Version of Record: https://www.sciencedirect.com/science/article/pii/S0300957221000034
Manuscript_01e2f9fa727166f922e2321b0ca829a7

Article title: '*I think he's dead*': a cohort study of the impact of caller declarations of death during the emergency call on bystander CPR

Authors

Marine Riou[1,2], Stephen Ball[2,3], Alani Morgan[2], Sheryl Gallant[2], Nirukshi Perera[2], Austin Whiteside[3], Janet Bray[1,5], Paul Bailey [2,3], and Judith Finn[2,3,4,5]

Author affiliations

[1]Centre de Recherche en Terminologie et Traduction (CRTT), Université Lumière Lyon 2, Lyon, 69007, France

[2]Prehospital, Resuscitation and Emergency Care Research Unit (PRECRU), School of Nursing, Midwifery and Paramedicine, Curtin University, Bentley, WA 6102, Australia

[3]St John Ambulance WA, Belmont, WA 6104, Australia

[4]Emergency Medicine, The University of Western Australia, Crawley, WA 6009, Australia

[5]Department of Epidemiology and Preventive Medicine, Monash University, Victoria 3004, Australia

Corresponding author

Dr Marine Riou
Centre de Recherche en Terminologie et Traduction (CRTT)
Université Lumière Lyon 2
35 rue Raulin
69007 Lyon
France
marine.riou@univ-lyon2.fr

Word count: 2094 (excluding title, abstract, keywords, references, tables, figures)

Word count of the abstract: 247

Number of tables: 2

Number of figures: 2

Supplementary material

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'*I think he's dead*': a cohort study of the impact of caller declarations of death during the emergency call on bystander CPR

Abstract

Background: In emergency calls for out-of-hospital cardiac arrest (OHCA), dispatchers are instrumental in the provision of bystander cardiopulmonary resuscitation (CPR) through the recruitment of the caller. We explored the impact of caller perception of patient viability on initial recognition of OHCA by the dispatcher, rates of bystander CPR and early patient survival outcomes.

Methods: We conducted a retrospective cohort study of 422 emergency calls where OHCA was recognised by the dispatcher and resuscitation was attempted by paramedics. We used the call recordings, dispatch data, and electronic patient care records to identify caller statements that the patient was dead, initial versus delayed recognition of OHCA by the dispatcher, caller acceptance to perform CPR, provision of bystander-CPR, prehospital return of spontaneous circulation (ROSC), and ROSC on arrival at the Emergency Department.

Results: Initial recognition of OHCA by the dispatcher was more frequent in cases with a declaration of death by the caller than in cases without (92%, 73/79 vs. 66%, 227/343, p<0.001). Callers who expressed such a view (19% of cases) were more likely to decline CPR (38% vs. 10%, adjusted odds ratio 4.59, 95% confidence interval 2.49-8.52, p<0.001). Yet, 15% (12/79) of patients described as non-viable by callers achieved ROSC.

Conclusion: Caller statements that the patient is dead are helpful for dispatchers to recognise OHCA early, but potentially detrimental when recruiting the caller to perform CPR. There is an opportunity to improve the rate of bystander-CPR and patient outcomes if dispatchers are attentive to caller statements about viability.

Keywords

Out-of-hospital cardiac arrest, cardiopulmonary resuscitation, bystander-CPR, telephone-CPR, barrier, viability, dispatcher, emergency call, communication

Introduction

Cardiopulmonary resuscitation (CPR) performed by a bystander before the arrival of the ambulance more than doubles the chance of survival from out-of-hospital cardiac arrest (OHCA).[1] Dispatch-assisted CPR (DA-CPR) is one way in which the rate of bystander-CPR can be increased.[2] Yet, despite considerable research on DA-CPR, little attention has been paid to the specific ways in which the assistance of a lay bystander can be effectively recruited by the dispatcher.

