



Data Article

Data concerning the Copenhagen tool: A research tool for evaluation of basic life Support educational interventions



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ARTICLE INFO

Article history:

Received 5 November 2020

Revised 15 December 2020

Accepted 17 December 2020

Available online 31 December 2020

ABSTRACT

The data presented in this article are supplementary data related to the research article entitled “The Copenhagen Tool: A research tool for evaluation of BLS educational interventions” (Jensen et al., 2019). We present the following supplementary materials and data: 1) a standardized

DOI of original article: [10.1016/j.resuscitation.2020.08.120](https://doi.org/10.1016/j.resuscitation.2020.08.120)

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<https://doi.org/10.1016/j.dib.2020.106679>

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Keywords:
BLS
Education
Resuscitation
Intervention
Validation

scenario used to introduce the test for gathering data on internal structure and additional response process; 2) test sheets used for rating test participant via video recordings; 3) interview-guide for collecting additional response process data; 4) items deemed relevant but not essential for laypersons, first responders and health personnel in the modified Delphi consensus process; 5) inter-rater reliability values for raters using the essential items of the tool to evaluate test participants via video recordings; 6) main themes from coding interviews with raters; 7) comparison of rater results and manikin software output.

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Specifications Table

Subject area	Interventions within medical education
Specific subject area	Basic life support educational interventions
Type of data	Tables and figures
How data was acquired	Standardised tests of course participants after a European Resuscitation Council (ERC) Basic Life Support (BLS) course were video recorded and presented to six raters, who rated the performance using test sheets. After evaluation, raters were interviewed about their experience using the test sheet. Interviews were transcribed and coded, and main themes are presented.
Data format	Analysed and described
Parameters for data collection	The inclusion criteria were participants who had recently passed a ERC BLS course. Three groups of participants were enlisted: laypersons, first responders and health care personnel.
Description of data collection	A standard scenario was constructed and tested. The data were collected at a post-course test where the participants were video-filmed while taking a 6-minute test of the skills acquired during a course. The test included a standard scenario and was video recorded from two angles. The recordings were rated by six experienced BLS course providers/instructors from different Danish organizations representing both ERC (e.g. Danish Resuscitation Council) and non-ERC (e.g. Red Cross) CPR course providers. The instructors were provided with a list of the essential items selected during the modified Delphi consensus process specifying what should be rated as acceptable.
Data source location	Copenhagen, Denmark
Data accessibility	Original data files can be accessed by contacting corresponding the author.
Related research article	The Copenhagen Tool: A research tool for evaluation of BLS educational interventions [1].

Value of the Data

- Development and validation of modern tools for psycho-motoric tests require validation evidence from several domains. The data in this coupled article is important because it presents validation evidence from the domains not covered in the main article.
- The data in this coupled article will benefit users of the Copenhagen Tool.
- Data illustrate how the Copenhagen tool can be applied in a standard setting. This is illustrated by presenting evidence from the domain “internal structure” data from raters

who rated post-course video recorded standard scenarios of ERC BLS course participants is presented.

1. Data Description

The data presented in this article is supplemental data to the study “The Copenhagen Tool: A research tool for evaluation of BLS educational interventions” [1]. Fig. 1 contains the standardized scenario used to introduce the test for gathering data on internal structure and additional response process data. Fig. 2 contains question sheets used for testing internal structure evidence. Fig. 3 contains an interview-guide for collecting additional response process data. Table 1 contains all items deemed relevant but not essential for laypersons, first responders and health care personnel in the modified Delphi process. Table 2 contains internal structure evidence with Krippendorff's alpha scores, comparing the question sheet score of different raters. Table 3 contains main themes of interview coding. Table 4 contains a comparison of rater results and manikin software output. The supplementary data contains raw data, Dataset 1. Modified delphi process answers, raw data, contains all answer by experts from the modified Delphi process. The supplementary Dataset 2. Test data CPH Tool, raw data contains all answers from standardized tests.

Table 1

List of relevant but not essential items for each level.

