ACCEPTED VERSION

"Sorry, what did you say?" Communicating defibrillator retrieval and use in OHCA emergency calls

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Abstract

Background: The defibrillator prompt, which directs callers to retrieve a defibrillator during out-of-hospital-cardiac arrest, is crucial to the emergency call because it can save lives. We evaluated communicative effectiveness of the prompt instated by the Medical Priority Dispatch System ™ version 13, namely: *if there is a defibrillator (AED) available, send someone to get it now, and tell me when you have it*.

Methods: Using Conversation Analysis and descriptive statistics, we examined linguistic features of the defibrillator sequences (call-taker prompt and caller response) in 208 emergency calls where non-traumatic out of hospital cardiac arrest was confirmed by the emergency medical services, and they attempted resuscitation, in the first six months of 2019. Defibrillator sequence durations were measured to determine impact on time to CPR prompt. The proportion of cases where bystanders retrieved defibrillators was also assessed.

Results: There was low call-taker adoption of the Medical Priority Dispatch System ™ version 13 prompt (99/208) compared to alternative prompts (86/208) or no prompt (23/208). Caller responses to the version 13 prompt tended to be longer, more ambiguous or unrelated, and have more instances of repair (utterances to address comprehension trouble). Defibrillators were rarely brought to the scene irrespective of defibrillator prompt utilised.

Conclusion: While the version 13 prompt aims to ensure the use of an available automatic external defibrillator, its effectiveness is undermined by the three-clause composition of the prompt and exclusion of a question structure. We recommend testing of a re-phrased defibrillator prompt in order to maximise comprehension and caller action.

Keywords: Out-of-hospital cardiac arrest; Defibrillator; Emergency medical services; Dispatch protocol; Emergency calls; Health communication; Linguistics; Conversation analysis

Introduction

Early defibrillation, prior to arrival of the emergency medical service (EMS), is a key determinant of survival in out-of-hospital cardiac arrest (OHCA).[1–3] The public availability of automated external defibrillators (AEDs) helps to facilitate early defibrillation,[3,4] and emergency call-takers play a critical role in guiding callers through AED use and cardiopulmonary resuscitation (CPR).[5,6] However, there are limited studies on how call-takers and callers communicate about defibrillators during OHCA calls. This paper contributes to understanding the communication process around bystander AED retrieval.[7]

Many EMSs triage emergency calls using the Medical Priority Dispatch System ™ (MPDS)[8] which includes script instructions for both bystander CPR and AED use. Prior to 2016 (in Australia and New Zealand), MPDS Version 12 used the prompt: *is there a defibrillator available?* (referred to as "v12-defib-prompt" henceforth). Subsequently, the prompt changed to: *if there is a defibrillator available, send someone to get it now, and tell me when you have it* ("v13-defib-prompt" henceforth); with call-takers having the option to use "AED" instead of "defibrillator". The catalyst for the change was the introduction of "Brock's Law" into MPDS Version 13. Brock Ruether was a Canadian teenager who, in 2012, collapsed from a cardiac arrest at high school.[9] Even though bystanders retrieved an AED, they did not inform the call-taker when it arrived, so it remained unused.[10] Later, the EMS delivered a defibrillator shock, but by then it was too late. Thus, Brock's Law states "the presence of an AED does not ensure its use – the EMD [emergency medical dispatcher] does".[9] In terms of linguistic structure, the v13-defib-prompt is a directive (command) - an attempt to make someone perform an action[11] - containing three clauses: a conditional clause (*if there is a defibrillator available*) and two imperative clauses (*send someone to get it now*, *tell me when you have it*).

In this mixed-methods study, we used Conversation Analysis[12,13] to understand how the defibrillator sequence (call-taker prompt and caller response) unfolded in OHCA calls. Our primary aim was to assess the communicative effectiveness of the v13-defib-prompt in instilling an appropriate response from the caller – one that indicated that changes due to Brock's Law (ostensibly the final clause, *tell me when you have it*) were comprehended and led to action where applicable. Our secondary aims were to: (1) ascertain whether the tri-clause structure in the v13-defib-prompt caused delays during calls; (2) determine the proportion of cases where bystanders retrieved defibrillators. This study adds to our previous linguistic research on the impact of variation in language in achieving potentially life-saving caller action in OHCA emergency calls.[14–18]

Methods

Setting

St John Western Australia (SJ-WA) is the sole provider of emergency road ambulance services in the state of Western Australia (WA), servicing approximately 2.6 million people over 2.5 million square kilometres in both metropolitan and rural locations.[19] Call-takers at the SJ-WA call centre are not clinicians, although clinicians are available for consultation.