A number of barriers to CPR during emergency calls have been documented, which include medical presentation (e.g. seizure-like activity [3]), physical obstacles (e.g. patient position [4–8]) and various psychological or communicative issues, such as emotional distress [9,10] and language barriers.[11,12] A few studies which analysed the audio or transcripts of

emergency calls mentioned that, among other factors, one obstacle to DA-CPR was the caller's perception that the patient was dead.[7,8,12–14]

In our previous work on CPR negotiation during emergency calls,[15] we identified a significant effect of the caller's perception of the patient's viability (as expressed by them in the call) on the acceptance or refusal to perform CPR. In this paper, we examine in more depth this relationship between caller's declaration of death and their subsequent response to dispatcher's initiation of CPR instructions ("CPR-opening"). We also explore the impact of such statements on initial OHCA recognition by the dispatcher during the call, and whether the patient achieved prehospital return of spontaneous circulation (ROSC).

Methods

Population and data collection

We conducted a retrospective cohort study of 422 emergency ("000") calls for non-traumatic OHCA cases attended in Perth, Western Australia by St John WA (SJ-WA) between 1 January 2014 and 31 December 2015. The study cohort consisted of all cases meeting the following criteria: non traumatic paramedic-confirmed OHCA in adults (≥14 years old) involving a single patient, where paramedics attempted resuscitation, and for which OHCA was recognised by the dispatcher during the call. The study cohort excluded cases where CPR was already in progress prior to the emergency call, cases where the caller mentioned CPR before the dispatcher, cases where the dispatcher did not deliver a CPR-opening, and cases where the caller did not respond to the CPR-opening at all (e.g. they ended the call). More details on the study cohort can be found in our previous paper.[15]

Dispatch protocol

During the study period, SJ-WA used version 12.1.3 of the Medical Priority Dispatch System™ (MPDS),[16] implemented with the ProQA software.[17] This computer-aided standardised dispatch protocol constrains the structure of calls with ordered, scripted questions that dispatchers must ask in order to gather information, identify a chief complaint, and provide the relevant life-support and pre-arrival instructions to callers.

Analysis of the calls

Analysing the emergency calls' audio recordings and transcripts, we coded each case for two main variables:

- **Declaration of death** (the exposure of interest), i.e. any utterance before initial dispatch (recorded in ProQA) in which the caller expressed their belief that the patient was dead, containing the words "dead", "died" or synonyms such as "passed (away)", "deceased", "gone", "not alive", "lifeless", "no signs of life", and "too late". We did not consider that the following were declarations of death: use of -ING inflection (e.g. "dying") referring to an event in progress rather than accomplished; and expression of absence of knowledge (e.g. "we're not sure if she's alive").

- **Response to CPR-opening** (primary outcome), i.e. whether the caller accepted vs. declined to perform CPR when the instructions were first initiated by the dispatcher. The CPR-opening typically corresponded to the scripted sentence "*listen carefully and I'll tell you how to do resuscitation*", though we found considerable variation in wording.[15] We considered that the caller agreed to perform CPR if they provided verbal confirmation (e.g. "yeah I can try it") or complied with subsequent CPR instructions.

Additionally, we included the following secondary outcomes and covariates, which were extracted from the audio recordings or the electronic patient care record, completed by the attending paramedic.

Secondary outcomes:

- **Bystander-CPR**, i.e. whether CPR was started at any point during the call by the caller or any other bystander present on scene, as evidenced through audible signs.
- **OHCA recognition**, i.e. at what point of the call the dispatcher recognised OHCA, this being either by the time of initial dispatch (initial recognition), or later during the call i.e. after initial dispatch (delayed recognition).
- **Return of Spontaneous Circulation (ROSC) at any point**, i.e. whether the patient achieved prehospital ROSC.
- **ROSC on arrival at Emergency Department (ED)**

Covariates:

- **Patient's age**, grouped into adult (14-69 years old) and elderly (≥ 70 years old)
- **Patient's sex**, male or female
- **Witnessed status**, i.e. whether the patient's collapse was unwitnessed or witnessed by a bystander
- **Interlocutors**, i.e. whether the dispatcher was in communication with a single caller (single-party call) or had more than one interlocutor on scene (multi-party call). We considered a call to be single-party if the dispatcher interacted with only one caller throughout the call, even if other bystanders were present, and even if the caller relayed instructions to them. However, if another bystander than the caller directly addressed the dispatcher, e.g. through loud speaker, then the call was considered multi-party.

