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Rapid response systems

Symptoms of post-traumatic stress disorder among first aid providers

Anna Marie Moe Øvstebø^a, Conrad Arnfinn Bjørshol^{a,b,c,*}, Sissel Grønlien^d, Helene Lund^e, Thomas Werner Lindner^a

Abstract

Background: Every year, large numbers of individuals are present or provide first aid in situations involving out-of-hospital cardiac arrest, injuries, or suicides. Little is known about the impact of providing first aid or witnessing a first aid situation, but research indicates that many first aid providers (FAP) experience persistent psychological difficulties. Here we aimed to assess the level of psychological impact of being a FAP.

Methods: In this retrospective study, FAP attending follow-up were asked to complete the International Trauma Questionnaire (ITQ), which is a self-report diagnostic measure of post-traumatic stress disorder (PTSD) and complex post-traumatic stress disorder (CPTSD). We recorded endorsement of a symptom or functional impairment (score $\geq 2/4$ on at least one of 18 items).

Results: Of the 102 FAP in this study, 86 (84%) showed endorsement of a symptom or functional impairment. Common symptoms/functional impairments included being super-alert, watchful, or on guard; having powerful mental images; avoiding internal reminders or memories; and being affected in important parts of one's life. One-third had affected ability to work. Of the FAPs who attended follow-up more than one month after the incident ($n = 32$), 19% met the criteria for PTSD or CPTSD.

Conclusions: The majority of FAPs have endorsement of a symptom or functional impairment. Some FAPs fulfil the criteria of PTSD. We suggest that follow-up should be offered by the EMS to all FAPs involved in incidents with an unconscious patient.

Keywords: CPR, Resuscitation, First aid, Cardiac Arrest, Follow-up, First aid provider (FAP)

Introduction

Sudden out-of-hospital cardiac arrest (OHCA) is the third leading cause of death in Europe,¹ with an annual incidence of 60–170 per 100,000 inhabitants.² In the US, the annual incidence of non-traumatic OHCA is 146,000.³ Life-saving measures for OHCA patients include bystanders recognizing the cardiac arrest, prompt alert of emergency medical services (EMS), and early initiation of cardiopulmonary resuscitation (CPR),⁴ often referred to as the chain of survival.⁵ Bystander CPR rates vary among countries, and range from 13% to 85%.^{2,6} Thus, each year, a large number of individuals witness an OHCA, call EMS, and/or initiate CPR.

Furthermore, in Europe, approximately 150,000 people die of injuries every year,⁷ and 56,000 commit suicide.⁸ In the US, around 200,000 people die each year from unintentional injuries,⁹ and 46,000 from suicide.¹⁰ Many of these incidents will involve the provision of first aid. However, no registries report the annual number of first aid providers (FAP) or their experiences and well-being.

Although little is known about the impact of providing first aid or witnessing a first aid situation, research indicates that FAPs experience emotional and social challenges, and may struggle to cope in daily life after providing CPR.^{11,12} After such incidents, FAPs may experience guilt and self-blame, and worry about patient outcome. Additionally, they report poor sleeping, recurring thoughts of the incident, reduced work capacity, and anxiety. Many also feel a lack of acknowledgement for their CPR attempts.¹³ Little is known about the potential sequelae of witnessing an OHCA or the incidence of PTSD among FAPs,¹⁴ although it has been described among first responders.¹⁵

It seems that CPR training does not adequately prepare FAPs for the experience of a first aid incident.¹³ A study from the Netherlands measured the impact of witnessing a cardiac arrest, and found that over one-third of witnesses experienced a high level of trauma-related stress two years after the incident.¹⁶ A German study reports that one of three bystanders of OHCA exhibit signs of pathological psychological processing weeks after the incident.¹⁷

* Corresponding author at: Stavanger University Hospital, P.O. Box 8100, NO-4068 Stavanger, Norway.

E-mail address: conrad.bjorshol@sus.no (C.A. Bjørshol).

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It is common practice for healthcare professionals to participate in debriefing after critical incidents,¹⁸ but this is not an established practice for FAPs. This is surprising since most CPR attempts are initiated by emergency medical communication centers (EMCC) and not by the caller.¹⁹ The 2021 European Resuscitation Council guidelines encourage EMS acknowledgement of lay bystanders, and state that systems should “Support bystanders in minimising the impact on their own health of performing bystander CPR”.²⁰ Therefore, in November 2020, a national FAP follow-up program was initiated in Norway.