In 2018, patients who received an AED shock by bystanders comprised 23% (40/172) of all OHCA survivors to hospital discharge in WA, although the overall number of cases where a defibrillator was applied by a bystander was low (5% of OHCA cases).[20]

Data source

We retrospectively analysed audio recordings of OHCA emergency ("000") calls received by SJ-WA between 1 January 2019 and 30 June 2019. Cases were identified using the SJ-WA OHCA Registry which captures data for all OHCAs attended by SJ-WA.[19]

Case definition

Inclusion criteria

Cases included were EMS-confirmed non-traumatic OHCAs. We only included cases where EMS-resuscitation was attempted because this indicates that patients were not declared dead at the scene and, therefore, there was potential for their survival to be impacted by the defibrillator sequence. Additional inclusion criteria were single patient, aged one year or over, and a second-party caller, meaning they were with the patient.

Exclusion criteria

We excluded EMS-witnessed arrests and cases where OHCA was not recognised during the call or recognition was delayed (i.e. call-taker determined the patient as not in OHCA at the time of initial ambulance dispatch; then later recognised an OHCA) because the MPDS script for AED prompts, proceeds differently in these calls. We also excluded cases where the AED was in use at call commencement; and cases with poor sound quality or unavailable audio files.

Dispatch protocol

At study period commencement, SJ-WA had been using MPDS Version 13.1 (implemented with ProQA software)[21] for 13 months. Figure 1 outlines steps in the OHCA call protocol. The call-taker asks initial questions in the case entry phase before allocating a specific MPDS determinant code

that indicates OHCA. The call-taker then makes the dispatch announcement, *I'm organising help for you now. Stay on the line*; followed by the v13-defib-prompt, before progressing to CPR instructions.