Statistical analysis

We used the chi-square test to analyse (1) the association between declaration of death and OHCA recognition (initial vs. delayed recognition), and (2) the association between witnessed status (unwitnessed vs bystander-witnessed) and declaration of death.

We conducted logistic regression to analyse the relationship between caller declaration of death (exposure) and response to CPR-opening (primary outcome). We adjusted for the following contextual variables, which we identified as potential confounders: witnessed status, interlocutors, patient's age, and patient's sex. We used the glm() function in R 3.4.1[18] and calculated odds ratios (OR) and 95% confidence intervals (95% CI).

A p-value <0.05 was considered statistically significant.

Ethics

Approval for the study was granted by the Human Research Ethics Committee of Curtin University (HR128/2013) and the SJ-WA Research Governance Committee.

Results

We analysed the emergency ambulance calls for n=422 non-traumatic paramedic-confirmed OHCA in adults (≥14 years old); with a mean age of 64 years (SD 18) and 67% males. A flowchart for the data collection is presented in Fig. 1.

Table 1 shows the patient/call characteristics and outcomes, by caller's declaration that the patient was dead. Prior to initial dispatch, the caller declared that the patient was dead in 19% (79/422) of the calls.

Declaration of death and witnessed status

Callers declared that the patient was dead in 28% (62/225) of cases where the patient's collapse was unwitnessed, and in 9% (17/197) of cases where the patient's collapse had been witnessed by a bystander (Table 1). This difference was statistically significant ($p<0.001$).

Declaration of death and OHCA recognition

Initial (vs. delayed) recognition of OHCA was significantly more frequent in cases with a caller declaration of death than in cases without a declaration of death (92%, 73/79 vs. 66%, 227/343, $p<0.001$) (Table 1).

Response to CPR-opening (Primary Outcome)

A caller's declaration of death before initial dispatch significantly increased the likelihood that they would decline to perform CPR later in the call (AOR 4.59, 95% CI 2.49-8.52, $p<0.001$) (Table 2). Two covariates were significant: callers were more likely to decline CPR for elderly patients (AOR 2.42, 95% CI 1.36-4.34, $p=0.003$) and less likely to decline for female patients (AOR 0.43, 95% CI 0.21-0.81, $p=0.01$).

Declaration of death and ROSC

Among the patients who had been described as dead by callers, 15% (12/79) achieved prehospital ROSC, with 9% (7/79) having ROSC at ED arrival ($p<0.001$) (Table 1). Of the latter, three patients had not received bystander-CPR before the arrival of paramedics.

In addition to the presentation of results in tabular form, we present in Fig. 2 the distribution of exposure, primary outcome, and secondary outcomes as per chronological order in the calls. This flowchart highlights the non-straightforward relationship between caller acceptance to perform CPR and actual provision of bystander-CPR. Given that 65 callers declined to perform CPR, and that 64 calls had no bystander-CPR, Table 1 might suggest that only 1 caller was persuaded by the dispatcher to perform CPR. By contrast, Fig. 2 indicates that 20 callers were persuaded. This is because, in addition to persuaded callers,

another group needs to be taken into account, namely, 19 callers who initially accepted to perform CPR, but did not actually do it (e.g. they retracted their agreement or encountered a physical barrier to CPR). Furthermore, we provide as Supplementary Material an example from a call transcript, which illustrates the intricacies of CPR discussion between caller and dispatcher.

Discussion

In our study cohort, where OHCA was recognised by the dispatcher and resuscitation was attempted by paramedics, we found that the incidence of the caller declaring the patient dead was one-in-five cases. The significance of this paper is that it highlights the importance of an under-described barrier to CPR. While declaration of death cases had higher rates of initial recognition of OHCA by the dispatcher, the callers were more likely to decline to perform CPR when it was proposed by the dispatcher later in the call.