Laypersons (Mr. and Mrs. Smith)		First responders (e.g. lifeguards and community first responders)		Health care personnel (e.g. doctors, nurses and EMS personnel)	
#	Item	#	Item	#	Item
1	Open airway	1	Inform helper	1	Call for help
2	DA-CPR: Follow instructions	2	Call EMS	2	Call EMS
3	DA-CPR: Speaker on	3	DA-CPR: Inform EMS	3	AED instructions followed
4	DA-CPR: Guided by dispatcher	4	DA-CPR: Follow instructions	4	Sequence
5	Compressions: Recoil/lean	5	DA-CPR: Speaker on	5	DA-CPR: Speaker on
6	Rescue breaths	6	DA-CPR: Speaker on	6	DA-CPR: Provide exact address
7	Compression/ventilation ratio	7	DA-CPR, Guided by dispatcher		
8	Activate AED	8	Sequence		
9	Stand clear	9	NTS: Situational awareness		
10	Sequence	10	NTS: Leadership		
11	NTS: Situational awareness	11	NTS: Hand-over		
12	NTS, Communication skills	12	NTS: Exchange information (address)		
13	NTS: Use of resources				
14	NTS: Leadership				
15	NTS: Hand-over				
16	NTS: Exchange information (address)				

All relevant but not essential items from the modified Delphi consensus process

AED: Automatic external defibrillator

NTS: Non-technical skills

DA-CPR: Dispatcher-assisted cardiopulmonary resuscitation

EMS: Emergency medical services

NTS: Non-Technical Skills

Standard scenario – page 1 of 1

Prior to test:

- Consent form signed
- Information provided on no liability to equipment upon damage
- Shirt zipper open
- AED visible in room

Inform participant that there is no expectation for any action. We intend for participants to act as they would in real life with a real person.

Case description:

The test has a total duration of 6 minutes. We will notify you when there is 1 minute remaining.

Imagine that you are in your local super market buy groceries. Suddenly a person next to you grabs his/her chest and fall on the floor. You know there is an AED at the entry to the super market. If you call for help a helper will aid you. This will be a second researcher. The breathing of the manikin is breathing is as you observe during the test. We will inform you when the test is finished.

Can you repeat the scenario?

- Wait for answer -

Good. When I say start the test has begun. Are you ready to start?

- Wait for answer -

Start test

During test:

- Inform participant test is ending in 1 minute
-

Post test:

- Ask two CPR questions
- Sign participation fee form

Copenhagen Score Standard scenario - English

Fig. 1. Standard scenario.

Table 2

Krippendorff's alpha scores of ratings test participant performance.

Item	Inter-rater reliability Krippendorff's alpha*, [95% CI]	Applicable level		
		Laypersons	First responders	Health care personnel
1. Safety	0.17 [-0.23, 0.44]	X	X	X
2. Responsiveness	-0.04 [-0.82, 0.67]	X	X	X
3. Call for help	0.43 [0.24, 0.61]	X	X	
4. Open airway	0.41 [0.25, 0.56]		X	X
5. Assess breathing	0.28 [0.03, 0.50]	X	X	
6. Inform helper	-0.03 [-1.0, 0.79]	X		
7. Send for AED	-0.02 [-0.5, 0.43]	X	X	X
8. Agonal breathing	0.35 [0.07, 0.61]	X	X	X
9. Hand position	0.26 [-0.2, 0.68]	X	X	X
10. Rate	-0.01 [-0.41, 0.32]	X	X	X
11. Depth	0.56 [0.33, 0.78]	X	X	X
12. Recoil/lean	0.16 [-0.09, 0.4]		X	X
13. Rescue breaths	0.34 [0.01, 0.61]		X	X
14. Ratio	0.02 [-0.50, 0.50]		X	X
15. Activate AED	0.16 [-0.14, 0.47]		X	X
16. AED instructions	0.39 [-0.52, 0.47]	X	X	
17. Correct attachment of AED pads	0.22 [-0.03, 0.47]	X	X	X
18. Stand clear	0.31 [0.01, 0.57]		X	X
19. Shock delivered	0.10 [-0.42, 0.53]	X	X	X
20. Hands-off	-0.01 [-0.2, 0.2]	X	X	X
21. Communication	0.13 [-0.5, 0.33]		X	X
22. Use of resources	0.30 [0.11, 0.49]		X	X
DA-CPR, Not hanging up	0.42 [0.24, 0.6]	X		
DA-CPR, Follow instructions	0.45 [0.25, 0.49]	X		

AED: Automatic external defibrillator;