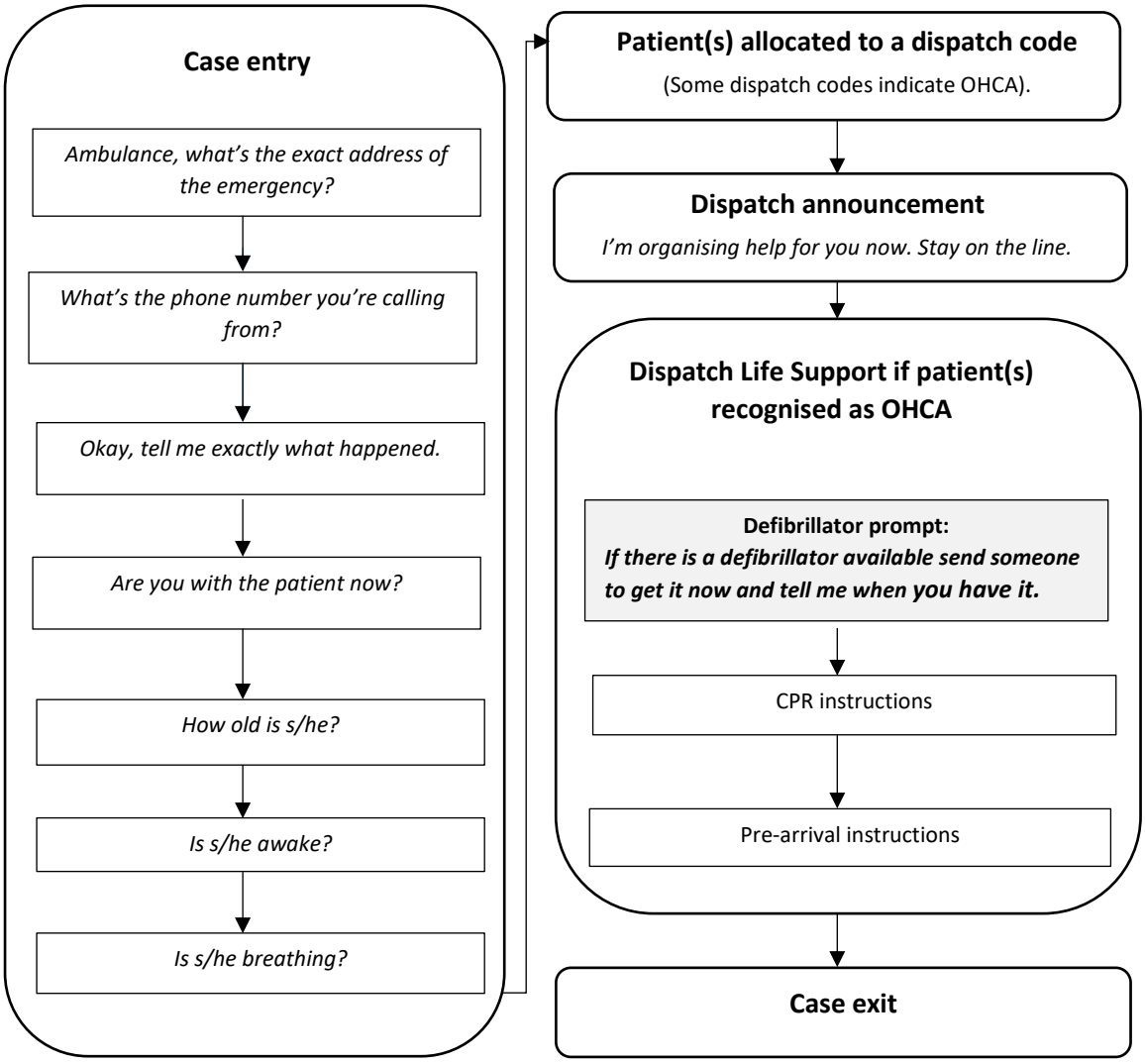


Figure 1 - The MPDS Version 13 call protocol, indicating instructions for patients recognised as OHCA[8]

Analysis

Linguistic analysis

Initially, the first author listened to a random sample of call recordings and applied Conversation Analysis techniques to identify linguistic phenomena in the defibrillator sequences and develop a coding scheme to quantify patterns. Conversation Analysis investigates the sequential organisation of naturally occurring interactions at a fine-grained level of detail.[13] The first author acted as the sole coder as she was the only linguist employed in the research group. To enhance study reliability two rounds of coding were undertaken followed by two rounds of checking for coding consistency.

We considered the defibrillator sequence as organised around two turns: (1) call-taker defibrillator prompt; (2) caller initial response. Depending on the initial response, the sequence could become an extended interaction in cases of repair.[22] Repair refers to practices that address communication trouble - problems with speaking, hearing or comprehending what was uttered[23] – and leads to additional dialogue. An initial repair response may be "sorry, what did you say?". In these cases, the ensuing interaction was not coded, only the first two key turns.

We coded defibrillator sequences for these variables:

(1) Call-taker prompt: type (v13-defib-prompt or variations); call-taker gave caller an opportunity (≥ one second pause) to respond (yes/no).

(2) Caller response: repair (yes/no); and if no repair, then type of response (affirmative, negative, other or none).

Descriptive statistics, as percentages with 95% confidence intervals, reported variable frequencies.

Time intervals

To ascertain impact on call duration, three time intervals were measured: (1) time to commencement of defibrillator sequence (call start to pause before defib prompt), (2) length of defibrillator sequence (start of defib prompt to end of caller's final response, inclusive of any repair interactions), (3) time to start of CPR prompt (typically marked by *listen carefully and I'll tell you how to do resuscitation)*. All timings were measured in seconds and reported as medians with interquartile ranges.