We recommend that dispatchers be trained to be attentive to any statement about patient non-viability when given by a lay caller. The two practical reasons for treating such statements with the utmost care are that (1) a non-negligible proportion of OHCA patients described as "dead" by lay callers are viable: 15% of these patients whom the caller declared as "dead" did actually achieve ROSC, and (2) the chance of obtaining bystander-CPR from such callers is lower.

When calling the emergency number, saying that the patient is dead is the most direct way to describe OHCA in lay terms. In a previous study,[19] we identified such a statement as one of the main things that callers say when they interrupt the flow of the dispatch protocol early in the call, which can create delays and loss of crucial information. We also found[15] that when the caller described the patient as dead, the dispatcher was more likely to talk about CPR as depending on someone's willingness (e.g. "do you want to do CPR?"), which in turn was associated with a lower CPR acceptance rate than when dispatchers used words expressing futurity (e.g. "we're going to do CPR") or necessity (e.g. "we need to do CPR"). Taken together, our present study and previous results[15,20] expose caller declaration of death as a major and previously under-described barrier to CPR. Even though this type of caller statement can facilitate initial recognition of OHCA, it can cause interactional roadblocks during the call.[21]

We previously identified one communicative strategy to persuade callers to perform CPR,[20] namely, providing callers with more context on the purpose of CPR (e.g. "*the ambulance is on its way, and this is to help him in the meantime*"). Further research is needed to refine recommended dispatcher strategies to engage with lay callers' perceptions of non-viability and reluctance to perform CPR.

Though the existing literature on barriers to CPR frequently calls for the implementation of strategies to overcome them, there is very little concrete evidence of what specific strategies can be used to effectively address vaguely defined "psychological" or "communicational" barriers to CPR. In addition to the standard calls for public education and CPR-training, we consider that interactional barriers to CPR can be addressed in real-

time during the emergency call. Still, much further research, both qualitative and quantitative, is needed before we begin to understand the complex underlying forces bearing on DA-CPR, and more generally, on emergency medical dispatch. We argue that there is an opportunity to increase the rate of bystander-CPR and improve patient outcomes through in-depth focus on what lay callers say during OHCA emergency calls. Valuable insight can be gained from the social sciences, with a growing body of research focusing on how speakers display resistance and achieve persuasion in medical interaction[22–25].

Conclusion

Based on the analysis of audio recordings of emergency calls, one in five lay callers expressed their belief that the OHCA patient was already dead; even though paramedics attempted resuscitation for all of them, and a sixth of the cases achieved ROSC. Our results indicate that caller statements that the patient is already dead are helpful for dispatchers to recognise OHCA early in the call (before initial dispatch), but potentially detrimental when it comes to recruiting callers to perform CPR on patients who need it.

These findings suggest that there is an opportunity to increase the rate of bystander-CPR and OHCA patient survival if 1) dispatchers are alert to any statement through which the caller expresses their view that the patient is not viable, and 2) dispatchers directly address such caller statements during the emergency call.

Funding

NP is funded by and JF & JB are Chief Investigators of the National Health and Medical Research Council (NHMRC) Prehospital Emergency Care Centre for Research Excellence (PEC-ANZ) (#1116453). JF is funded by a NHMRC Investigator grant #1174838. JB is funded by a Heart Foundation Fellowship (#101171).