NTS: Non-technical skills

DA-CPR: Dispatcher-assisted cardiopulmonary resuscitation

EMS: Emergency medical services

NTS: Non-Technical Skills

* Acceptable level = 0.2

2. Experimental Design, Materials and Methods

This data article includes information on tests conducted for collection of validation evidence to support the use of the Copenhagen Tool presented as the main article [1]. A total of 21 persons participated in the standardized test presented in Fig. 1. The test participants all had participated in a ERC BLS course immediately prior to the test. The tests were video-recorded and rated by six raters. Raters were experienced CPR course instructor from four different organizations operating in Denmark (Red Cross, Danish Swimming Federation, Danish First Aid Council and Danish Emergency Management Agency). Raters used the question sheet of items deemed essential for different skill levels by the expert panel, as covered in the main article [1]. A list of relevant but not essential items is presented in Table 1.

2.1. Response process evidence

To provide additional response process evidence, all six raters were interviewed using a semi-structured interview-guide as presented in Fig. 3. The interviews were coded using a phenomenological method modified to enable systematic condensing [2]. All minor themes from the

Table 3
Main themes of interview coding.

<i>Response process: Actions and thoughts of the tester</i>	
Research comparison	<i>"I think it is good to have a uniform tool [in research] (...) I would say if I am a teacher who needs to test afterwards it may also give very good insight"</i>
Potentials of the tool	<i>"For the average good instructor in Denmark, it will be a tool that is quite essential to have. And it will also be a tool that can make you focus on the teaching because you can just cut out all that nonsense of how do I think now it went? It might get cut down to some concrete evidence ... something that is measurable."</i>
How to use the tool	<i>"When you get started with it and have run through a few slides (...) then it becomes more and more understandable(...) so it goes easier in the last one than it does in the first 2-3 ratings especially."</i>
<i>Consequence evidence: Intended and unintended of applying the tool</i>	
Efforts in relation to intervention/course	<i>"A score or scale would help raise the lowest standard. So the low level would benefit from it (...) so basically it has a positive effect, I'm pretty sure it will (...) it will be helpful to have these things in general first aid in general."</i>
Willingness to join intervention/course	<i>"There may also be another consequence to what is so slightly more (...) general... if taking a first aid course becomes difficult (...) Then it can have the consequence, that it causes some to say, well then they should not be in the course. I can almost hear my mother-in-law saying that if it looked (...) if it is that difficult, then you shouldn't be on course."</i>
Willingness to act	<i>"Now let's say that the 6 points or 4 points you do not achieve when you go home from a course (...) Going home with the conviction that you are poor at first aid. I don't know if they will act in a real situation. If they were standing with cardiac arrest down the street. We hope so. "</i>
Objectivity in assessment and feedback	<i>"I think the tool can make it visible if there has been something in the teaching that has not gone through properly to the individual student. Because ... then there might be more people who have misunderstood it. And then you have a chance (...) to clarify that."</i>
Structure of intervention/course	<i>"You can really just take the (...) schedule and work from it. So you make sure you get it all. "</i>

Themes and best illustrating citations from post rating interviews. The themes are presented in the left column. The key themes are in bold. The right column contains best illustrating citation from each theme and sub theme. = break; (. . .) = text is shortened.

Interviews were identified by two researchers [TW] and [TPM] and condensed into subgroups of themes, and subsequently the two coders collected main themes. Main themes of the interview coding are presented in [Table 3](#).

2.2. Internal structure evidence

Internal structure evidence was collected by analyzing inter-rater reliability. Raters watched the videos in separate rooms and noted achievements on a list containing all elements from all levels shown in [Fig. 2](#). Inter-rater reliability of video ratings was assessed using Krippendorff's alpha as the reliability measure [3–5] as shown in [Table 2](#). This reliability measure was used as it can be applied regardless of the number of raters, scale of measurements (e.g. binary and continuous), sample sizes, and presence of missing data. An alpha value of one indicates perfect agreement, while an alpha value of zero indicates complete absence of agreement. The analysis was performed using the Statistical Analysis System (version 9.4, city, country) and the KALPHA SAS macro. Krippendorff's alpha is estimated by bootstrapping using 10,000 bootstrap samples. The 95% confidence interval for Krippendorff's alpha was given as the 2.5th and 97.5th percentiles of the bootstrap distribution.

