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

3

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

36 **Abstract**

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

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

49 *Results:* Initial recognition of OHCA by the dispatcher was more frequent in cases with a
50 declaration of death by the caller than in cases without (92%, 73/79 vs. 66%, 227/343,
51 $p < 0.001$). Callers who expressed such a view (19% of cases) were more likely to decline CPR
52 (38% vs. 10%, adjusted odds ratio 4.59, 95% confidence interval 2.49-8.52, $p < 0.001$). Yet,
53 15% (12/79) of patients described as non-viable by callers achieved ROSC.

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

58 **Keywords**

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

61 **Introduction**

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

68 A number of barriers to CPR during emergency calls have been documented, which include
69 medical presentation (e.g. seizure-like activity [3]), physical obstacles (e.g. patient position
70 [4–8]) and various psychological or communicative issues, such as emotional distress [9,10]
71 and language barriers.[11,12] A few studies which analysed the audio or transcripts of

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

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

81 **Methods**

82 *Population and data collection*

83 We conducted a retrospective cohort study of 422 emergency ("000") calls for non-
84 traumatic OHCA cases attended in Perth, Western Australia by St John WA (SJ-WA) between
85 1 January 2014 and 31 December 2015. The study cohort consisted of all cases meeting the
86 following criteria: non traumatic paramedic-confirmed OHCA in adults (≥ 14 years old)
87 involving a single patient, where paramedics attempted resuscitation, and for which OHCA
88 was recognised by the dispatcher during the call. The study cohort excluded cases where
89 CPR was already in progress prior to the emergency call, cases where the caller mentioned
90 CPR before the dispatcher, cases where the dispatcher did not deliver a CPR-opening, and
91 cases where the caller did not respond to the CPR-opening at all (e.g. they ended the call).
92 More details on the study cohort can be found in our previous paper.[15]

93 *Dispatch protocol*

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

99 *Analysis of the calls*

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

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

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

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

118 Secondary outcomes:

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

127 Covariates:

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

138 *Statistical analysis*

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

142 We conducted logistic regression to analyse the relationship between caller declaration of
143 death (exposure) and response to CPR-opening (primary outcome). We adjusted for the
144 following contextual variables, which we identified as potential confounders: witnessed
145 status, interlocutors, patient’s age, and patient’s sex. We used the glm() function in R
146 3.4.1[18] and calculated odds ratios (OR) and 95% confidence intervals (95% CI).

147 A p -value <0.05 was considered statistically significant.

148 *Ethics*

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

151 Results

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

155

156 Table 1 shows the patient/call characteristics and outcomes, by caller's declaration that the
157 patient was dead. Prior to initial dispatch, the caller declared that the patient was dead in
158 19% (79/422) of the calls.

159 *Declaration of death and witnessed status*

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

164 *Declaration of death and OHCA recognition*

165 Initial (vs. delayed) recognition of OHCA was significantly more frequent in cases with a
166 caller declaration of death than in cases without a declaration of death (92%, 73/79 vs. 66%,
167 227/343, $p < 0.001$) (Table 1).

168 *Response to CPR-opening (Primary Outcome)*

169 A caller's declaration of death before initial dispatch significantly increased the likelihood
170 that they would decline to perform CPR later in the call (AOR 4.59, 95% CI 2.49-8.52,
171 $p < 0.001$) (Table 2). Two covariates were significant: callers were more likely to decline CPR
172 for elderly patients (AOR 2.42, 95% CI 1.36-4.34, $p = 0.003$) and less likely to decline for
173 female patients (AOR 0.43, 95% CI 0.21-0.81, $p = 0.01$).

174 *Declaration of death and ROSC*

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

178 In addition to the presentation of results in tabular form, we present in Fig. 2 the
179 distribution of exposure, primary outcome, and secondary outcomes as per chronological
180 order in the calls. This flowchart highlights the non-straightforward relationship between
181 caller acceptance to perform CPR and actual provision of bystander-CPR. Given that 65
182 callers declined to perform CPR, and that 64 calls had no bystander-CPR, Table 1 might
183 suggest that only 1 caller was persuaded by the dispatcher to perform CPR. By contrast, Fig.
184 2 indicates that 20 callers were persuaded. This is because, in addition to persuaded callers,