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Fig. 1. Data collection flowchart

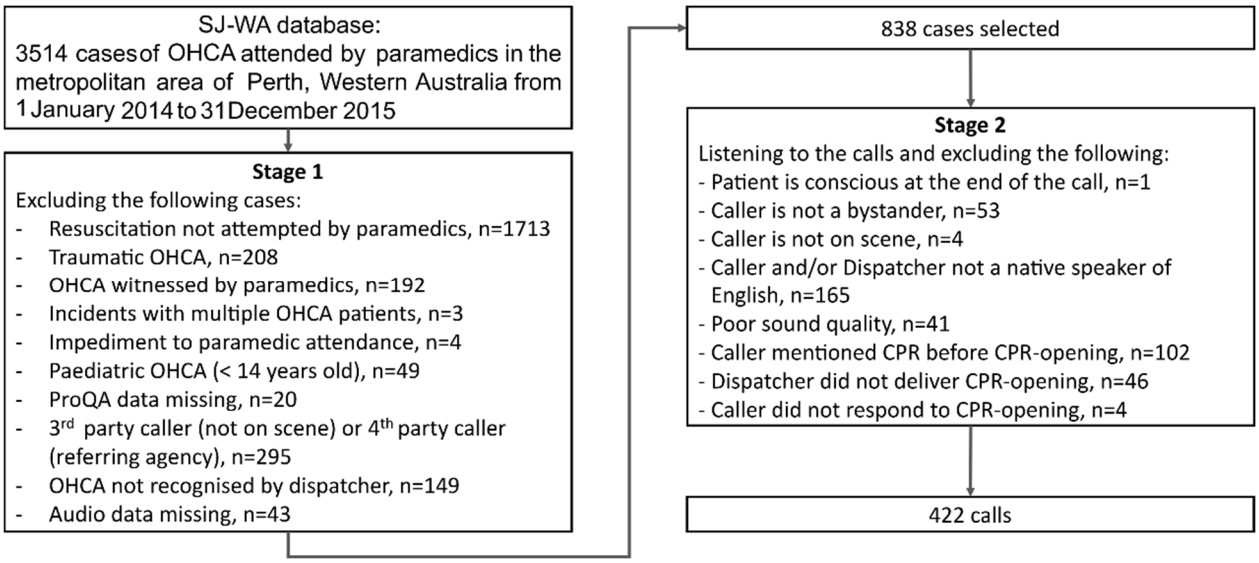

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Fig. 2. Distribution of exposure, primary outcome, and secondary outcomes in chronological order