Table 4

Rater result and manikin software output.

Item	Agreement [%]
Hand position	9.3
<i>Middle of the chest</i>	
Rate	80.8
<i>Average rate within guidelines 100-120/min</i>	
Compression depth	80.8
<i>As recommended by ILCOR (5-6cm) in at least 50% of compressions</i>	
Recoil/lean	65.8
<i>Full chest rise in at least 50% of all compressions</i>	
Rescue breaths	86.7
<i>Visible chest rise in at least 50% of all ventilations OR more than 400ml</i>	
Ratio	82.5
<i>Acceptable range 28-32:2</i>	
Hands-off	60
<i>Relevant actions of resuscitation in \leq 75% of the test time*</i>	

ILCOR: The International Liaison Committee on Resuscitation

* Final manikin data output was calculated by subtracting standardized flow fraction times entities when test participants performed relevant actions. The relevant actions and time entities were: ensure safety 5s; check responsiveness 5s; call for help 5s; open airway 5s; assess breathing 10s; inform helper 5s; send for AED 5s; correct attachment of AED pads 10s; stand clear 5s; and delivered shock with 5s per shock delivered.

2.3. Relations to other variables

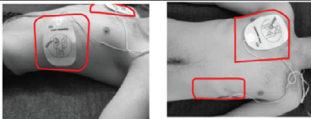
The evidence domain labeled “*relations to other variables*” presents associations between assessment scores and other measures of the same content. In this study evidence from this domain was collected with the scope of facilitating comparison of research in BLS educational interventions. We have compared the answers of the raters with that manikin data to provide further sources of comparison. In [Table 4](#), the estimates of agreement between raters’ scores and manikin data output are presented.

3. Limitations

The authors note [Fig. 2](#). in this paper contains image of a misplaced AED electrode pad. The long axis of the apical paddle should be orientated in a cranio-caudal direction to minimise transthoracic impedance.

Name of participant: _____ Date: _____

Rating part 1

ITEM	What to mark [achieved]	✓
1. Safety	Asks for or indicates safety awareness	
2. Responsiveness	Shake AND shout	
3. Call for help	Call out aloud, alerting bystanders	
4. Open airway	Opens or correctly tries to open mouth (chin lift OR jaw thrust)	
5. Assess breathing	Rescuer looks, listen AND feels for normal breathing	
6. Inform helper	Rescuer informs helper to call 1-1-2 and inform about cardiac arrest	
7. Send for AED	Asks for AED availability AND someone to retrieve it	
8. Agonal breathing	Rescuer informs EMS or helper that breathing is "not normal" (≠ absent)	
9. Hand position	Middle of the chest	
10. Rate	Average rate within guidelines 100-120/min	
11. Depth	Keep a compression depth as recommended by ILCOR (5-6cm) in at least 50% of compressions	
12. Recoil/lean	Full rise in at least 50% of all compressions	
13. Rescue breaths	Visible chest rise in at least 50% of all ventilations OR more than 400ml	
14. Ratio	Acceptable range 28-32:2	
15. Activate AED	Rescuer activates AED immediately upon arrival	
16. Correct attachment of AED pads	According to picture of AED placement See appendix 1. <div style="display: flex; justify-content: space-around; align-items: center;">  </div>	
17. Stand clear	Rescuer ensures safety by looking around AND verbally announcing delivery of shock	
18. Shock delivered	Shock delivered at AED prompt	
19. AED instructions	Rescuer follows the instructions from the AED	
20. Sequence	Rescuer follows the sequence of the guidelines	
21. Situational awareness	1. Send someone to lead the way for ambulance crew OR calms relatives if necessary OR asks for more information	
22. Communication	1. Clear delegation of tasks OR 2. Rescuer counts aloud OR 3. Provides short resume of events to other rescuers (most relevant items)	
23. Use of resources	Rescuer instructs helper to partake in resuscitation attempt OR changes roles of rescuers if appropriate	
24. Leadership	Rescuer summarizes the situation to the team and EMS during resuscitation OR delegates tasks	
25. Hand-over	Rescuer performs hand-over to the advanced team in a structured fashion	
26. Hands-off	Relevant actions (1-8, active CPR and 16-18) of resuscitation with in more than 75% of the test time	

Overall performance:

1	2	3	4	5	6	7
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Fig. 2. Question sheet.

