Volunteer responder provision of support to relatives of out-of-hospital cardiac arrest patients: a qualitative study

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ABSTRACT

Objectives Smartphone dispatch of volunteer responders for out-of-hospital cardiac arrest (OHCA) is implemented worldwide. While basic life support courses prepare participants to provide CPR, the courses rarely address the possibility of meeting a family member or relative in crisis. This study aimed to examine volunteer responders’ provision of support to relatives of cardiac arrest patients and how relatives experienced the interaction with volunteer responders.

Design In this qualitative study, we conducted 16 semistructured interviews with volunteer responders and relatives of cardiac arrest patients.

Setting Interviews were conducted face to face and by video and recorded and transcribed verbatim.

Participants Volunteer responders dispatched to cardiac arrests and relatives of cardiac arrest patients were included in the study. Participants were included from all five regions of Denmark.

Results A thematic analysis was performed with inspiration from Braun and Clarke. We identified three themes: (1) relatives’ experiences of immediate relief at arrival of assistance, (2) volunteer responders’ assessment of relatives’ needs and (3) the advantage of being healthcare educated.

Conclusions Relatives to out-of-hospital cardiac arrest patients benefited from volunteer responders’ presence and support and experienced the mere presence of volunteer responders as supportive. Healthcare-educated volunteer responders felt confident and skilled to provide care for relatives, while some non-healthcare-educated volunteer responders felt they lacked the proper training and knowledge to provide emotional support for relatives. Future basic life support courses should include a lesson on how to provide emotional support to relatives of cardiac arrest patients.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This is the first study to describe the experiences of volunteer responders and relatives of cardiac arrest patients. Researchers with extensive knowledge of resuscitation, psychology and qualitative methodology contributed to this study, and we followed the Consolidated Criteria for Reporting Qualitative Research Checklist.

⇒ The method used in the study employed several techniques to enhance the rigour of qualitative research such as participant triangulation (volunteer responders and relatives of the cardiac arrest patient).

⇒ A limitation of the study is the potential risk of desirability bias, which means that volunteer responders may, consciously or not, have described their actions in such a way as to receive the interviewers’ acceptance or approval.

⇒ We acknowledge the possibility of recall bias as participants sometimes found it difficult to describe settings with any degree of accuracy.

⇒ A limitation of the study is the small sample size that prompts further work to explore views and experiences of relatives.

INTRODUCTION

Successful resuscitation after out-of-hospital cardiac arrest (OHCA) is largely determined by early cardiopulmonary resuscitation (CPR) and defibrillation.\(^1\)\(^-\)\(^3\) Engaging volunteers to bring an automated external defibrillator (AED) to the scene of an OHCA and provide CPR strengthens the chance of survival.\(^4\)\(^-\)\(^5\) Bystander alert technologies and app-dispatch programmes have been implemented worldwide to enhance survival chances after OHCA.\(^6\)\(^,\)\(^7\) In 2020, Denmark became one of the first countries to implement a nationwide system for alerting volunteers.\(^8\)

Most OHCAs occur in private homes, and the most likely witnesses are therefore close relatives or the spouse.\(^9\)\(^-\)\(^10\) Witnessing a relative in cardiac arrest is a traumatic experience, which often leads to feelings of inadequacy and helplessness for the witness.\(^11\)\(^-\)\(^15\) Being
present in the first critical minutes after OHCA where early CPR can be lifesaving is an emotionally highly demanding situation. Some relatives lack the confidence, ability or knowledge to perform CPR and may panic.12–16 Thus, relatives of OHCA patients may benefit from psychological support throughout the resuscitation process, something that is also increasingly recognised for in-hospital cardiac arrests.17

In Denmark, nearby volunteer responders are activated through a phone app (HeartRunner App) when a cardiac arrest occurs. Volunteers are strongly recommended to complete a basic life support course, and 99% of volunteer responders have completed training prior to registration.8 While basic life support courses prepare participants to provide CPR and use an AED, the courses rarely address the possibility of meeting a relative in crisis. Volunteer responders are therefore not necessarily qualified or prepared to provide support to relatives. Furthermore, it is unclear how volunteer responders and close relatives of OHCA patients perceive and interact with each other during resuscitation.

This study was designed to explore the interactions between relatives of OHCA patients and volunteer responders during and immediately after a resuscitation attempt. Additionally, we examined how volunteer responders and relatives perceived and experienced each other’s presence during resuscitation.

METHODS
This study used a qualitative and explorative design using in-depth semi-structured interviews guided by Crabtree and Miller and Kvale and Brinkman.18 19 In-depth interview allows the researcher to pose open-ended questions to explore participants’ thoughts and feelings.19 The research was carried out at the Emergency Medical Services in the Capital Region of Copenhagen (EMS Copenhagen), Denmark. We followed the consolidated criteria for reporting qualitative research checklist.20

Author and reflexivity
All interviews were conducted by the principal researcher. The principal researcher is a woman with a Master of Science in Health Science from the University of Copenhagen and an educated cardiac nurse. The principal researcher has been employed at the EMS Copenhagen since 2018 and has continuously been defusing volunteer responders who need professional follow-up after being alerted to an OHCA. The principal investigator has defused more than 300 volunteer responders and possesses a wide knowledge of the psychological impact of alerting volunteer responders for OHCA. A central part of this study’s integrity is the ability of reflecting the principal researchers’ own position in relation to the subject of investigation. A leading course for the conduct of this study was the principal investigators’ experiences from defusing volunteer responders and their descriptions of interactions with relatives. To increase the understanding of the collected data in this qualitative study, triangulation was done between authors (ARK, AJG, TT-T and CMH).

The nationwide Danish volunteer responder programme
The nationwide Danish volunteer responder programme is integrated with all five dispatch centres in Denmark. Dispatchers can activate volunteer responders through their mobile phones in case of a presumed cardiac arrest within a radius of 5.0 km. Volunteer responders are dispatched to either go straight to the cardiac arrest location or to retrieve the nearest accessible AED. Up to 20 volunteer responders are activated in case of a suspected cardiac arrest at all hours of the day. Most frequently, volunteer responders are sent to private homes, where three out of four OHCA occur.8 When activated, volunteer responders arrive at the cardiac arrest before the ambulance in ~50% of the cases.8

Volunteers must be 18 years of age or older, and prior training in CPR is not required, but it is recommended. About one in four of all registered volunteer responders are healthcare personnel, and 99% have completed a basic life support course.21 Volunteer responders are not expected to provide care for relatives of OHCA patients, and training in psychological care for relatives is not provided by the volunteer responder programme, although an educational video is available through the programme’s website. All volunteer responders receive a survey after being notified of a nearby cardiac arrest. The survey consists of questions related to tasks undertaken by volunteer responders, one of which is whether they provided support for relatives (online supplemental material 1).

Sampling and interview setting
A purposive sampling strategy aiming for maximal variation was conducted to recruit volunteer responders and relatives to OHCA patients. As the relative of the cardiac arrest patient was expected to be in a highly sensitive emotional stage, relatives were given time to decide whether to participate. The principal investigator discussed with the relatives what consequences it might have for them to speak about the experience in detail in an interview, while also acknowledging the emotionally sensitive experience it can be to witness a cardiac arrest. Participants were invited 10–12 weeks after the event. This timing was considered appropriate to ensure data were collected as soon as possible after the experience but not during the immediate crisis period. Due to the COVID-19 pandemic, participants were asked whether they wished to conduct the interview online through a video interview or in a live setting. All in-person interviews took place at the emergency medical dispatch centre in Copenhagen and were held by the primary investigator (ARK) between July 2020 and March 2022.