Defibrillation outcome

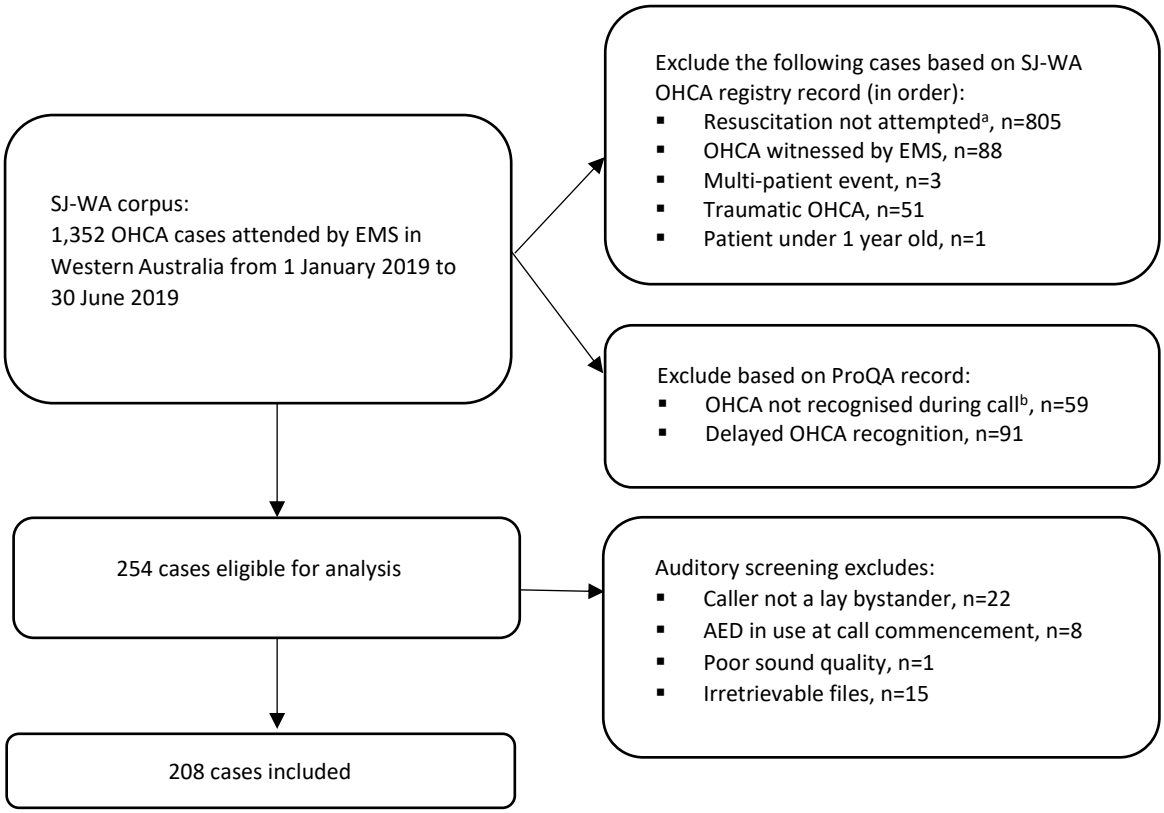
We recorded whether an AED was located (by call-taker; caller/bystander), retrieved, applied to patient, and whether an AED shock was delivered.

Ethics

The study was approved by the Curtin University Human Research Ethics Committee (HR128/2013) and SJ-WA Research Governance Committee.

Results

In the six-month period there were 1,352 EMS-confirmed OHCA cases attended by SJ-WA of which 208 cases were included in the study (Figure 2). Table 1 summarises key case characteristics.



[a]no defibrillation or CPR by EMS, and no AED shock delivered by bystanders

[b]cases where patient not recognised as OHCA by call-taker (may include cases where patient had not arrested at time of call)

Figure 2 - Data inclusion flow diagram

Characteristics	Number (% of total cases)	
TOTAL	208	100%
Sex		
Male	148	(71.2%, 64.5–77.2)
Female	58	(27.9%, 21.9–34.5)
Unspecified	2	(1.0%, 0.1–3.4)
Age		
Adult (18-70 years old)	127	(61.1%, 54.1–67.7)
Elderly (>70 years old)	76	(36.5%, 30.0–43.5)
Child (<18 years old)	4	(1.9%, 0.5–4.9)
Unspecified	1	(0.5%, 0.0–2.6)
Location		
Private residence	161	(77.4%, 71.1–82.9)
Public	36	(17.3%, 12.4–23.1)
Residential care	10	(4.8%, 2.3–8.7)
Medical centre	1	(0.5%, 0.0–2.6)
Region		
Metropolitan	159	(76.4%, 70.1–82.0)
Rural	49	(23.6%, 18.0–29.9)
Bystander witnessed		
No	129	(62.0%, 55.0–68.6)
Yes	79	(38.0%, 31.4–45.0)
Initial CA rhythm		
Non-shockable	157	(75.5%, 69.1–81.2)
Shockable	51	(24.5%, 18.8–30.9)
Bystander CPR		
Yes	181	(87.0%, 81.7–91.3)
No	27	(13.0%, 8.7–18.3)
Response time (minutes)		
Median (IQR)[1]	8.32	(6.60-10.44)

95% confidence intervals were calculated using Clopper-Pearson[24] exact intervals.