Notes – NOT rating

Below is a complete list of the original intention of each item. To improve the assessment of the rating make sure; you asses from both angles; you asses all items; you judge all items separately and objectively. Remember all items have equal value and should be judged no matter what order they are placed in.

ITEM	INTENTION
1. Safety	Rescuer ensures safety of him-/herself and the victim
2. Responsiveness	Rescuer recognizes unresponsive victim
3. Call for help	Rescuer recognizing need for help and alerting surroundings
4. Open airway	Rescuer ensures open airway
5. Assess breathing	Rescuer looks, listen and feels for normal breathing
6. Inform helper	Rescuer informs helper to call 1-1-2 and inform about cardiac arrest
7. Send for AED	Rescuer asks other bystanders to retrieve an AED
8. Recognition of agonal breathing	Rescuer recognises agonal breathing as being “not normal”
9. Hand position	Rescuer places the heel of one hand on the middle of the chest and interlocks fingers from both hands
10. Compressions – Rate	Rescuer keeps a compression rate of approximately 100-120 compressions per min. throughout the CPR
11. Compressions – Depth	Rescuer keeps a compression depth of approximately 5-6 cm
12. Compressions – Recoil/lean	Rescuer ensures adequate thoracic rise (recoil) after each compression
13. Rescue breaths	Rescuer shows ability to provide high quality rescue breaths
14. Compression/ventilation ratio	Rescuer delivers compressions and ventilations in a 30:2 ratio
15. Activate AED	Rescuer activates AED immediately upon arrival
16. Correct attachment of AED pads	Rescuer places AED pads correctly on the victim
17. Stand clear	Rescuer operating the AED ensures all stand clear when shock is delivered
18. Shock delivered	Rescuer delivers shock, when indicated by the AED
19. AED instructions followed	Rescuer follows the instructions from the AED
20. Sequence	Rescuer follows the sequence of the guidelines
21. Situational awareness	Rescuer shows ability to anticipate and think ahead
22. Communication skills	Rescuer communicates effectively with other bystander(s) during CPR
23. Use of resources	Rescuer shows ability to use additional rescuers for relevant tasks
24. Leadership	Rescuer summarizes the situation to the team and EMS during resuscitation
25. Hand-over	Rescuer performs hand-over to the advanced team in a structured fashion
26. Hands off	Rescuer acts effectively with minimal hands-off time and delays in CPR

Fig. 2. Continued

Appendix for rating 1.

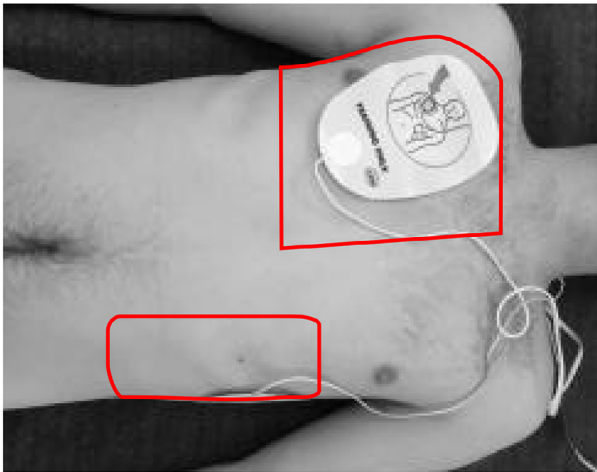
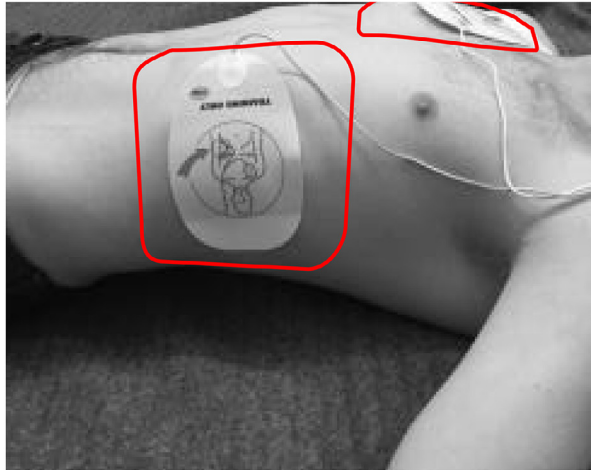


Fig. 2. Continued

Name of participant: _____

Date: _____

Rating part 2.