In the present study, we aimed to assess the level of psychological impact of being a FAP.

Methods

Study setting

In this retrospective study, participants had been present, performed first aid, and/or called EMS in situations with an unconscious patient, and attended the FAP follow-up program between November 2020 and October 2022. FAP were excluded if their age was <16 years.

The FAP follow-up program

FAPs were offered follow-up through information leaflets distributed by the EMS, rescue personnel, or hospital employees, and/or through text messages from the EMCC and by media. The recruitment method was documented. The FAP follow-up program was initiated in 2020 and is a national public health service to promote well-being among FAPs. The program offers a conversation with health care professionals with experience from emergency medical care.¹⁴ The purpose is to acknowledge FAPs, provide answers to questions, explain their importance in the chain of survival,⁵ assist in modifying strong sensory impressions and relieve feeling of guilt and shame.¹¹ A follow-up conversation lasts approximately 90 minutes.

All FAPs were asked to complete the International Trauma Questionnaire (ITQ), which is a self-report diagnostic measure of post-traumatic stress disorder (PTSD) and complex post-traumatic stress disorder (CPTSD).^{21,22} The ITQ follows the 11th version of the International Classification of Diseases (ICD-11).²³ It reveals problems that may be experienced by people who have experienced potentially traumatic or stressful life events.²² We further recorded patient outcome (survived, died, or unknown) according to the FAP’s knowledge.

The ITQ focuses on the core features of PTSD and CPTSD.²² Endorsement of a symptom or functional impairment is defined as a score ≥ 2 (scale 0–4) on at least one of 18 specific items.²² We counted the number of FAPs with endorsement of a symptom or functional impairment for each item on the ITQ form, as well as the mean ITQ score. We also counted the number of FAPs with at least one endorsement of a symptom or a functional impairment. The number of FAPs who met the criteria of PTSD and CPTSD were identified, these were calculated based on different combinations of scores according to the instructions on the ITQ form.²² We defined persisting symptoms as a duration of >one month. CPR and non-CPR providers were compared using Mann-Whitney U test (IBM SPSS Statistics version 26).

All participants signed an informed consent upon inclusion. The study was approved by the Regional Ethics Committee (#276455) and by the Institutional Review Board.

AMMØ and CAB analyzed the data.

Results

In this study, 102 FAPs participated. Fig. 1 shows the selection of FAPs. Table 1 presents the participants’ demographic data. The age range of the FAP was 17–81 years, and 64% were female. Among the incidents, 60% were medical cardiac arrests, the remainder mainly comprised trauma and suicide. 73% of the FAPs were a family member or acquaintance of the patient, and 19% were health-care professionals. 25% of the patients survived.

Among the FAPs in our study, 69% participated in follow-up less than one month after the incident. On the other hand, 4% participated in follow-up 1–5 years after the incident, and 5% after more than five years.

ITQ scores are reported in Appendix 1. Maximum ITQ score (scale 0–72) was 63, minimum score was 0. Among the 102 FAP, 84% showed endorsement of a symptom or functional impairment²² (Table 2). Additionally, among the 32 FAPs who attended follow-up more than one month after the incident, 81% had at least one endorsement of symptom or functional impairment. About half of the FAPs had performed CPR, while the other half had called the EMCC, performed other types of first aid, or only witnessed an incident. The mean ITQ score was comparable between FAPs who provided CPR and those who did not (Table 3).

Based on the ITQ results, the highest number of FAPs had endorsement of the following symptoms or functional impairments: a feeling of being “super-alert”, watchful, or on guard; having powerful mental images related to the incident; and avoiding internal reminders or memories. Nearly half reported that their issues affected parenting, school, or college work; and one-third reported that their ability to work was affected.

Among the 32 FAPs who attended follow-up more than one month after the incident, three fulfilled the criteria for PTSD and three for CPTSD according to the combination of scores as described on the ITQ form.²² Thus, 19% of these FAPs met the criteria for PTSD or CPTSD.

Text messages from EMCC recruited 39% of the participants, and 23% after receiving information leaflets from EMS, rescue personnel, or hospital employees not on site, only 15% attended after receiving information from EMS personnel on site.