[1]IQR=Interquartile range at 25th and 75th quartile

Table 1 – Key characteristics of OHCA cases (counts, percentages, and 95% confidence intervals)

Types of defibrillator prompts

There was considerable variation in defibrillator prompts used by call-takers (Table 2). In 99/208 (47.6%) calls, the v13-defib-prompt was initiated. Of these 99 calls, 22 (22.2%) displayed a salient linguistic variation: either the first conditional clause was reconfigured into a yes/no question (e.g. "is there a defibrillator available? Send someone to get it now and tell me when you have it") (2/99); or a response-mobilising particle (20/99) such as "okay?" or "alright?" was added to the end of the prompt to check caller understanding.

Prompt type	Frequency n (%, 95% CI[a])
v13-defib-prompt *If there is a defibrillator available, send someone to get it now, and tell me when you have it*	99 (47.6%, 40.6–54.6)
v12-defib-prompt *Is there a defibrillator available?*	41 (19.7%, 14.5–25.8)
v13-pre-OHCA-defib-prompt *If there's a defibrillator available send someone to get it now in case we need it later*	28 (13.5%, 9.1–18.9)
Other e.g. *Do you have a defibrillator? Send someone to get it now*	17 (8.2%, 4.8–12.8)
No prompt uttered	23 (11.1%, 7.1–16.1)
TOTAL	**208**

[a] 95% confidence intervals were calculated using Clopper-Pearson exact intervals.

Table 2 - Frequency of call-taker defibrillator prompts (counts, percentages, and 95% confidence intervals)

The remaining 109/208 (52.4%) cases were deviations from the v13-defib-prompt, including (1) the v12-defib-prompt, *is there a defibrillator available?*, (41/208, 19.7%), and (2) the "v13-pre-OHCA-defib-prompt", *if there's a defibrillator available send someone to get it now in case we need it later,* (28/208, 13.5%). This latter prompt is intended for non-OHCA dispatch codes where the patient is considered at risk of arrest (e.g. chest pain). Since our cohort was restricted to initial recognition of OHCA, use of the v13-pre-OHCA-defib prompt represents a deviation. A further 17/208 (8.2%) cases constituted the "other" group, typically consisting of some variation of the v13-defib-prompt but excluding the key clause, *tell me when you have it*, e.g., "do you have a defibrillator? Send someone to get it now". For 23/208 (11.1%) cases there was no defibrillator prompt at all.

<u>Caller responses to defibrillator prompts</u>

Table 3 summarises initial responses for 185 cases where a prompt was uttered, divided into two groups: those with repair initiated by the caller (n=35) and those without (n=150).

	Prompt type				
	v13-defib-prompt *If there is a defibrillator available, send someone to get it now, and tell me when you have it* n=99	**v12-defib-prompt** *Is there a defibrillator available?* n=41	**v13-pre-OHCA-defib-prompt** *If there's a defibrillator available send someone to get it now in case we need it later* n=28	**Other** e.g. *do you have a defibrillator? Send someone to get it now* n=17	**Total**
INITIAL RESPONSE TYPES					
***Repair*[1, 2]**	18 (18.2%, 11.1–27.2)[1]	13 (31.7%, 18.1–48.1)[1]	3 (10.7%, 2.3–28.2)[1]	1 (5.9%, 0.1–28.7)	35 (18.9%, 13.5–25.3)
No Repair	81 (81.8%, 72.8–88.9)[1]	28 (68.3%, 51.9–81.9)[1]	25 (89.3%, 71.8–97.7)[1]	16 (94.1%, 71.3–99.9)	150 (81.1%, 74.7–86.5)
Negative responses	**39 (39.4%, 29.7–49.7)**	**23 (56.1%, 39.7–71.5)**	**10 (35.7%, 18.6–55.9)**	**9 (52.9%, 27.8–77.0)**	**81 (43.8%, 36.5–51.3)**
1-3 words	6 (6.1%)	15 (36.6%)	3 (10.7%)	3 (17.6%)	27 (14.6%)
≥ 4 words	33 (33.3%)	8 (19.5%)	7 (25.0%)	6 (35.3%)	54 (29.2%)
Other responses	**23 (23.2%, 15.3–32.8)**	**5 (12.2%, 4.1–26.2)**	**7 (25.0%, 10.7–44.9)**	**4 (23.5%, 6.8–49.9)**	**39 (21.1%, 15.4–27.7)**
Related[3]	6 (6.1%)	5 (12.2%)	2 (7.1%)	2 (11.8%)	15 (8.1%)
Unrelated[4]	17 (17.2%)	0 (0.0%)	5 (17.9%)	2 (11.8%)	24 (13.0%)
Affirmative responses	**13 (13.1%, 7.2–21.4)**	**0 (0.0%, 0.0–8.6)**	**5 (17.9%, 6.1–36.9)**	**1 (5.9%, 0.1–28.7)**	**19 (10.3%, 6.3–15.6)**
True affirmative[5]	2 (2.0%)	0 (0.0%)	1 (3.6%)	1 (5.9%)	4 (2.2%)

