST

Bernd W. Böttiger is board member and treasurer of the European Resuscitation Council (ERC), chairman of the German Resuscitation Council (GRC), federal state doctor of the German Red Cross, member of the Advanced Life Support (ALS) Task Force of the International Liaison Committee on Resuscitation (ILCOR), board

member of the German Interdisciplinary Association for Intensive Care and Emergency Medicine (DIVI), founder of the German Resuscitation Foundation, founder of the ERC Research NET, co-editor of *Resuscitation*, editor of *Notfall+Rettenngsmedizin*, and co-editor of the *Brazilian Journal of Anesthesiology*. He received fees for lectures from the following companies: Forum für medizinische Fortbildung (FomF), Baxalta Deutschland GmbH, ZOLL Medical Deutschland GmbH, C.R. Bard GmbH, GS Elektromedizinische Geräte G. Stemple GmbH, Novartis Pharma GmbH, Philips GmbH Market DACH, and Bioscience Valuation BSV GmbH. No other potential conflict of interest relevant to this article was reported.

FUNDING

None.

ACKNOWLEDGMENTS

The full list of the Delphi Study Investigators (in alphabetical order): Abdulmajeed Solaiman Khan (Saudi Resuscitation Council, Pan Arab Resuscitation Council, Mecca, Saudi Arabia); Ahmed Elshaer (Department of Accident and Emergency, University Hospital Ayr, Ayr, Scotland, UK); Amber V. Hoover (American Heart Association, Dallas, TX, USA); Anastasia Spartinou (School of Medicine, University of Crete, Goufira, Greece); Emergency Department, University Hospital of Heraklion, Heraklion, Greece); Andrea Scapiigliati (Università Cattolica S. Cuore, Institute of Anesthesiology and Intensive Care, Fondazione Policlinico Universitario A. Gemelli, IRCCS, Rome, Italy); Artem Kuzovlev (Federal Research and Clinical Center of Intensive Care Medicine and Rehabilitation, Moscow, Russia); Baljit Singh (Department of Anesthesiology, Faculty of Medicine and Health Sciences, SGT University, Gurugram, India); Clare Morden (Department of Intensive Care Medicine, Salisbury District Hospital, Salisbury, UK); Cristian Abelairas-Gómez (CLINURSID Research Group; Faculty of Education Sciences, Universidade de Santiago de Compostela, Santiago de Compostela, Spain); Daniel Meyran (Bataillon de Marins Pompiers, Groupement santé, Marseille, France); Daniel Schroeder (Central Hospital of the German Armed Forces, Koblenz, Germany); Daniil O. Starostin (Federal Research and Clinical Center of Intensive Care Medicine and Rehabilitation, Moscow, Russia); David Stanton (Netcare, Johannesburg, South Africa); Eirik Alnes Buanes (Haukeland University Hospital, Bergen, Norway); Ekaterina A. Boeva (Federal Research and Clinical Center of Intensive Care Medicine and Rehabilitation, Moscow, Russia); Enrico Baldi (Division of Cardiology, Fondazione IRCCS Policlinico San Matteo, Pavia, Italy); Evanthia Georgiou (Education Sector, Nursing Services, Ministry of Health,

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Conceptualization: AB; Data curation: all authors; Formal analysis: AB, AG; Investigation: all authors; Methodology: AB, AG, BWB; Project administration: AB, BWB; Supervision: AB; Validation: AB, AG; Writing—original draft: AB; Writing—review & editing: AG, BWB, the Delphi Study Investigators. All authors read and approved the

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