Patient and public involvement
Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.
Data generation
In-depth semistructured interviews were performed in accordance with two interview guides aimed to facilitate a loose and flexible overall structure. One guide was specifically developed for relatives and one for volunteer responders (online supplemental material 2). The interview guides were developed by three researchers (ARK, TTT and CMH) in collaboration with a chief psychologist with expertise in crisis handling (AKC).

We used NVivo V.10 Software Program for Windows for data analysis. Two researchers (ARK and AJG) coded transcripts and discussed themes with inspiration from reflexive thematic analysis by Braun and Clarke.22  ,23 The analytical process was a hermeneutical, iterative process moving between coding, thematising, refining codes and reassessing raw data transcripts. A detailed description of methods is available in online supplemental material 3.

Ethical considerations
This study followed the principles outlined in the Declaration of Helsinki24 as well as the Danish General Data Protection Regulation. Oral and written informed consent was obtained prior to data collection. All participants received a letter containing a thorough description of the purpose of the study. The freedom to choose whether to participate or not was emphasised as was the right to withdraw consent at any moment. All participants were given time to decide if they would sit for an interview. Data were transcribed and stored in a secure web server operated by the Emergency Medical Services Copenhagen. Data were anonymised to protect participants.

RESULTS
Characteristics of the participants
Sixteen participants were interviewed about their experiences with 14 different cardiac arrest situations: five relatives to five different cardiac arrest patients and 11 volunteer responders to nine different cardiac arrest patients.

The participants’ age ranged from 23 to 78 years, with a median of 40 years. Ten participants were female and six were male. Five out of 11 volunteer responders were healthcare professionals. Among relatives to OHCA patients, there was one husband, two wives and two daughters. Participants were selected from all five regions in Denmark. Cardiac arrests took place between November 2019 and March 2022.

Interviews ranged from 35 min to 68 min, with a mean duration of 48 min.

Characteristics of included relatives to OHCA patients are presented in table 1. Characteristics of included volunteer responders are presented in table 2.

Main findings
We developed three main themes: (1) relatives’ experiences of immediate relief at arrival of assistance, (2) volunteer responders’ assessment of relatives’ needs and (3) the advantage of being healthcare educated.

The coding framework is shown in table 3.

Theme 1: relatives’ experiences of immediate relief at arrival of assistance
All relatives described a feeling of immediate relief when help arrived, whether it was emergency personnel or volunteers. Relatives were often exhausted from performing CPR and were just grateful for someone to help and support during the chaotic and critical situation.

When relatives talked about their close relatives’ collapse, they experienced a stressful situation and a need to act fast, especially those relatives who were alone with the collapsed patient.

A woman and her spouse were on vacation in their summer residence. They were sitting on their terrace reading newspapers when he suddenly knocked on his chest and told her that his arm was tingling and feeling numb. Shortly after, he collapsed. The woman immediately called the medical emergency number, put the call on speaker and was guided to start CPR. She described the sudden arrival of a volunteer responder:

I was talking to the emergency dispatch center, and she told me to place him safely on a flat surface. I remember she told me I did not push hard enough on the chest; I wasn’t able to compress deeper. But very quickly, these volunteers arrived. My arms were sore, I couldn’t go on any longer. One person came jumping in, and he just immediately switched places with me. I remember I felt SO relieved. (N16, spouse)

Volunteer responders’ participation in the resuscitation often allowed relatives to deal with their own emotions during the stressful situation and to let go of the weight...
of responsibility for a moment. The arrival of volunteers to assist was perceived as comforting and relieving in a situation where helplessness and exhaustion were dominating feelings:

It gave us time to breathe. And that’s more important than you could know. To let go for a moment and breathe. (N12, daughter)

The arrival of competent help

Feelings of relief expressed by relatives were often grounded in the perception of volunteers acting competently. A husband who had been alone with his collapsed wife for 15 min was guided by the emergency dispatch centre to perform CPR. He had been told by the dispatcher that he needed to compress deeper but was exhausted from the hard work. He described the moment when the volunteer responders arrive at his home:

Suddenly these competent people were standing in my living room. It was obvious to me that these volunteer responders were competent. They were in total control of the situation and which tasks had to be carried out. One of them began with the heart, with chest compressions. And the other one did something to her face. (N13, spouse)

Relatives described they had the impression volunteer responders were competent because they presented themselves and acted fast:

The volunteer responder arrived and told me she was a volunteer responder. She was carrying a defibrillator. She immediately declared: He needs CPR right away, and he must get the shirt off! (N15, daughter)

Strangers but helpers

Relatives were not always aware that a volunteer responder could show up. However, the arrival of just someone to help and assist was appreciated.

One daughter, whose mother had collapsed, explained how she felt comfortable with the volunteer responders’ presence despite them being strangers:

The volunteer responder went inside and immediately began compressions and one more arrived, and a third. They were completely in control of the situation, and I actually felt comfortable with them being there. Nineteen minutes went by before the ambulance arrived. And that’s a long time. A really long time. It was so nice the volunteer responders arrived and could take over the situation. And in that situation, you don’t consider them strangers. (N12, daughter)

Overall, relatives found volunteer responders’ actions rewarding, maybe partly because they did not expect volunteers to arrive:

I had this feeling: wow – four complete strangers arrive on a Friday night, half past seven, to help someone they don’t even know. That’s quite fantastic. (N12, daughter)

The relatives included in this study seemed to immediately trust the volunteer responders and their intentions. A woman was with her teenage son when their husband and father collapsed. She and her son had collaborated on CPR and were exhausted at the time of the volunteer responder’s arrival:

I didn’t know what a volunteer responder was. But someone to assist and take over, it was just what I needed, because I couldn’t handle it anymore. And neither could my son, it was tough. I remember thinking: She tells me she’s a volunteer responder, she probably knows what to do. And she told me: I know what I’m doing. (N14, spouse)

Even though volunteer responders and relatives were strangers to each other, a trust emerged between them,

### Table 2 Characteristics of volunteer responders

<table>
<thead>
<tr>
<th>Participant number/sex</th>
<th>Age range (years)</th>
<th>Healthcare educated</th>
<th>Time rate from cardiac arrest to interview in dates</th>
<th>Region</th>
<th>Interview time rate in minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1/female</td>
<td>40–50</td>
<td>No</td>
<td>34</td>
<td>Zealand</td>
<td>68</td>
</tr>
<tr>
<td>N2/male</td>
<td>20–30</td>
<td>No</td>
<td>34</td>
<td>Zealand</td>
<td>62</td>
</tr>
<tr>
<td>N3/female</td>
<td>30–40</td>
<td>Yes</td>
<td>60</td>
<td>Capital</td>
<td>45</td>
</tr>
<tr>
<td>N4/male</td>
<td>20–30</td>
<td>No</td>
<td>32</td>
<td>Central</td>
<td>47</td>
</tr>
<tr>
<td>N5/female</td>
<td>20–30</td>
<td>Yes</td>
<td>21</td>
<td>Southern</td>
<td>35</td>
</tr>
<tr>
<td>N6/male</td>
<td>60–70</td>
<td>No</td>
<td>69</td>
<td>Capital</td>
<td>43</td>
</tr>
<tr>
<td>N7/male</td>
<td>50–60</td>
<td>No</td>
<td>36</td>
<td>Capital</td>
<td>48</td>
</tr>
<tr>
<td>N8/female</td>
<td>20–30</td>
<td>Yes</td>
<td>22</td>
<td>North</td>
<td>47</td>
</tr>
<tr>
<td>N9/male</td>
<td>50–60</td>
<td>No</td>
<td>61</td>
<td>Zealand</td>
<td>48</td>
</tr>
<tr>
<td>N10/female</td>
<td>30–40</td>
<td>Yes</td>
<td>8</td>
<td>Southern</td>
<td>56</td>
</tr>
<tr>
<td>N11/female</td>
<td>20–30</td>
<td>Yes</td>
<td>8</td>
<td>Southern</td>
<td>56</td>
</tr>
</tbody>
</table>
### Table 3 Framework of codes and themes