Acknowledgement receipt[6]	11 (11.1%)	0 (0.0%)	4 (14.3%)	0 (0.0%)	15 (8.1%)
No response	**6 (6.1%, 2.3–12.7)**	**0 (0.0%, 0.0–8.6)**	**3 (10.7%, 2.3–28.2)**	**2 (11.8%, 1.5–36.4)**	**11 (5.9%, 3.0–10.4)**
No opportunity[7]	4 (4.0%)	0 (0.0%)	3 (10.7%)	2 (11.8%)	9 (4.9%)
Silent (despite opportunity)[8]	2 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (1.1%)
TOTAL	**99**	**41**	**28**	**17**	**185**

95% confidence intervals were calculated using Clopper-Pearson exact intervals. Confidence intervals were not calculated for secondary categories of No-Repair.

[1] a Chi-square (χ^2) test of heterogeneity showed a non-significant (p=0.075) association between prompt type (v13-defib-prompt, v12-defib-prompt, and v13-pre-OHCA-defib-prompt) and repair/non-repair. The "other" prompt type was excluded from this test, as it compromised the Chi-square assumption of no more than 20% of expected values <5. Similarly, no other associations were tested due to low expected values.

[2] initial response addresses communication trouble e.g. "sorry, what did you say?"

[3] related to question of defibrillator

[4] does not directly correspond to prompt uttered

[5] indicates presence of defibrillator

[6] indicates caller received message

[7] call-taker does not leave at least 1 second pause for caller response

[8] caller is silent despite call-taker pause

Table 3 - Frequency of initial caller responses by prompt type (counts, percentages, and 95% confidence intervals)

For the v13-defib-prompt, 18/99 (18.2%) utterances elicited repair. Repairs were slightly more common in cases with the command form of the prompt (15/77, 19.4%) compared to cases with a question/response-mobilising particle (3/22, 13.6%), however this was not significantly different (p=0.756, two-tailed Fisher Exact). The majority of repairs were multi-worded, for example, "do I have a what, sorry?" and several took the form of a two-part question such as "can I have what? Send what?" indicating difficulty with interpreting three clauses in succession. In 12/18 (66.7%) cases of v13-defib-prompt repair, the call-taker did not respond by verbatim repetition but by reconfiguration into a simple phrase, e.g. "a defibrillator", or used a variation of the v12-defib-prompt (Transcript A). For v12-defib-prompt cases, 13/41 (31.7%) also resulted in repair (Transcript B), however, 8/13 (61.5%) repairs were a single-word question, e.g. "sorry?" and there were no multi-question repairs.

Transcript A (file NP1102)[1]

CT: if there is a defibrillator available

send someone to get it now and tell me when you have ↑it

do you have a dif- fribrillator[2] there?

CAL: (1.5) sorry say again?

CT: do you have a defibrillator there?

CAL: (1.5) do I have a wh↑at

CT: a defribrillator

CAL: (0.5) no

[1] Transcription conventions:

CT	Call-taker
CAL	Caller
↑	Sharp rise in intonation
?	Rising intonation
-	Self-interruption
(1.0)	Pause (in seconds)
.	Falling intonation
=	latching (no pause)

[2] spelling is deliberate to indicate pronunciation

Transcript B (file NP1328)

CT: is there a defibrillator there?

CAL: (1.5) a wh↑at=

CT: =a defibrillator.

CAL: I don't know what that is

For non-repair cases, the most frequent response type was negative (81/150) and these were grouped by word count: (1) between one and three words, e.g. “no”, “no there isn’t” (n=27); (2) four or more words, e.g. “I don't have a defibrillator”, “there's no defibrillator ‘cause I'm at my house. I'm here at home” (n=54). Overall, there was a higher frequency of longer responses (≥4 words) for the v13-defib-prompt and a higher frequency of shorter responses (1-3 words) for the v12-defib-prompt.