Discussion

Of all the participants in this study, 84% had endorsement of a symptom or functional impairment (score ≥ 2 on at least one item

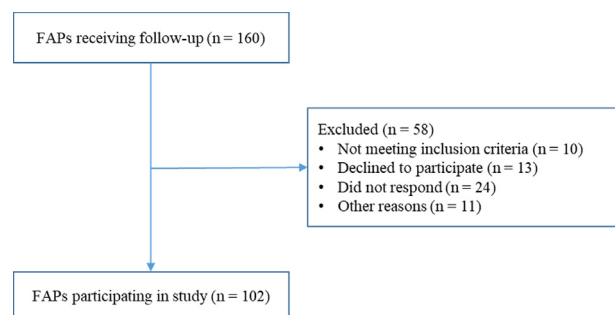


Fig. 1 – Selection of First Aid Providers (FAP) for this Study.

Table 1 – Participants' Demographic Data.

| Variable | | Number of FAP (%) |
|---|---|-------------------|
| Age | Mean age, years | 45 |
| Gender | Female | 65 (64) |
| | Male | 37 (36) |
| Type of incident | Medical cardiac arrest | 61 (60) |
| | Trauma | 17 (17) |
| | Suicide | 12 (12) |
| | Other | 12 (12) |
| Background | Healthcare professionals | 19 (19) |
| Relationship to patient | Family | 50 (49) |
| | Acquaintance | 24 (24) |
| | Stranger | 28 (27) |
| Patient outcome | Dead | 69 (68) |
| | Survived | 26 (25) |
| | Unknown | 7 (7) |
| Time from first aid incident to participation | ≤14 days | 56 (55) |
| | 14 days–1 month | 14 (14) |
| | 1 month–1 year | 23 (23) |
| | 1–5 years | 4 (4) |
| | over 5 years | 5 (5) |
| Recruitment methods (multiple replies possible) | Text message from EMCC | 43 (39) |
| | Information from EMS, rescue personnel, or hospital employees (not on site) | 25 (23) |
| | Information from EMS personnel on site | 17 (15) |
| | Media | 13 (12) |
| | Other | 12 (11) |

EMCC denotes emergency medical communication center, EMS emergency medical services, and FAP first aid provider.

Table 2 – Time from Incident to Participation, and Results from International Trauma Questionnaire (ITQ).

| Time from incident to follow-up | Total number of FAP (%) | Number of FAP (%) with endorsement of symptom or functional impairment | Mean ITQ score (scale 0–72) |
|---------------------------------|-------------------------|--|-----------------------------|
| All | 102 (100) | 86 (84) | 18 |
| <1 month | 70 (69) | 60 (86) | 18 |
| >1 month | 32 (31) | 26 (81) | 19 |

FAP denotes first aid provider.

Table 3 – Mean Sum of International Trauma Questionnaire (ITQ) Among FAPs who Did or Did Not Provide CPR.

| | CPR providers <i>n</i> = 57 | Non-CPR providers <i>n</i> = 45 | <i>P</i> value |
|------------------|--------------------------------|------------------------------------|----------------|
| ITQ median (IQR) | 16 (7.5–25.5) | 19 (10–29) | 0.16 |

CPR denotes cardiopulmonary resuscitation, and FAP first aid provider.

in the ITQ form) at the time of follow-up, hence they had symptoms or functional impairment related to PTSD or CPTSD. A number of FAPs who attended follow-up more than one month after the incident met the criteria for PTSD or CPTSD. As a combination of replies are required to fulfil the criteria for PTSD/CPTSD,²² these findings demonstrate that a number of FAPs were seriously affected by their experience over time, and that some FAPs require follow-up.

As ITQ score was comparable between CPR providers and non-CPR providers that demonstrates the importance that FAP follow-up should not be restricted purely to CPR providers.

One of four patients in our study survived, demonstrating that a good patient outcome does not exclude the need for FAP follow-up. As the majority of the FAPs were a family member or acquaintance of the patient, this explains why most FAPs were aware of the patient outcome. Healthcare professionals may also need follow-up after experiencing a first aid incident, as one of five in our study were health care professionals.