<table>
<thead>
<tr>
<th>Main theme subthemes</th>
<th>Codes</th>
<th>Example of quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The arrival of competent help</strong></td>
<td>Quick assessments and interventions.</td>
<td>Suddenly these competent people were standing in my living room. It was obvious to me that these volunteer responders were competent. They were in total control of the situation and which tasks had to be carried out. One of them began with the heart, with chest compressions. And the other one did something to her face I didn’t know what a volunteer responder was. But someone to assist and take over, it was just what I needed, because I couldn’t handle it anymore. And neither could my son, it was tough. I remember thinking: She tells me she’s a volunteer responder, she probably knows what to do. And she told me: I know what I’m doing.</td>
</tr>
<tr>
<td><strong>Strangers but helpers</strong></td>
<td>Someone to help and assist.</td>
<td>It gave us time to breathe. And that’s more important than you could know. To let go for a moment and breathe I had this feeling: Wow – four complete strangers arrive on a Friday night, half past seven, to help someone they don’t even know. That’s quite fantastic.</td>
</tr>
<tr>
<td><strong>Receiving comfort and support</strong></td>
<td>Alleviating mental distress.</td>
<td>The volunteer responder, a young lady, took me outside and brought me a glass of water. She talked to me. She covered my ears when the helicopter landed. It was nice. Otherwise, I would have been all by myself. Everybody was inside resuscitating my husband. I really appreciated she stayed with me. One of the volunteer responders, the one who wasn’t with the kids, she was just walking around a little. And she was asking things like ‘Are these your dads’ glasses?’ or ‘Was he off work today?’: I mean, she tried talking to us. And I answered her questions, but my mom was annoyed. At some point, my mom just told her: I know you are trying, but please leave me alone.</td>
</tr>
<tr>
<td><strong>Volunteer responders’ assessment of relatives needs</strong></td>
<td>Practical tasks.</td>
<td>I made sure that the wife was sent safely by car to the hospital, and that their house was locked, and they had the keys with them. Just practical stuff you easily could forget All I was thinking was ‘She needs some help’. It was important to me to talk to her and to provide some psychological first aid. I told her that her husband had gained circulation and that the emergency staff would take him to the hospital where she would be given more information.</td>
</tr>
<tr>
<td><strong>Challenges in providing care</strong></td>
<td>A distraction rather than a help.</td>
<td>The volunteer responder, a young lady, she took me outside and brought me a glass of water. She talked to me. She covered my ears when the helicopter landed. It was nice. Otherwise, I would have been all by myself. Everybody was inside resuscitating my husband. I really appreciated she stayed with me. One of the volunteer responders, the one who wasn’t with the kids, she was just walking around a little. And she was asking things like ‘Are these your dads’ glasses?’ or ‘Was he off work today?’: I mean, she tried talking to us. And I answered her questions, but my mom was annoyed. At some point, my mom just told her: I know you are trying, but please leave me alone.</td>
</tr>
<tr>
<td><strong>The advantage of being healthcare educated</strong></td>
<td>Informing and guiding relatives during the acute situation.</td>
<td>We were actually just standing there watching. We asked her if she would like some water or a whiskey. And then we were all laughing … I just went into panic. I kept thinking if he had something stuck in his throat. I tried to bend his neck a little to make room, and then closed his mouth and blew as hard as I could, but I didn’t sense it was working. So, I asked the other bystander to continue.</td>
</tr>
</tbody>
</table>

maybe as a result of the context of the situation being critical and in the space between life and death. Relatives’ perception of volunteer responders as competent generated a feeling of relief from responsibility, something they needed when they were exhausted from providing CPR. Receiving comfort and support For all relatives participating in this study, it was their first time providing CPR on a real person. Relatives considered performing chest compressions a crucial task, yet both emotionally and physically demanding. Many relatives
felt lonely performing CPR, and some felt inadequate and doubted their efforts. While medical emergency staff were often busy providing advanced life support, they were rarely able to also assess relatives’ needs and emotional states. Volunteer responders, therefore, played an crucial role by supporting the relatives.

The husband who had witnessed his wife collapse was distressed and mentally exhausted when volunteer responders arrived:

I went to the kitchen because (crying). I was mentally collapsing. (N13, spouse)

The emergency medical staff arrived and initiated advanced resuscitation of his wife, while volunteer responders accompanied the spouse to the kitchen and offered him some water. Shortly after, resuscitation was terminated, and his wife was declared dead. He described his impression of the presence of volunteer responders:

Volunteer responders made a difference. Because I wasn’t alone. I was not alone, and it wouldn’t be a good thing to be alone in such a situation. Even though our kids arrived, I was grateful they were there. The volunteer responders’ behavior and performance, they were competent, and they knew their stuff. And at the same time, they had room for caring. (N13, spouse)

For most relatives, being alone was described as a distressing experience. Feelings of loneliness in the acute situation seemed to be reduced through volunteers’ small actions or just by their presence. Small gestures, such as offering a glass of water, corresponded to the feeling of being cared for in an unknown and overwhelming situation.

The woman whose spouse had collapsed in their summer residence described the situation while the emergency staff was treating her husband:

The volunteer responder, a young lady, she took me outside and brought me a glass of water. She talked to me. She covered my ears when the helicopter landed. It was nice. Otherwise, I would have been all by myself. Everybody was inside resuscitating my husband. I really appreciated she stayed with me. (N16, spouse)

The woman’s husband had gained return of spontaneous circulation while she was sitting outside with the volunteer responder. She described the situation:

It really meant a lot to me that the volunteer responder sat with me outside, it was actually nice someone thought about me. Otherwise, everything was about him, but someone who cared for me as well, it was comforting. (N16, spouse)

Although relatives overall considered volunteer responders helpful and supportive, one relative described she felt overcared for. Her dad had collapsed, and she was in his residence with her mother and her brothers’ two young children. Two volunteer responders had arrived, and while one of the responders looked after the kids, the other one tried to talk to the relatives:

One of the volunteer responders, the one who wasn’t with the kids, she was just walking around a little. And she was asking things like ‘Are these your dads’ glasses?’ or ‘Was he off work today?’. I mean, she tried talking to us. And I answered her questions, but my mom was annoyed. At some point, my mom just told her: I know you are trying, but please leave me alone. (N15, daughter)

In this situation, the volunteer responder became disruptive to the situation and not helpful. Similarly, not all relatives perceived care as a necessity. The woman who was with her son when their father/husband collapsed wanted everyone to focus on saving her husband’s life. She did not need the volunteers to care for her, she wanted them to resuscitate her husband. She described her thoughts:

I am deeply thankful that someone has the courage. That’s what I am thankful for. I didn’t need them to stay and talk with me. But they saved my husband’s life, no doubt about that. (N14, spouse)

As relatives’ needs in the tense and acute situations were diverse, it could be challenging for some volunteer responders to appraise relatives’ emotional states. In theme 2, we will illuminate how volunteers approached relatives during cardiac arrests and how they experienced providing care.