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

190 Discussion

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

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

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

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

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

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

232 Conclusion

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

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

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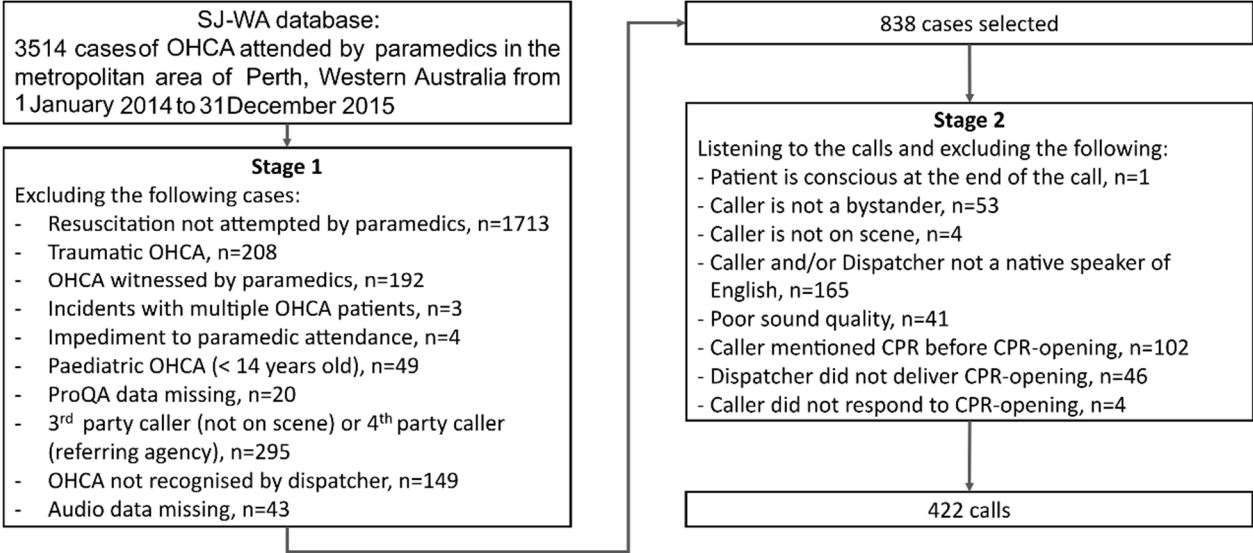
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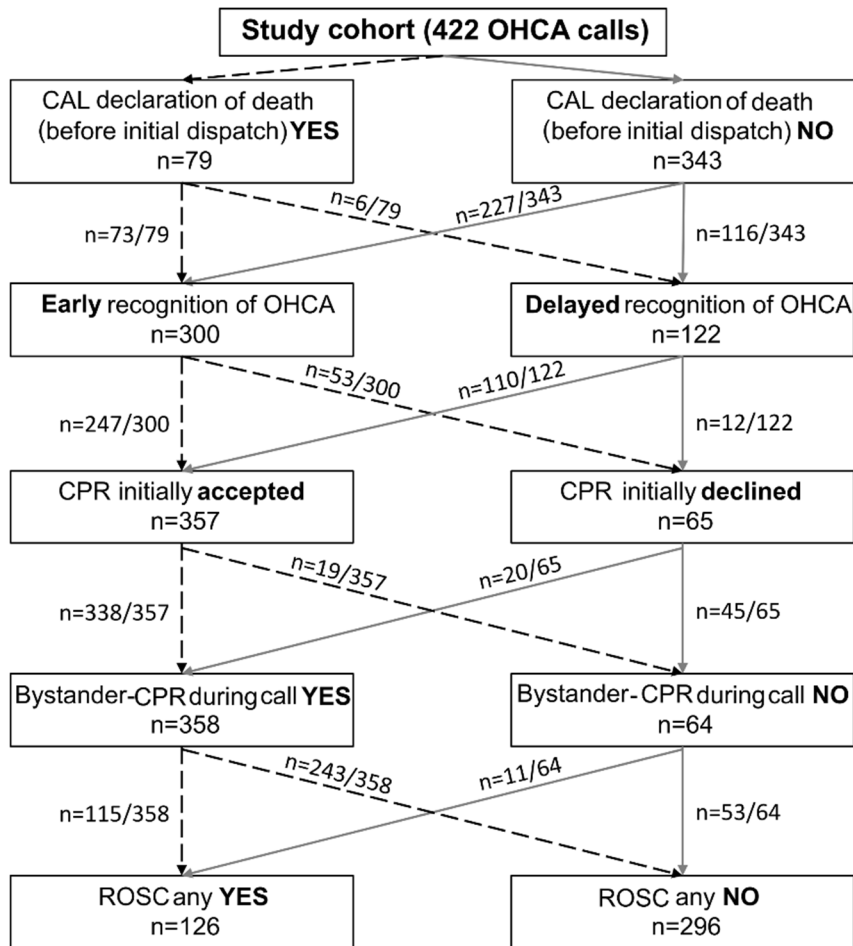
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Fig. 1. Data collection flowchart



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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	<i>p</i> 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.