We believe that follow-up should be offered to FAPs after all first aid incidents with an unconscious patient. The differences in time from first aid incidence to time of follow-up demonstrates the possible long-term effects of being a FAP, and the need for follow-up.

In our study, 84% of the FAPs had endorsement of a symptom or functional impairment.²² In general, after potentially traumatic events, it is expected that 35–65%²⁴ of individuals will be resilient.²⁵ Our present results could be partly due to a selection bias. The reported symptoms show that previous FAPs have strong and persistent troublesome symptoms after the incident, being super-alert, having powerful mental images and avoiding internal reminders of the incident. These experiences are not just mentally challenging but also affect daily life like parenting, school or work for a large portion of FAPs. Although these symptoms are not usually disease-specific, they do indicate that FAPs have challenges that should be addressed by the EMS. It is reasonable to believe that addressing these problems in a FAP follow-up program could potentially prevent future disease among FAPs.

Studies show that untargeted prevention programs are relative ineffective and may even be harmful, whereas targeted intensive programs are more effective.²⁴ We believe it is appropriate to select FAPs for follow-up through targeted invitations to relevant FAPs by text messages from EMCC and information leaflets from EMS and rescue personnel, as well as motivated FAPs making contact. Our study only included FAPs to unconscious patients, but the majority were OHCA, serious injuries and suicides. However, further studies are needed to optimize the selection of participants for FAP follow-up.

Text messages from EMCC was the most successful method to reach the participants. This might be because they are very goal-directed to relevant FAPs. Surprisingly, very few received information from EMS personnel on site. This may be explained by insufficient EMS awareness of the follow-up program.

FAPs who attended follow-up less versus more than one month after the incident exhibited similar levels of endorsement of symptoms and functional impairment. This might be explained by the manner of FAP selection. Additionally, some who attended follow-up more than one month after the incident might have experienced a delayed response and therefore a rise in symptoms over time.²⁴

We already know that many FAPs have pathological psychological processing after OHCA,¹⁷ and that family members of OHCA patients often have prolonged grief, anxiety, depression or PTSD,²⁶ and there is some overlap between these symptoms.²⁷ Our results show that one of five FAPs fulfilled the criteria for PTSD or CPTSD according to the ITQ form and ICD-11.^{22,23} However, these were not medical diagnoses made following a medical examination. The FAPs did not receive treatment for PTSD or CPTSD within the follow-up program, but were referred to qualified personnel for diagnosis and treatment. After a potential traumatic event, 5–30% are expected to display a high level of dysfunction.²⁴ This is in agreement with our present findings. In contrast to our results, a previous study reports that citizen responders showed few signs of PTSD.²⁸ This difference might be due to their selection of individuals who had volunteered as citizen responders.

Based on the findings in this study, we have showed that being a FAP does have a psychological impact which can be troublesome and influence daily life. We think FAPs in situations with an unconscious patient, and OHCA in particular, should be offered follow-up. Such FAP follow-up should be provided by the EMS as they are responsible for prehospital emergency care, and very often initiate first aid or CPR from the EMCC. The FAP does after all provide the first and most important links in the chain of survival.²⁹

Since initiating the national FAP follow-up in November 2020, more than 230 FAPs have received follow-up. Our experience is that

they have various symptoms, and that these can be mitigated by acknowledgement, answering questions, give information about sensory impressions and how to cope with them, and relieve the feeling of guilt. Further, follow-up can be required even without psychological sequelae, as one participant scored 0 points on all items in the ITQ form but still felt a need for follow-up. The need for acknowledgement and information is not possible to measure by the ITQ form.

Future studies should measure the change in ITQ over time among FAPs who attend or do not attend follow-up. Further studies are needed to measure the potential benefit of follow-up for different groups of FAPs, which parts of the follow-up program that has the greatest effect, and to find the optimal timing of FAP follow-up. Qualitative studies are needed to reveal the user experience of attending a FAP follow-up program.