**Theme 2: volunteer responders’ assessment of relatives needs**

None of the relatives and volunteer responders included in our study were familiar to each other. Reaching out to comfort an unknown person requires a complex assessment of needs and the competence to sense the right time to approach or even whether to approach at all.

**Manifestations of care**

Volunteer responders’ engagement in comforting relatives was multifaceted, and not all volunteers found it easy to identify and address relatives’ needs. Volunteer responders’ provision of care for relatives varied between participants and care could be manifested in many ways. While some volunteers were very direct in their approaches, others cared for relatives by handling practical tasks:

I made sure that the wife was sent safely by car to the hospital, and that their house was locked, and they had the keys with them. Just practical stuff you easily could forget. (N9)

Some volunteers were very aware of the relatives’ emotional state. One young volunteer had just arrived at the address of the cardiac arrest. The emergency medical services had already arrived, so the volunteer immediately screened the scene for possible tasks. He described his thoughts when he approached the patient’s wife:
All I was thinking was ‘She needs some help’. It was important to me to talk to her and to provide some psychological first aid. I told her that her husband had gained circulation and that the emergency staff would take him to the hospital where she would be given more information. (N4)

**Challenges in providing care**
Assessment of the relatives’ emotional state came spontaneously to some volunteer responders, while for others it was more challenging.

One female volunteer responder described a situation where she was willing to help but felt inadequate:

> We were walking around in the garden waiting for the ambulance staff to take the patient with them. And I remember thinking: I should go, I’m just standing here watching her cry. I was thinking of something to say to her. But it all ends up with me reaching my hand towards her, and I don’t say a single word. And she just says ‘Thank you’. I really didn’t know what to do. (N1)

Another volunteer responder who had arrived at the same cardiac arrest event explained their lack of ability to comfort the wife:

> We were actually just standing there watching. We asked her if she would like some water or a whiskey. And then we were all laughing. (N2)

Some volunteer responders had difficulties with being close to an unfamiliar person. Performing resuscitation requires actions at intimate distance. Yet the presence of the other person may at times be overwhelming because of the greatly stepped-up sensory inputs. Sounds, smells and the necessity to perform ventilations or compressions may force the volunteer to ignore their own personal boundaries. Thus, not all volunteers felt confident in being close to an unknown person and struggled to handle the situation.

While some volunteers had difficulties assessing the relatives’ needs, healthcare-educated volunteers described more ease with initiating emotional support for relatives. In theme 3, we will describe how it was an advantage to be healthcare educated while handling relatives’ needs during cardiac arrest.

**Theme 3: the advantage of being healthcare educated**
Five of the interviewed volunteer responders were healthcare educated, and they drew on their professional expertise including assessment skills, resuscitation knowledge and an overall holistic approach to care delivery.

**Drawing attention to relatives’ needs**
One consistent finding was that healthcare-educated volunteer responders’ attention towards relatives and their well-being was timely. One healthcare-educated volunteer responder arrived at a cardiac arrest scene where a man had collapsed in the street outside his house. While other bystanders were performing CPR, the volunteer responder, together with another volunteer responder, immediately approached the spouse to check-up on her and to ensure she knew what was happening. The volunteer responder talked about the episode:

> We knock on the door where the family lives. A son opens the door. We tell him his father is sick and ask if his mother is home. She was in the shower he said. The other volunteer takes care of the son, while I wait for the mother to finish her shower. I tell her about her husband and that she should get dressed because there are many people outside her house. I put my arms around her shoulders and follow her out on the street. (N3)

Healthcare-educated volunteers immediately gauged relatives’ emotional state. One nurse explained how she quickly identified a relative of the cardiac arrest patient and adjusted her focus:

> I opened the defibrillator and looked up. I saw a young woman standing there. Are you the daughter, I asked her? Yes, she said. Why don’t we go outside for a while, and the emergency team will continue working. (N8)

Caring for relatives could even be done through a phone call. Healthcare-educated volunteer responders were often focused on calming relatives by providing information about their loved ones:

> I call the spouse and tell him I’m a volunteer responder, and that I’m at their house and his wife needs first aid. I tell him the medical emergency staff is here and that we’re plenty of people at the scene, and that we’re taking good care of their child. I try to calm him and comfort him. (N11)

Though non-health-educated volunteers perceived provision of psychological support for relatives an important task, it was somehow more challenging. One volunteer responder described:

> We were two volunteer responders standing and waiting. We talked to the spouse and his son who had an enormous dog. They had found his mother on the floor and called the emergency number 112. I could sense the dog was frightened, it was whining. The son, he cried a lot. They were standing all by themselves, and it was quite heavy. And I felt like we as volunteers had a job there. Not that we should act like psychologists or something like that. But maybe make them talk. But it’s damned tough to figure out what to do. It was a bit easier with that dog… (N6)

The lack of ability to just be with the relatives in silence was a pattern among non-health-educated volunteers. Many needed to say something or do something to interrupt the awkward situation. One male volunteer responder was involved in a cardiac arrest where the father of three small kids had collapsed. He explained...
how he was navigating between comforting the mother and calming her kids while he was stressed in the chaotic situation:

The emergency staff had just arrived and started advanced life-support. I turned around, and suddenly saw the wife of the patient standing with their three small kids on the stairway behind us. And I was like - wow, full panic. I just turned towards her and said, ‘Calm down, the experts are here now’. I tried to calm her down by keeping a conversation going. (N7)

He continued: ‘I looked at the kids and said “Oh, what a mess, that’s bad. But the experts are here now, the experts are here”’ (N7).

Being healthcare educated was an advantage for those volunteer responders who had professional experience with patients and relatives. A volunteer responder reflects on her professional identity: ‘I guess I have a trained eye through my work to direct my attention at the relatives (...) I know a lot about grieving processes. I don’t think she needed me to say much, rather than just to be there in the moment with her’ (N3).

Healthcare-educated volunteer responders felt much more experienced in navigating, assessing and meeting needs of relatives during the acute and stressed situation, while non-health care educated volunteers could misinterpret needs and signals from relatives. Healthcare-educated volunteer responders explained that they felt confident in managing people in psychological distress and that they drew on strategies adapted from their professions. Yet, when volunteer responders register as volunteers, they typically expect involvement in resuscitation rather than involvement in care and support for relatives. Nevertheless, our interviews reveal that volunteer responders, even those who are not healthcare educated, are very attentive towards relatives’ psychological needs.

Relatives could perceive persons who are not part of the official emergency medical response coming into their private space as overwhelming or even offensive. Furthermore, their CPR skills may not be trusted.20 Our study found that relatives found volunteer responders’ contributions rewarding and were grateful for their efforts. The consensus among relatives was that of feeling immediate relief at the arrival of assistance. This relief was closely related to relatives’ perception of volunteers acting competent and skilled. Relatives expressed appreciation that ‘just someone’ arrived to assist them, even if it was a volunteer responder who showed up unexpectedly. Relatives were particularly thankful for volunteers responders who stayed with them while EMS treated their loved ones. Small tasks such as offering a glass of water or just listening were highly appreciated.