Telephone assisted CPR tests

ITEM	What to mark [achieved]	<input checked="" type="checkbox"/>
1. Call EMS	Rescuer provides location, asks for AED, AND informs of the need to perform CPR	<input type="checkbox"/>
2. Location	Rescuer provides exact address to dispatcher	<input type="checkbox"/>
3. Not hanging up	Keeps, EMS/dispatcher on phone without hanging up the phone	<input type="checkbox"/>
4. Speaker phone	Activates speaker on phone	<input type="checkbox"/>
5. T-CPR awareness	Asks for instructions OR accepts guidance	<input type="checkbox"/>
6. Interact with dispatcher	Active interaction. Answers questions from EMS/dispatcher	<input type="checkbox"/>
7. Follow instructions	Count out loud or let the dispatcher set compression rate	<input type="checkbox"/>

Notes – NOT rating

Below is a complete list of the original intention of each item. To improve the assessment of the rating make sure; you assess from both angles; you assess all items; you judge all items separately and objectively. Remember all items have equal value and should be judged that same no matter what order they are placed in.

ITEM	INTENTION
1. Call EMS	Rescuer shows ability to provide information to emergency medical service by telephone
2. Location	Intention: Rescuer provides exact address of the cardiac arrest for locations where he/she spends a fair amount of time. (e.g. home, at relative's house, at friend's house, workplace, cabin)
3. Not hanging up	The rescuer should be aware not to hang up the phone
4. Speaker phone	Rescuer activates speaker function on his/her mobile phone when asked by the dispatcher to do so
5. T-CPR awareness	Rescuer understands and follows local T-CPR instructions when provided over the telephone
6. Interact with dispatcher	Rescuer performs CPR and communicates with the dispatcher at the same time
7. Follow instructions	The rescuer should know that dispatch can assist with CPR instructions

Fig. 2. Continued

Interview guide

The Copenhagen Tool –

post-video rating interview (response & consequence evidence)

Purpose of interview:

Examine how rater or examinee responses align with the intended construct; including respondent's thought processes, response systems and test security.

Themes	Questions
Briefing and presentation	Present interviewer and the topic of the interview Presentation of respondent
Copenhagen tool response evidence	If you were to describe the test questions to a friend or colleague – how would you describe them? One of the purposes of the test is to use it for comparison of research – in your judgement could the test questions contribute to this? Why/why not? Describe your thought about using these test questions for evaluation of CPR-AED course participants?
Perspectives on consequences of using test questions (consequence evidence)	What influence do you think the questions have on the person being tested? What influence do you think the test questions have for the preparation for of the person being tested? What influence do you think the questions have on the person conducting the test (researcher/instructor)? How could the test question change feedback given by the instructor during a course? How could the test question change curriculum on courses? In your opinion was the level for answering yes/no on the items relevant in relation to what the persons on the videos presented? If no, what should be changed? How could the test questions change the boundaries on pass/fail on courses? How could the test questions change what is perceived as important in a course?
Open ended exploration	In your opinion is there any important issues or topics regarding the test questions we have not covered? In your opinion is there any important issues or topics regarding consequences of the test questions we have not covered? Do you have any comments for further considerations?
Conclusion	Information: You have now participated in a validation process on a new tool for comparing research on BLS interventions and have provided knowledge about the tools reliable by rating the videos. Further you have contributed important insight into the validations process by aiding the research team in evaluating whether the test questions represent the intended purpose and what consequences use of the test questions might have. Thank respondent for participation Sign consent and payment form

Fig. 3. Interview guide.

Data Accessibility

Raw data for this study is attached as supplementary materials. All data is accessible except for the video-recordings of the tested subjects. Video-recordings can be shared upon reasonable request.

Ethics Statement

All experts agreed to participate. The Regional Ethical Committee in the Capital Region of Denmark waived the need for approval (journal number 16027743).

Declaration of Competing Interest

The authors declare no competing interests.

Acknowledgments

This work was funded by the Danish Foundation TrygFonden with no commercial interest in the field of cardiac arrest.

Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.dib.2020.106679](https://doi.org/10.1016/j.dib.2020.106679).

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