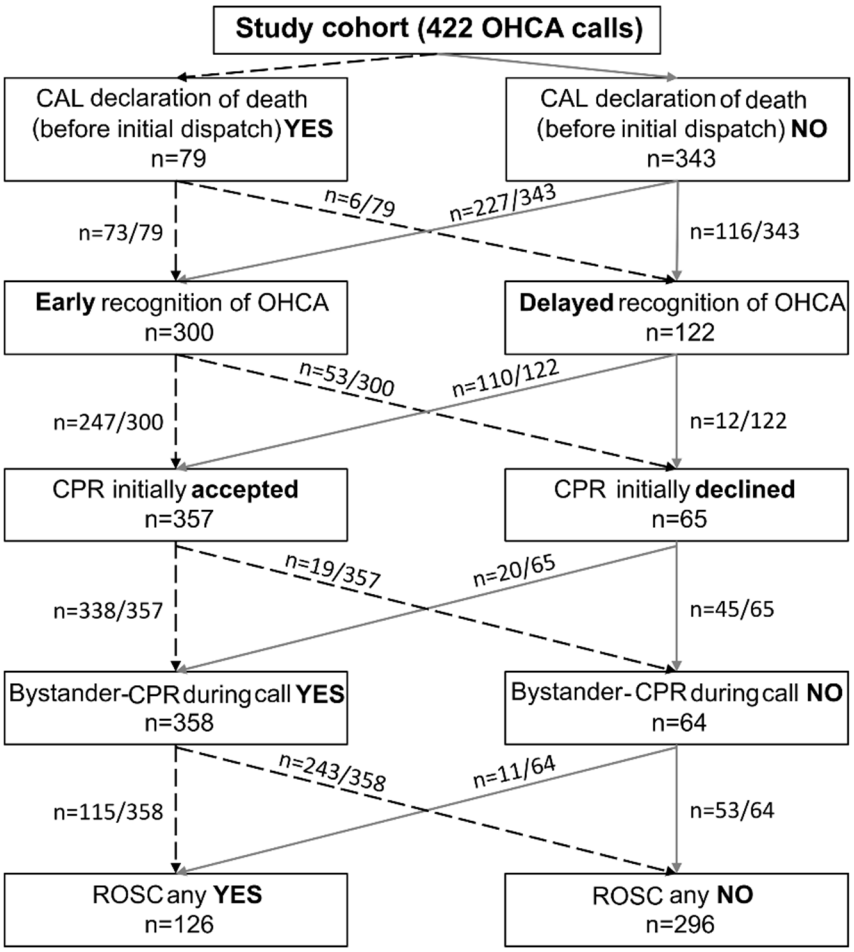

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Table 1.

Patient/call characteristics and outcomes by caller's declaration that the patient was dead. Percentages are relative to column totals.

	Calls with declaration of death by caller	Calls with no declaration of death by caller	Total	*p* value*
TOTAL	**79**	**343**	**422**	
OUTCOMES				
Caller's response to CPR-opening				
Accepted CPR	49 (62%)	308 (90%)	357 (85%)	<0.001
Declined CPR	30 (38%)	35 (10%)	65 (15%)	
Bystander-CPR during call				
Bystander-CPR	51 (65%)	307 (90%)	358 (85%)	<0.001
No bystander-CPR	28 (35%)	36 (10%)	64 (15%)	
OHCA recognition				
Initial recognition	73 (92%)	227 (66%)	300 (71%)	<0.001
Delayed recognition	6 (8%)	116 (34%)	122 (29%)	
Any ROSC				
Any ROSC (prehospital or ED)	12 (15%)	114 (33%)	126 (30%)	0.002
No ROSC	67 (85%)	229 (67%)	296 (70%)	
ROSC at ED				
ROSC at ED arrival	7 (9%)	95 (28%)	102 (24%)	<0.001
No ROSC at ED arrival	72 (91%)	248 (72%)	320 (76%)	
COVARIATES				
Patient's age				
Adult (14-69 years old)	44 (56%)	204 (59%)	248 (59%)	0.54
Elderly (≥ 70 years old)	35 (44%)	139 (41%)	174 (41%)	
Patient's sex				
Male	53 (67%)	228 (66%)	281 (67%)	0.97
Female	26 (33%)	115 (34%)	141 (33%)	
Witnessed status				
Bystander-witnessed collapse	17 (22%)	180 (52%)	197 (47%)	<0.001
Unwitnessed collapse	62 (78%)	163 (48%)	225 (53%)	
Interlocutor				
Single-party call	63 (80%)	227 (66%)	290 (69%)	0.02
Multi-party call	16 (20%)	116 (34%)	132 (31%)	

* *p* values were calculated with the chi-square test

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Table 2.

Results of logistic regression of caller declining to perform CPR as a function of call circumstances, including caller's declaration of death.

Variables	OR [95% CI]	AOR [95% CI]*	*p* value**
Caller's declaration of death			
Caller did not declare patient dead	1.00	1.00	
Caller declared patient dead	5.39 [3.03 – 9.58]	4.59 [2.49 – 8.52]	<0.001
Witnessed status			
Bystander-witnessed collapse	1.00	1.00	
Unwitnessed collapse	2.21 [1.27 – 3.97]	1.80 [0.97 – 3.41]	0.07
Interlocutors on scene			
Single-party call	1.00	1.00	
Multi-party call	0.62 [0.32 – 1.12]	0.73 [0.37 – 1.40]	0.35
Patient's age			
Adult (14-69 years old)	1.00	1.00	
Elderly (≥ 70 years old)	2.12 [1.25 – 3.65]	2.42 [1.36 – 4.34]	0.003
Patient's sex			
Male	1.00	1.00	
Female	0.55 [0.29 – 1.00]	0.43 [0.21 – 0.81]	0.01

N = 422

OR = unadjusted Odds Ratio; CI = 95% Confidence Interval; AOR = Adjusted Odds Ratio.

* Adjusted model with all covariates in Table 2 included.

** p-values refer to Adjusted Odds Ratios.