As volunteer responders were not particularly well prepared to provide care for relatives, some volunteers felt ill-equipped to provide emotional support and did not know how act or what to say. Volunteers who were not confident in how to provide care sometimes felt they had to overstep their own boundaries. The American anthropologist Edward Hall developed the theory of proxemics, which concerns how people behave together in different spaces.26 Normally, the personal space among strangers displays a limited range of acceptable body contact. Yet, the setting of a cardiac arrest in a private home is a tense and intimate situation, where physical space is limited. According to Hall, feeling one’s space is invaded causes emotional discomfort.27 Our interviews have shown that volunteers may struggle to maintain a balance between being uncomfortably close and awkwardly distant from the relative. Provision of resuscitation or care for relatives often requires exceeding one’s own limits or boundaries.

When volunteer responders receive an alarm, no information is provided on the circumstances of the OHCA, neither presence of relatives or even small children. As initiators of volunteer responder programmes, one must reflect on the moral responsibility of preparing volunteer responders for how to handle relatives to OHCA patients. In Denmark, volunteer responders are not expected to be trained in prioritising or handling psychological crisis reactions. One recent study of how Swedish volunteer responders perceived being dispatched found a need for preparatory training of volunteers engaged in resuscitation programmes.28 The authors suggested some action points to be included in future CPR training programmes, one of which was to prepare volunteers to handle the patients’ family and the unfamiliar environment, for example, in someone’s private home. Furthermore, a qualitative study on first responders engagement in OHCA found the interaction with family members to the OHCA patient could affect responders in their aftermath.29 We suggest that volunteer responder programmes could benefit from basic life support courses that include tasks beyond resuscitation, such as provision of emotional support for relatives.

**DISCUSSION**

This study investigated how volunteer responders and relatives to OHCA patients interacted with and perceived each other during resuscitation. Among relatives to OHCA patients, the main findings were their feeling of immediate relief when someone arrived to help and that volunteer responders provided valuable assistance just by providing some company. Among volunteer responders, the main finding was that it was an advantage to be healthcare educated, because this provided a better basis for assessing the situation and comforting relatives. Overall, volunteer responders were very attentive towards relatives’ needs, although some volunteer responders did find it challenging to approach relatives.

Our findings provide unique insights into the interaction between relatives and volunteer responders. Although volunteer responder programmes have been implemented with the intention to improve patient survival, the interaction between volunteer responders and relatives to patients is not necessarily uncomplicated.
Managing the emotional impact of being dispatched as a volunteer responder can be challenging. One recent study found that 1.2% of dispatched volunteer responders reported severe psychological impact. Facing relatives to OHCA patients in crisis may be emotionally demanding, which adds a further dimension to preparing volunteer responders for OHCA. The American Heart Association suggests that CPR and AED training programmes should directly address potential psychological barriers and to include a system of volunteer responder follow-up support. One key element in securing volunteers’ psychological well-being is a comprehensive education in how to handle relatives as volunteer responder. While emotional support is not a task volunteer responders are expected to handle, this study shows it is a task they end up handling, which underscores the need for preparatory courses offering training on how to provide emotional support for relatives during resuscitation. This study is based on in-depth interviews with 16 individuals. A larger sample would increase generalisability of the study’s results. Future studies focusing solely on relatives’ experiences with volunteer responders would be beneficial.

Conclusion

Relatives to patients of OHCA benefited from volunteer responders’ presence and support in an intense and critical situation. Relatives experienced the mere presence of volunteer responders as supportive and the responders made the relatives feel less alone. Healthcare-educated volunteer responders felt confident and skilled to provide care for relatives, while some non-healthcare-educated volunteer responders felt they lacked the proper training and knowledge to provide emotional support for relatives. Focusing on volunteer responders’ support for relatives during OHCA may be an important concept in prehospital resuscitation care and enhance relatives’ experience of being cared for during resuscitation. Since not all volunteer responders may be mentally prepared for, or willing to provide, emotional support, basic life support courses to build confidence and skills to provide emotional support to relatives of OHCA patients may benefit volunteer responders.

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Contributors ARK drafted the manuscript, conducted, coded and transcribed all interviews and contributed to the analysis. ARK is the guarantor of the study and accepts full responsibility for the conduct of the study. ARK had access to the data, and controlled the decision to publish. AJJ read interview transcripts, coded transcripts and contributed to the analytical work. TT-T contributed to the analytical work and to the drafting and design of the study. LZ and CMH contributed the interpretation of data. MCTG, LCA, FF, AKC and JK contributed with critically revision of the content. All authors have made a substantial contribution to the concept, analysis or design of the article. The manuscript version has been approved to be published by all authors.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Consent obtained directly from patient(s)

Ethics approval The study was registered and approved at the Knowledge Center for Data reviews, the Capital Region of Denmark: P-2022-64. The Danish Heart-Runner Trial was assessed by the local ethics committee and waived formal consent unnecessary (Journal nr.: 17018804).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. Interview transcripts are available on reasonable request by sending an email to the corresponding author.

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REFERENCES

Heart Runner questionnaire v. 3.1

TrygFonden
Survey for the Heart Runner project

Text message
Dear Heart Runner
You have recently been alerted about a cardiac arrest near you by the Heart Runner app. Whether you responded to the alert or not, you can help us improve the Heart Runner program by answering a questionnaire for us - it should only take you seven minutes.

Use this link to go to the questionnaire: [LINK]

Thank you in advance.

Sincerely
TrygFonden

Introduction
We ask you to answer this questionnaire from TrygFonden (TryghedsGruppen smba, ‘TrygFonden’) because you have received an alert about a Heart Runner mission in your vicinity.

We will ask how you made your way to the scene of the emergency, whether you performed CPR, whether an AED was used, whether you arrived before the ambulance etc. We will also ask you to tell us if the mission has had an impact on you. By completing this questionnaire, you allow TrygFonden to store and analyze any personal information, including information about your personal health, that you provide.

Completing the questionnaire is completely voluntary, and you can retract your consent (which you find towards the end of the questionnaire) at any time by getting in touch with TrygFonden. We do, however, need your consent before you can complete the questionnaire.

Read more (in Danish) about how we safeguard your personal information in our Data Policy for Heart Runners at Persondatapolitik for hjerteloebere (hjertestarter.dk).
START questionnaire

Q1 How did you respond to the alert?

☐ Accepted (Go to Q2)
☐ Rejected (Go to Q35)

‘ACCEPTED’-questions:

Q2 Did you reach the person who had a cardiac arrest?

☐ Yes (Go to Q6)
☐ No (Go to Q3)

Q3 Did you reach the location for the cardiac arrest?