Limitations

Only FAPs who attended the FAP follow-up program participated in our study. This could have led to a selection bias, as they seek follow-up to receive assistance for their experience. It could also happen that the FAPs who experience the greatest impact do not get in touch because of a feeling of shame or guilt. Additionally, there was a large variation in time from the first aid incidents to study participation. There were also large variations in demographics, such as type of incident (medical cardiac arrest, suicide, accident, etc.), role as FAP (CPR provider, witness, etc.), and relationship to the patient (family, stranger, etc.). Finally, although some FAPs had ITQ scores compatible with PTSD and CPTSD, and symptoms lasting over one month, the FAPs were not diagnosed with PTSD or CPTSD. We do not know how the results would differ in various societies, but we believe the psychological impact of being a FAP is comparable in countries with a similar health care system.

Conclusions

The majority of FAPs have endorsement of a symptom or functional impairment. Some FAPs fulfil the criteria of PTSD. We suggest that follow-up should be offered by the EMS to all FAPs involved in incidents with an unconscious patient.

CRedit authorship contribution statement

Anna Marie Moe Øvstebø: Conceptualization, Methodology, Software, Validation, Investigation, Resources, Data curation, Visualization, Supervision, Project administration, Funding acquisition.

Conrad Arnfinn Bjørshol: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Visualization, Supervision, Project administration, Funding acquisition. **Sissel Grønlien:** Conceptualization, Software, Validation, Investigation, Resources, Data curation, Project administration, Funding acquisition. **Helene Lund:** Conceptualization, Validation, Investigation, Resources, Data curation, Funding acquisition. **Thomas Werner Lindner:** Conceptualization, Validation, Investigation, Resources, Supervision, Project administration, Funding acquisition.

Conflicts of interest

AMMØ has no conflicts of interest.

CAB is employed by the Regional Competence Centre for Acute Medicine in Western Norway (RAKOS), with financial support from the Norwegian Directorate of Health. He has participated in Global Resuscitation Alliance meetings sponsored by the Laerdal Foundation, TrygFonden, and EMS2018.

TWL is employed by SAFER.

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Appendix 1. Supplementary material

Supplementary material to this article can be found online at <https://doi.org/10.1016/j.resplu.2023.100373>.

Author details

^aThe Regional Centre for Emergency Medical Research and Development (RAKOS), Stavanger University Hospital, Stavanger, Norway ^bDept. of Anesthesiology and Intensive Care Medicine, Stavanger University Hospital, Stavanger, Norway ^cClinical Institute 1, Faculty of Medicine, University of Bergen, Bergen, Norway ^dEmergency Medical Communication Center, Innlandet Hospital, Gjøvik, Norway ^eEmergency Medical Communication Center, Stavanger University Hospital, Stavanger, Norway