The “other” (39/150) category of non-repair responses did not contain overt affirmative or negative answers. Responses were either related (15/39) to the defibrillator, e.g. “I don't know where to get one that's all” or they were unrelated (24/39), implying the caller had not heard the prompt or was distracted, usually by the patient’s state, e.g. “(crying) I can't feel a pulse” or “alright cheers thank you”. Unrelated responses were more common for the v13-defib-prompt (17/99) and v13-pre-OHCA-defib-prompt (5/28) than the v12-defib-prompt (0/41). In seven of these 24 unrelated responses, the call-taker was able to rectify the problem by delivering more prompts but in 10 cases the call-taker moved on, leaving the matter unresolved.

There were 19/150 affirmative response cases. These were delineated by those acting as acknowledgement receipts (15/19), e.g. “yes”, “right”, indicating callers had heard the prompt; and those classed as true affirmative where the response confirmed AED availability and intention to retrieve (4/19), e.g., “yes no problem I'll organise that”. Out of four true affirmative responses, three led to AED retrieval and use – one case with the v13-defib-prompt, one, the v13-pre-OHCA-prompt, and one with an “other” prompt. All three prompts had a question structure: using a response-mobilising particle, “okay?”, or interrogative syntax “can you?”/”is there?” to elicit a response. None of the initial true affirmative responses directly addressed the imperative, *tell me when you have it*, however callers did notify call-takers when the AED arrived.

For a small number of non-repair cases (11/150), there was no response due to the call-taker not giving the caller an opportunity to answer (n=9), or caller silence despite the opportunity to respond (n=2). These are further cases where the defibrillator question was unresolved.

Duration of defibrillator sequences

For 185 cases with a defibrillator sequence, median call duration was 10 minutes 4 seconds and median time to defibrillator prompt was 1 minute 15 seconds after call commencement. As Table 4 shows, median duration of the defibrillator sequence was 7 seconds, with little variation in the median time between v13-defib-prompt (8 seconds), v12-defib-prompt (6 seconds), and v13-pre-OHCA-defib-prompt (7 seconds). Overall, across 185 cases, repair was associated with an additional 5 seconds in median duration of the sequence (6 seconds without repair vs 11 seconds with repair).

Of the 136 calls where the call-taker delivered a defibrillator prompt *and* subsequently initiated the CPR prompt, median duration of defibrillator sequence (7 seconds) constituted 4.1% of median time to CPR initiation (2 minutes 50 seconds).

Defibrillation outcomes

An AED was located in 20/208 (9.6%) OHCA cases – identified by caller/bystander (7/20) or call-taker (13/20) who had information on AED locations. There were 12/208 (5.8%) cases where an AED was retrieved, brought to the patient's side, and applied to the patient, however in only 5/208 (2.4%) cases was a shock delivered.

	Call-taker prompt				
	All	**v13-defib-prompt** *If there is a defibrillator available, send someone to get it now, and tell me when you have it*	**v12-defib-prompt** *Is there a defibrillator available?*	**v13-pre-OHCA-defib-prompt** *If there's a defibrillator available send someone to get it now in case we need it later*	**Other** e.g. *do you have a defibrillator? Send someone to get it now*
Total cases with a defibrillator sequence	185	99	41	28	17
Duration of defibrillator sequence (in seconds; median and IQR[1])	7 (5-10)	8 (6-11)	6 (4-8)	7 (5-10)	6 (5-8)
Total cases without initial caller repair	150	81	28	25	16
Duration of defibrillator sequence (in seconds, median and IQR)	6 (5-9)	7 (6-10)	4 (3-6)	6 (5-9)	6 (5-7)
Total cases with initial caller repair	35	18	13	3	1
Duration of defibrillator sequence (in seconds, median and IQR)	11 (8-14)	12 (11-15)	8 (7-9)	11 (10-15)	22

[1]IQR=Interquartile range at 25th and 75th quartile

Table 4 - Duration of defibrillator sequences according to prompt type

Discussion

After reviewing 208 OHCA calls we found that, despite the latest MPDS protocol being in place for over a year, there was only partial call-taker adoption of the v13-defib-prompt (*if there is a defibrillator available, send someone to get it now, and tell me when you have it)*. Furthermore, the majority of alternative defibrillator prompts uttered did not include changes promoted by Brock's Law (ostensibly, *tell me when you have it*). At the same time, in this OHCA cohort, a publicly available defibrillator was rarely brought to the scene.