☐ Yes (Go to Q4)
☐ No (Go to Q5)

Q4 Why did you not reach the person? (Multiple answers allowed)

☐ The emergency medical services on site declined my offer of help
☐ I noticed that an ambulance was already at the scene
☐ I noticed that the police/fire brigade was already at the scene
☐ I noticed that other Heart Runners were already at the scene
Other reason. Please specify: (Free text box)

(Go to Q6)

Q5 Why did you not reach the location for the cardiac arrest? (Multiple answers allowed)

☐ I noticed that an ambulance/emergency medical services was close/had already arrived
☐ I noticed that the police/fire department was close/had already arrived
☐ I noticed that other volunteers/heart runners were close/had already arrived
☐ I noticed the alert too late
☐ I thought I was too far away
☐ There were problems with the app
☐ The alert did not provide sufficient information
☐ I could not be of assistance after all
☐ The alert was cancelled
☐ Other reason. Please specify: (Free text box)

(Go to Q7)

Q6 How did you get there? (Multiple answers allowed)
On foot
☐ By bicycle
☐ By car
☐ Other mode of transportation

(Go to Q7)

Q7 Did you attempt to bring an AED?
☐ Yes (Go to Q8)
☐ No, but I was not sent for one (See ‘Activation’ under Q9)
☐ No, other reason. Please specify: (Free text box) (See ‘Activation’ under Q9)

Q8 Did you get hold of an AED?
☐ Yes (Go to Q10) (See ‘Activation’ under Q9)
☐ No (Go to Q9)

Q9 Why did you not bring an AED? (Multiple answers allowed)
☐ The alert did not provide sufficient information
☐ There were problems with the app
☐ The AED was locked away
☐ The AED had been taken
☐ I was unable to locate an AED
☐ Other reason. Please specify: (Free text box)

Activation: To Q10, if respondent reported that they found the patient. If they merely arrived at the location, they should go to Q18 (the question about relatives). If they did not reach the person or the location, but did get hold of an AED, they should go to Q27 (the question about physical danger).

Headline: When you got to the person with cardiac arrest

Q10 Did you get to the person with cardiac arrest before the professionals (emergency medical services, ambulance, fire department or police)?
☐ Yes, before
☐ No, after
☐ No, at the same time
☐ Unknown

Q11 Had anyone begun CPR and/or mouth to mouth resuscitation when you arrived?
☐ Yes
☐ No
☐ Unknown

Activation: If the respondent answered ‘Yes’ to Q11, they will be sent to Q12 if they also responded ‘No’ or ‘Unknown’ in Q10, or to Q13 if they responded ‘Yes, before’ to Q10. If the respondent answers ‘No’ or ‘Unknown’ to Q11, they are sent to Q14.

Q12 Who were doing CPR and/or mouth to mouth resuscitation when you arrived? (Multiple answers allowed)
☐ Emergency medical service personnel
Q13 Who were doing CPR and/or mouth to mouth resuscitation when you arrived? (Multiple answers allowed)
- Another Heart Runner
- A relative to the person with a cardiac arrest
- Others
- Unknown

Q14 Did you provide lifesaving first aid? (Please reply for each category)

<table>
<thead>
<tr>
<th>Did you provide CPR?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you provide mouth-to-mouth?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you apply an AED?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Activations: If respondent replied ‘Yes’ to CPR OR ‘mouth-to-mouth’ in Q14 and ‘No’ or ‘Unknown’ in Q11, they are sent to Q15. If they reply ‘No’ to both CPR and mouth-to-mouth, they are sent to Q16.

Q15 Were you the first to perform CPR and/or mouth-to-mouth?
- Yes
- No
- Unknown

Activations: Go to Q17 if the respondent applied an AED (see Q14). If respondent did not apply an AED, go to Q18.

Q16 Why did you not perform CPR and/or mouth-to-mouth resuscitation? (Multiple answers allowed)
- The person was conscious
- The person was not in cardiac arrest
- Someone else was performing CPR and/or mouth-to-mouth
- Other reason. Please specify: (Free text box)

Activations: Go to Q17 if the respondent applied an AED (see Q14). If respondent did not apply an AED, go to Q18.

Q17 Did the AED provide an electric shock (defibrillation) to the person with cardiac arrest?
- Yes
- No
- Unknown

Q18 Were there any relatives to the person with cardiac arrest present?
- Yes
No
Unknown

Activations: If the respondent replies ‘Yes’ or ‘Unknown’, they are sent to Q19, if they reply ‘No’, they are sent to Q20. Please note that Q18 is ONLY asked if the respondent arrived at the location. This is because Heart Runners have wondered about being asked about relatives in questionnaire 2.0 despite reporting that they did not arrive at the location.

Q19 Did you engage with the relatives? (Multiple answers allowed)
- No, others were there who dealt with the relatives
- No, other reason
- Yes, I did what I could to comfort the relative(s) during the resuscitation
- Yes, after the ambulance had left, I remained on site and did what I could to comfort the relative(s)
- Yes, another role. Please specify: (Free text box)

Activations: If a respondent replies ‘no’, the ‘yes’-options must become unavailable and vice versa.

Q20 Please explain what else you did (if anything) to help during the emergency: (Free text box)
Q21 Which of the following circumstances applied to the situation? (Please select one response for each line)

The person with cardiac arrest was below the age of 18
Yes  No  Unknown
At one point, I was alone with the person with a cardiac arrest
I knew the person who suffered from cardiac arrest
I knew the relative(s) of the person with cardiac arrest

Q23 Were you shocked by the event?
☐ Very much
☐ Somewhat
☐ A little
☐ Not at all
☐ Unknown

Q25 Please note the accuracy of the following statement: “The collaboration with the professional emergency response personnel was very good.”
☐ Not relevant
☐ Fully agree
☐ Agree
☐ Neither agree nor disagree
☐ Disagree
☐ Disagree completely

Q26 Please note the accuracy of the following statement: “The collaboration with the other helpers/Heart Runners was very good.”
☐ Not relevant
☐ Fully agree
☐ Agree
☐ Neither agree nor disagree
☐ Disagree
☐ Disagree completely

Please note: Everyone who responded to the alert will be asked the following questions, except the ‘Rejected’ questions, which are asked of those who did not respond to the alert.

Headline: Personal consequences for you

Q27 Were you injured or close to getting injured on your way to the cardiac arrest (did you, e.g., hurt yourself or were you close to having an accident in traffic)?
☐ Yes, I nearly was hurt
☐ Yes, I sustained an injury, but I did not require medical attention
☐ Yes, I sustained an injury, and I did require medical attention
☐ No
☐ Unknown
☐ Not relevant
Q28 Providing help to someone with a cardiac arrest can affect you mentally. Have you noted any effects of the experience so far?

☐ Very much
☐ Somewhat
☐ A little
☐ Not at all
☐ Unknown

Q30 Would you like a consultation to discuss the event?

☐ Yes
☐ No

You will be contacted and offered a consultation at the earliest opportunity if you reply ‘Yes’ to the above, or if you indicated that the person with a cardiac arrest was below the age of 18 (Q21).

Headline: Your experience with the app

Q31 What is your overall assessment of the app in relation to this alert?

☐ Very good
☐ Good
☐ Adequate
☐ Poor
☐ Very poor

Q32 Please elaborate on your experience with the app and share any ideas for how we may improve the app (Free text box)

Headline: Closing questions

Q33: Do you plan to stay on as Heart Runner?

☐ Yes
☐ No
☐ Unknown

(Then END)

If you would like to talk about the event or the Heart Runner program, please send a mail to hjerteloebden-praehospitale-virkomhenedregionh.dk, and we will get in touch as soon as possible. Please note that we are not at liberty to discuss the outcome for a specific person who has suffered a cardiac arrest.

Thank you for your participation.