REFERENCES

- Gräsner JT, Wnent J, Herlitz J, et al. Survival after out-of-hospital cardiac arrest in Europe – Results of the EuReCa TWO study. *Resuscitation* 2020;148:218–26.
- Gräsner JT, Herlitz J, Tjelmeland IBM, et al. European Resuscitation Council Guidelines 2021: Epidemiology of cardiac arrest in Europe. *Resuscitation* 2021;161:61–79.
- CARES Survival Report. CARES, 2022. Accessed 25.01.23 at <https://mycares.net/sitepages/uploads/2022/2021%20Non-Traumatic%20National%20Survival%20Report.pdf>.
- Olasveengen TM, Semeraro F. Basic life support and systems saving lives. *Curr Opin Crit Care* 2021;27:617–22.
- Nolan J, Soar J, Eikeland H. The chain of survival. *Resuscitation* 2006;71:270–1.
- Tjelmeland I, Kramer-Johansen J, Nilsen JE, et al. Årsrapport for 2021 med plan for forbedringstiltak. Oslo: NAKOS; 2022.
- Accidents and injuries statistics. Eurostat, 2022. Accessed 26.01.23 at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Accidents_and_injuries_statistics&oldid=262847.
- Just over 56 000 persons in the EU committed suicide. Eurostat, 2018. Accessed 26.01.23 at <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20180716-1>.
- Accidents or Unintentional Injuries. Centers for Disease Control and Prevention, 2022. Accessed 26.01.23 at <https://www.cdc.gov/nchs/fastats/accidental-injury.htm>.
- Suicide and Self-Harm Injury. Centers for Disease Control and Prevention, 2022. Accessed 26.01.23 at <https://www.cdc.gov/nchs/fastats/suicide.htm>.
- Mathiesen WT, Bjørshol CA, Braut GS, Søreide E. Reactions and coping strategies in lay rescuers who have provided CPR to out-of-hospital cardiac arrest victims: a qualitative study. *BMJ Open* 2016;6:e010671.
- Myall M, Rowsell A, Lund S, et al. Death and dying in prehospital care: what are the experiences and issues for prehospital practitioners, families and bystanders? A scoping review. *BMJ Open* 2020;10:e036925.
- Mausz J, Snobelen P, Tavares W. “Please. Don’t. Die.”: A Grounded Theory Study of Bystander Cardiopulmonary Resuscitation. *Circ Cardiovasc Qual Outcomes* 2018;11:e004035.
- First aid providers. Stavanger University Hospital, 2021. Accessed 25.01.23, 2023 at <https://helse-stavanger.no/en/avdelinger/prehospital-klinikk/rakos/first-aid-providers>.
- First Responders and PTSD: A Literature Review. *Journal of Emergency Medical Services*, 2020. Accessed 29.07.20 at https://www.jems.com/2020/07/28/first-responders-and-ptsd-a-literature-review/?utm_medium=email&utm_campaign=2020-07-28&utm_source=jems_now_newsletter.
- Van’t Wout Hofland J, Moolaert V, van Heugten C, Verbunt J. Long-term quality of life of caregivers of cardiac arrest survivors and the impact of witnessing a cardiac event of a close relative. *Resuscitation* 2018;128:198–203.
- Brinkrolf P, Metelmann B, Metelmann C, et al. One out of three bystanders of out-of-hospital cardiac arrests shows signs of pathological psychological processing weeks after the incident – results from structured telephone interviews. *Scand J Trauma Resusc Emerg Med* 2021;29:131.
- Harrison R, Wu A. Critical incident stress debriefing after adverse patient safety events. *Am J Manag Care* 2017;23:310–2.
- Recommendations from sub-project 113 – Saving lives together. The Norwegian Directorate of Health, 2018. Accessed 02.01.20 at https://www.helsedirektoratet.no/rapporter/sammen-redder-vi-liv-strategidokument/Saving%20lives%20together%20-%20Recommendations%20from%20project%20113.pdf/_/attachment/inline/eac985af-de53-46ef-a679-d9ee6bbe3afe:a4fcd8ec7b996a082a1bb44b9f7f625cf5a75a6/Sammen%20redder%20vi%20liv%20-%20Recommendations%20from%20project%20113%20-%20english.pdf.
- Mentzelopoulos SD, Couper K, Voorde PV, et al. European Resuscitation Council Guidelines 2021: Ethics of resuscitation and end of life decisions. *Resuscitation* 2021;161:408–32.
- Cloitre M, Shevlin M, Brewin CR, et al. The International Trauma Questionnaire: development of a self-report measure of ICD-11 PTSD and complex PTSD. *Acta Psychiatr Scand* 2018;138:536–46.
- International Trauma Questionnaire. The International Trauma Consortium. Accessed 26.01.23 at <https://www.traumameasuresglobal.com/itq>.
- ICD-11 for Mortality and Morbidity Statistics (Version: 02/2022). World Health Organization, 2022. Accessed 26.01.23 at <https://icd.who.int/browse11/l-m/en#/http://id.who.int/icd/entity/2070699808>.
- Bonanno GA, Westphal M, Mancini AD. Resilience to loss and potential trauma. *Annu Rev Clin Psychol* 2011;7:511–35.
- Bonanno GA. Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? *Am Psychol* 2004;59:20–8.
- Carlsson N, Alvariza A, Axelsson L, Bremer A, Årestedt K. Grief reactions in relation to professional and social support among family

- members of persons who died from sudden cardiac arrest: A longitudinal survey study. *Resusc Plus* 2022;12:100318.
27. Carlsson N, Arestedt K, Alvariza A, Axelsson L, Bremer A. Factors associated with symptoms of prolonged grief and psychological distress among bereaved family members of persons who died from sudden cardiac arrest. *J Cardiovasc Nurs* 2022.
 28. Ries ES, Kragh AR, Dammeyer J, Folke F, Andelius L, Malta HC. Association of psychological distress, contextual factors, and individual differences among citizen responders. *J Am Heart Assoc* 2021;10:e020378.
 29. Deakin CD. The chain of survival: Not all links are equal. *Resuscitation* 2018;126:80–2.