The occurrence of v13-pre-OHCA-defib-prompt (*if there's a defibrillator available send someone to get it now in case we need it later*) in 13.5% of OHCA cases relayed a mixed message to the caller, indicating OHCA as a future possibility rather than current reality. Its similar wording, and the fact that it is applied in a large volume of emergency calls, may mean that it is used interchangeably with the v13-defib-prompt.

The three-clause composition of the v13-defib-prompt is also problematic. In this stressful context, callers are not necessarily focused on call-takers' directions, so if they miss the first conditional clause (*if there is a defibrillator available)*, the rest of the prompt is rendered meaningless. As Transcripts A and B show, issues arose with device unfamiliarity, mispronunciation and miscomprehension of the word "defibrillator" in the first clause. In fact, the results show similar issues for the v12-defib-prompt (*is there a defibrillator available?*). The difference with the v12-defib-prompt is its single-clause composition meaning repairs were handled more directly. Furthermore, where no defibrillator is available, only the first clause is relevant and subsequent clauses are redundant. Apart from issues with the three-clause composition, making the prompt a command, with the two final imperative clauses, was not conducive to eliciting caller responses due to the absence of a question form.[25,26]

While we acknowledge that issues with the defibrillator sequence can delay time to CPR prompt initiation, we found the effect was minimal. Defibrillator sequences constituted only 4.1% of call time to CPR prompt; thus the extra seconds added by repair or word count of the v13-defib-prompt may not be clinically meaningful. We suggest that ensuring caller comprehension and appropriate action is more important than minimising time. Taking time is worthwhile if it results in AED application. Having said that, a defibrillator prompt that effectively minimises repairs and ambiguous or non-answers is likely to induce smoother progression to CPR.

We posit that call-takers, having experienced the interactional inefficiencies of the v13-defib-prompt, pre-empted trouble through prompt modifications. Call-takers displayed a tendency to turn part of the tri-clause command into a question or to use the v12-defib-prompt to extract a yes/no answer (Transcripts A and B).

We recommend future research into rewording and then testing the effectiveness of the defibrillator prompt to address issues with clause structure. One option to consider is to break the current prompt into instalments. For example, the first question could be, “is there a defibrillator available?”. Checking AED availability as an initial step elicits a specific answer and allows for problems with the word “defibrillator” to be addressed before moving to the next question. If the answer is affirmative, call-takers could then ask, “can you send someone to get it and tell me when it arrives?”. If the response to the first question is negative, this latter question need not be uttered. Further research also needs to look at the use of standardised lay descriptions of “defibrillator” to assist in cases of caller unfamiliarity with the term (Transcript B).

We found that 17.3% of our OHCA cohort occurred in public spaces and 9.6% had a proximal AED identified. With this reality, call-takers face a tension between following protocol or acting swiftly to facilitate bystander CPR. If they assess that the defibrillator prompt may cause communication trouble, and that AEDs are likely unavailable, they might forgo the opportunity for AED use in favour of commencing CPR. Of note, in the 208 cases, there was not a single instance of caller reluctance to retrieve a defibrillator if one was identified (unlike caller resistance to perform CPR[18]). There was only one case where a caller could not retrieve a nearby AED because they were alone and the call-taker instructed them not to leave the patient. Our study suggests that, apart from modifying the protocol, there is a need for further community education about publicly available defibrillators to help increase general familiarity with the device; and for defibrillator locator technology and first responder schemes that support widespread AED use.[27–30]

Study Limitations

Whilst MPDS is widely used, our study was limited to one (large) EMS, hence results may vary from other contexts. We studied the two key turns of the defibrillator sequence and did not include references to the defibrillator in other parts of the call, such as call-takers checking defibrillator status once bystanders have left to retrieve it. Other parts of the protocol that address AED use would potentially promote Brock's Law. We did not investigate why call-takers omitted or varied defibrillator prompts so further research could identify the underpinning reasons. In terms of repair, Conversation Analysis was limited to the initial repair response and not the expanded interaction. We intend to address this in a future paper through qualitative analyses of repair sequences.

Conclusion

The communicative effectiveness of a tri-clause command to prompt defibrillator retrieval and use appears to be compromised by the prompt's multi-clause composition and absence of a question to elicit a specific caller response. Thus, despite the best intention to promote Brock's Law through the MPDS v13-defib-prompt, it was not wholly adopted by call-takers. We recommend that testing be undertaken to refine the defibrillator prompt in order to maximise comprehension and caller action. This, together with increased AED availability, education and locator technology, may help to improve the currently low rate of AED uptake.

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