Handling of personal information included in the questionnaire

TrygFonden continuously attempts to identify ways improve on the Heart Runner program and the related app.
I hereby give my consent to TrygFonden to collect, store and process my replies to this questionnaire, including whatever health information I have submitted, for the explicit purpose of improving the Heart Runner program and the related app.

Use of my replies in the questionnaire for scientific purposes

The Heart Runner program is the subject of scientific studies, both to determine the effects of the program, and to identify ways to improve the program. For that reason, TrygFonden shares data collected via the app with the Capital Region of Denmark and Central Denmark Region for use in scientific studies.

I hereby give my consent to TrygFonden to share my replies to this questionnaire, including whatever health information I have submitted, with (i) the Capital Region of Denmark, Kongens Vænge 1, DK-3400 Hillerød and (ii) central Region Denmark, Skottenborg 26, DK-8800 Viborg, for the explicit purpose of research into the Heart Runner program.
'Rejected’-questions:

Please help us improve the Heart Runner program by responding to the following brief questions:

**Q35: Why did you reject the alert? (Multiple answers allowed)**
- I was unable to accept the alert
- I did not feel I was able to provide the necessary assistance
- I was certain that an ambulance would get there before me
- The app did not function properly
- Other reason(s). Please specify: (Free text box)

**Q36: Do you plan to remain part of the Heart Runner program?**
- Yes
- No
- Unknown

(End to END2)

**END2** If you would like to be contacted by someone from the program, please send an email to hjerteloeber.den-praehospitale-virksomhed@regionh.dk

**Handling of personal information included in the questionnaire**

TrygFonden continuously attempts to identify ways to improve on the Heart Runner program and the related app.

[ ] I hereby give my consent to TrygFonden to collect, store and process my replies to this questionnaire, including whatever health information I have submitted, for the explicit purpose of improving the Heart Runner program and the related app.

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**Interview guide:** *How do volunteer responders (Heart Runners) support relatives during resuscitation attempts?*

The interview guide is based on the following research questions:

<table>
<thead>
<tr>
<th>Situation 1 – The Heart Runner alert and the meeting with the relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did the encounter between the Heart Runner and the relative play out? What else took place in that situation?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Situation 2 - The Heart Runner alert and the meeting with the relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did the Heart Runner experience the encounter with the relative? What level of attention did the Heart Runner pay to the relative?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Situation 3 – Long-term effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>What impact has the encounter with the relative had on the Heart Runner?</td>
</tr>
</tbody>
</table>

Semi-structured interviews are, according to Kvale & Brinkmann (Steinar Kvale and Svend Brinkmann, 2008), conducted on the basis of an interview guide that narrows the scope of interviews to specific pre-defined topics. The following guide has been developed on the basis of the research questions above to examine specific issues that are deemed to be relevant for the overall objective, i.e., to determine how Heart Runners support relatives during resuscitation attempts. The opening question, “Tell me what happened from the moment you received the Heart Runner alert”, is intended to facilitate an open and honest dialogue during the interview. At the end of the interview, each informant will be asked if they have any further thoughts, perspectives or questions that did not come up during the interview. The interviews will be transcribed immediately after the interviews have taken place.

**Semi-structured interview guide: Heart Runner’s support of relatives**

<table>
<thead>
<tr>
<th>Heart Runner’s name</th>
<th>Age</th>
<th>Location of the incident (public or private.)</th>
<th>Heart Runner’s profession</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Research question</th>
<th>Interview questions</th>
<th>Elaborating questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation 1 – The Heart Runner alert and the meeting with the relative</td>
<td>Opening question:</td>
<td>What happened then?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What did you do?</td>
</tr>
</tbody>
</table>

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### How did the encounter between the Heart Runner and the relative play out? What else took place in that situation?

Tell me what happened from the moment you received the Heart Runner alert

**Follow-up questions:**
- Describe the situation you found at the scene.
- Who were already there?
- Do you recall if any relatives were present? How did you find out that they were relatives?
- Were there any other Heart Runners at the scene?

**What was going through your mind?**

**How did you feel?**

### Situation 2 - The Heart Runner alert and the meeting with the relative

How did the Heart Runner experience the encounter with the relative? What level of attention did the Heart Runner pay to the relative?

- Do you recall your encounter with the relative?
- How did you become aware of the relative?
- Can you describe what your specific task was in relation to the relative?
- Do you recall what went through your mind?
- What do you think it meant for them that you did that? What makes you say that?
- What was your experience of the relative’s reaction?
- Did anything make a special impression on you?
- What was your experience of the way the relatives reacted to your arrival as a Heart Runner?
- Is there anything you wish you had done differently?
- How did you prepare for the encounter with the relatives?

**How did you feel about that?**

**What made the biggest impression?**

**How?**

**How come you did that?**

**How did that feel like?**

**What did that do to you?**

**In what way?**
<table>
<thead>
<tr>
<th>Situation 3 – Long-term effects</th>
<th>In what ways?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What impact has the encounter with the relative had on the Heart Runner?</td>
<td>How have you been since your Heart Runner mission?</td>
</tr>
<tr>
<td></td>
<td>Why do you think that you feel this way?</td>
</tr>
<tr>
<td></td>
<td>Is this feeling one you have also had in other situations?</td>
</tr>
<tr>
<td></td>
<td>How have you been since your Heart Runner mission?</td>
</tr>
<tr>
<td></td>
<td>What has that meant for your own life?</td>
</tr>
<tr>
<td></td>
<td>What do you think your efforts has meant for the relative?</td>
</tr>
<tr>
<td></td>
<td>What impact has the experience of facing the relative had on you?</td>
</tr>
<tr>
<td></td>
<td>What has made the strongest impression on you?</td>
</tr>
<tr>
<td></td>
<td>When you reflect on how you supported the relative, what is most important to you?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In closing</th>
<th>How do you feel about this interview?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If I think of something I’d like to ask you later, is it ok if I get in touch again?</td>
</tr>
<tr>
<td></td>
<td>I hope you will get in touch if you think of something, anything, you’d like to add to what you’ve already told me.</td>
</tr>
</tbody>
</table>

**Closing question:** Do you have anything you’d like to add or to explain more before we end the interview?

**Sampling:**

Informants will be selected to ensure **maximum variation sampling**. We aim for the widest possible variation in gender, age, line of work (about 1 in 3 will be health care professionals), geographic location, and whether the cardiac arrest happened in a private residence or in a public space.

All told, 8-12 informants are deemed optimal for this purpose.

The analysis will be a thematic analysis as defined by Braun & Clarke (Braun and Clarke, 2006).
Interview guide: *How do Heart Runners support relatives during resuscitation attempts?*

The interview guide is based on the following research questions:

<table>
<thead>
<tr>
<th>Research questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How did the relative feel about Heart Runners arriving on the scene?</td>
</tr>
<tr>
<td>2. How did the relative feel about the presence of the Heart Runner?</td>
</tr>
<tr>
<td>3. How does the relative feel about the Heart Runner’s actions?</td>
</tr>
<tr>
<td>4. Has the presence of the Heart Runner had a lasting impact on the relative?</td>
</tr>
</tbody>
</table>

Ethics:

All informants must give their consent before the interview and are informed that data is treated as confidential and is anonymized. During the interviews, each informant’s personal preferences and boundaries are carefully observed. Interviews with relatives may be a painful experience because the relatives are forced to relive a potentially traumatic experience. Informants can request a pause or a change of subject at any time, just as they can end the interview at any point.

All informants are offered a follow-up consultation one week after the call.

<table>
<thead>
<tr>
<th>Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age:</td>
</tr>
<tr>
<td>Relation to the patient:</td>
</tr>
<tr>
<td>Location of the cardiac arrest:</td>
</tr>
<tr>
<td>Date of the incident:</td>
</tr>
</tbody>
</table>

Introduction:

I know it can be painful to think back to the incident where XXX had a cardiac arrest. If we, during this interview, end up talking about something you would prefer not to think about or explain to me, let me know, and we can change the subject or take a break if you feel like it.

<table>
<thead>
<tr>
<th>Research question</th>
<th>Interview question</th>
<th>Elaborating questions</th>
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<tbody>
<tr>
<td>1. How did the relative feel about Heart Runners arriving on the scene?</td>
<td>Take me back to the day when your relative had a cardiac arrest. Can you describe to me what happened?</td>
<td>How did you think about Heart Runners arriving on the scene?</td>
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<td></td>
<td>What did you do?</td>
<td>How did you feel about that?</td>
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<td></td>
<td>Who showed up?</td>
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<td>Do you recall that Heart Runners arrived at the scene?</td>
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<td></td>
<td>How many?</td>
<td></td>
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<td>How did you become aware that they were Heart Runners?</td>
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</table>
2. How did the relative feel about the presence of the Heart Runner?
Thinking back on it now, do you recall what the Heart Runner actually did?
Do you recall if the Heart Runner did anything for you?
In what way?
And what were you doing?
What did you think about that?
How did you feel at that time?
Why do you think you felt that way?

3. How does the relative feel about the Heart Runner's actions?
What are your thoughts on the fact that Heart Runners arrived at the scene?
Thinking back now, what did it mean for you in that situation that the Hear Runner showed up?
Can you describe to me what you were feeling in that situation?
What effect did that have on you?
In what way?

4. Has the presence of the Heart Runner had a lasting impact on the relative?
What has it meant for you since then, that a Heart Runner showed up?
What do you think has made the biggest impression on you?
How so?

**Supplemental Material 3**

**Detailed Methods**

**Sampling and Recruitment**

**Sampling of volunteer responders**
Volunteer responders were eligible for inclusion if they had been involved in an OHCA in a private home with the presence of one or more relatives of the cardiac arrest patient. To ensure diversity among volunteer responders, recruitment took place in two ways: first, volunteer responders were purposefully selected through the volunteer responder survey. We sought participants who had stated that relatives were present during resuscitation in the survey. Further, we aimed for a variation in professional backgrounds, age, and sex. Secondly, we made a public announcement on the official Danish volunteer responder social media profile for volunteer responders who had been dispatched to a cardiac arrest where relatives were present. We specifically tried to recruit participants who had been actively involved with relatives to the OHCA patient to enhance information power and obtain an adequate sample size with focus on the richness of data rather than quantity(1).

**Sampling of relatives of OHCA patients**
Close relatives to OHCA patients who had been present during the resuscitation attempt in a private home with a volunteer responder present were eligible for inclusion. Close relatives were defined as either spouse, partner, adult child, sibling, or parent to the cardiac arrest patient. Contact with relatives was established through contact to the caller to the dispatch center, who was often a family member or close relative. When volunteer responders had been involved in an OHCA, the principal investigator attempted to reach the person who called the emergency medical dispatch center by phone. The principal investigator would ask the caller if he or she was satisfied with the dispatcher’s instructions and information during the event. Subsequently, the caller was asked whether he or she was a close relative to the cardiac arrest patient and, if so, invited to participate in the study. Further, relatives were invited to participate through the official Danish volunteer responder social media platform. As the relative of the cardiac arrest patient was expected to be in a highly sensitive emotional stage, relatives were given time to decide whether to participate. The principal investigator discussed with the relatives what consequences it might have for them to speak about the experience in detail in an interview, while also acknowledging the emotionally sensitive experience it can be to witness a cardiac arrest. Participants were invited some 10-12 weeks after
the event. This timing was considered appropriate to ensure data was collected as soon as possible after the experience, but not during the immediate crisis period.

**Elaboration of the interview setting**

Interviews were held individually. Volunteer responders who had been involved in the same alert were given the opportunity to participate in an individual or joint interview, which led to two combined interviews. The joint interviews provided space for interactive reflection on the participants’ roles and actions during the cardiac arrest situation. The interviewer allowed both participants equal time to speak. Interviews ranged from 35 minutes to 68 minutes, with a mean duration of 48 minutes. Due to the coronavirus pandemic, participants were asked whether they wished to conduct the interview online through a video interview or in a live setting. All in-person interviews took place at the emergency medical dispatch center in Copenhagen and were held by the primary investigator (ARK) between July 2020 and March 2022. Video interviews were performed in a calm and undisturbed environment with good quality camera and microphone. Video interviews have been proven valid and trustworthy alternatives to face-to-face interviews(2).

**Elaboration of the data generation**

In-depth semi-structured interviews(3) were performed in accordance with two interview guides aimed to facilitate a loose and flexible overall structure. One guide was specifically developed for relatives and one for volunteer responders. The semi-structured guides allowed for participants to raise and explore topics not pre-determined in the guides. The development of interview guides was a five-step process inspired by Kallio et al. and was pilot tested as explained below(4). The interview guides were developed by three researchers (ARK, TTT, CMH) in collaboration with a chief psychologist with expertise in crisis handling (AKC). The guides comprised three sections: 1) the meeting between volunteer responders and relatives, 2) the interaction between volunteer responders and relatives, 3) thoughts after of the event. The first interview served as a pilot test where the participant was asked to give feedback regarding the interview process. By testing the interview guide on both volunteer responders and relatives, it was possible to make adjustments to the interview questions and improve the quality of data collection(5). Subsequently, in-depth interviews were conducted to explore meanings and experiences through the participants’ narratives of their experiences during resuscitation. Participants’ narrative of their
experiences was initiated by the first question “Could you start by telling me what happened when your spouse collapsed?” or “Could you start by telling me what happened when you received the alarm as volunteer responder?”. Then participants were asked if they remembered who else was present and to describe the situation in detail. Participants were encouraged to elaborate on their experiences: “Could you tell me more about that?”, “Do you remember what went through your mind in that situation?”. All interviews were recorded and transcribed immediately after the interview by the primary investigator who also translated interviews from Danish to English.

**Ethical considerations**

We explored a highly sensitive and complex area by interviewing relatives of OHCA patients, which entailed substantial ethical responsibility during data collection. It was a cause for concern that relatives to patients who were not successfully resuscitated were affected by grief and therefore emotionally vulnerable. As researchers, we were responsible for weighing the risks and benefits of research participation(7). The interviews brought up painful thoughts and emotions for some of the participants, and the interviewed relatives were often in tears or emotionally affected during the interview. Yet, participants often expressed relief when given the opportunity to speak about their experiences. This is in line with previous studies reporting therapeutic effects from undertaking an interview; participants are often grateful for the opportunity to tell their story and may find increased self-awareness, emotional relief, and a sense of healing(8) (9). However, as interviews may stir up emotions and actualize a need for professional support, all participants were offered a follow-up conversation with principal investigator one week after the interview to ascertain their wellbeing.
References:


