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Article title: *'We're going to do CPR': a linguistic study of the words used to initiate dispatcher-assisted CPR and their association with caller agreement.*

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'We're going to do CPR': a linguistic study of the words used to initiate dispatcher-assisted CPR and their association with caller agreement.

Abstract

Background: In emergency ambulance calls for out-of-hospital cardiac arrest (OHCA), dispatcher-assisted cardiopulmonary resuscitation (CPR) plays a crucial role in patient survival. We examined whether the language used by dispatchers to initiate CPR had an impact on callers' agreement to perform CPR.

Methods: We analysed 424 emergency calls relating to cases of paramedic-confirmed OHCA where OHCA was recognised by the dispatcher, the caller was with the patient, and resuscitation was attempted by paramedics. We investigated the linguistic choices used by dispatchers to initiate CPR, and the impact of those choices on caller agreement to perform CPR.

Results: Overall, CPR occurred in 85% of calls. Caller agreement was low (43%) when dispatchers used terms of willingness ("*do you want to do CPR?*"). Caller agreement was high (97% and 84% respectively) when dispatchers talked about CPR in terms of futurity ("*we are going to do CPR*") or obligation ("*we need to do CPR*"). In 38% (25/66) of calls where the caller initially declined CPR, the dispatcher eventually secured their agreement by making several attempts at initiating CPR.

Conclusion: There is potential for increased agreement to perform CPR if dispatchers are trained to initiate CPR with words of futurity and/or obligation.

Keywords

Out-of-hospital cardiac arrest, bystander cardiopulmonary resuscitation, emergency medical services, dispatch, emergency calls, communication, linguistics, conversation analysis

Introduction

Bystander cardio-pulmonary resuscitation (CPR) is an important factor in patient survival from out-of-hospital cardiac arrest (OHCA), approximately doubling the chance of survival.[1] Dispatchers have a crucial role in bystander-CPR, through the provision of dispatch-assisted CPR. Dispatcher-assister CPR (DA-CPR) is a major contributor to overall rates of bystander CPR.[2] However, even with DA-CPR, a proportion of patients do not receive bystander-CPR. There is significant room for improvement in uptake of DA-CPR instructions by callers.

Two important foci of research on DA-CPR during emergency calls have been: the delays and barriers to bystanders performing CPR[3–13] and the specific protocol for DA-CPR.[14–20] Whether callers agree to attempt CPR is an issue which is distinct from, though closely connected to, whether bystander-CPR occurs. For example, some callers may be willing to attempt CPR, but are physically unable to do so. Some callers may initially decline to attempt CPR, but then be persuaded to attempt CPR by the dispatcher. Studies to date have not explored the language used by dispatchers in initiation of CPR as a barrier to DA-CPR (but see [21]). Our previous work has shown variation in language to impact on the duration of the

call[22] and recognition of agonal breathing.[23] In this study, we hypothesise that the language used by dispatchers to initiate DA-CPR impacts the likelihood of caller agreement. Our aims were (1) to determine what linguistic features of dispatchers' utterances initiating CPR ("CPR-openings") were associated with caller agreement to perform CPR, and (2) to determine how caller agreement to perform CPR translated into actual provision of bystander-CPR.

Methods

Population

We conducted a retrospective cohort study of emergency calls for paramedic-confirmed OHCA received at the call centre of St John Ambulance Western Australia (SJA-WA) between 1 January 2014 and 31 December 2015 for cases in the Perth metropolitan area. There were two stages to the process of data collection. During Stage 1, the inclusion criteria were: emergency calls relating to bystander-witnessed non-traumatic OHCA in adults (≥ 14 years old) where paramedics attempted resuscitation and there were no impediments to paramedic attendance (e.g. patient on aeroplane), and for which OHCA was recognised by the dispatcher. The exclusion criteria were: incidents with multiple OHCA patients, OHCA witnessed by paramedics, third-party (not on scene) and fourth-party (referring agency) callers as identified by dispatchers, and cases for which the dispatch data and/or all audio recordings were not available. We considered that OHCA was recognised in the presence of at least one of the following elements: (a) The dispatch code indicated cardiac arrest, (b) dispatch protocol steps for CPR were taken, (c) Two Priority 1 ("lights and siren") paramedic-staffed ambulances were dispatched, as SJA-WA automatically allocate dual responses to suspected cardiac arrest cases; providing OHCA was not de-recognised later during the call (e.g., if the patient was reported as breathing).

During Stage 2, we listened to the audio recordings of calls and further excluded cases if any of the following conditions were identified: the patient was unequivocally conscious at the end of the call, the caller was not a lay bystander (e.g. care facility staff), the caller was not on scene, the caller and/or dispatcher was not a native speaker of English, sound quality was poor, the caller mentioned CPR before the dispatcher delivered a CPR-opening, the dispatcher did not deliver a CPR-opening, the caller did not respond to the CPR-opening (e.g. caller walked away from the telephone).

Dispatch protocol

During the study period, SJA-WA used the Medical Priority Dispatch System (MPDS, version 12.1.3),[24] implemented with the ProQA software.[25] We define "**CPR-opening**" as the utterance by which the dispatcher initiates instructions for DA-CPR, irrespective of whether the caller agrees to perform CPR, and of whether CPR actually occurs. Typically, this corresponds to the scripted sentence "*listen carefully and I'll tell you how to do resuscitation*".

Analysis of the calls

We transcribed dispatchers' CPR-openings and the callers' responses in all calls meeting our case definition. We counted how many CPR-openings were delivered by the dispatcher in each call. In calls where the dispatcher delivered more than one CPR-opening, we analysed the linguistic features (see below) of the first CPR-opening to which the caller responded. We considered that the caller agreed to perform CPR if they verbally indicated it or if they complied with subsequent CPR instructions. We also coded the occurrence of bystander-CPR, as evidenced through audible signs at any point before the arrival of the paramedics (such as the caller counting compressions out loud).

Our analysis of CPR-openings focused on the linguistic modality that dispatchers used. A key component of language, modality refers to how a speaker expresses the conditions under which something is said or done.[26–28] This covers a wide range of meaning, including likelihood (e.g. *might*), ability (e.g. *can*), obligation (e.g. *must*), willingness (e.g. *want*), and futurity (e.g. *will*). As a well-established scientific topic, modality provides a clearly defined basis for categorising speakers' meaning in emergency calls. In this paper, we analysed the success of different modalities in terms of achieving the caller's agreement to start CPR. To do this, we coded CPR-openings for three modalities (preliminary analysis of the calls showed that other modalities were very rare in this context):

1. Futurity, i.e., whether CPR was expressed as impending (*will, be going to*).
2. Obligation, i.e., whether CPR was expressed as necessary (*need, have to*).
3. Willingness, i.e., whether CPR was expressed as depending on the desire of the caller or dispatcher (*want, would like, be willing, be happy to*).

The three modalities are not mutually exclusive. Therefore, we report modality patterns, based on the combinations of modalities expressed in CPR-openings.

From preliminary inspection of the calls, we hypothesised that the patient's condition, as perceived and verbalised by the caller, could act as a confounder of the relationship between the dispatcher's phrasing of the CPR-opening and the caller's agreement, i.e., a caller's statement that the patient was dead may predict their decreased willingness to perform CPR, while simultaneously affecting the language choices of the dispatcher when delivering the CPR-opening. We transcribed any utterance in which the caller declared that the patient was dead, which we defined as a statement containing the words "died", "dead", "passed (away)", "deceased", "gone", "not alive", "lifeless", "no signs of life", and "too late" delivered at any point prior to the CPR-opening. If the caller made a statement about their absence of knowledge ("*I don't know if he's alive or dead*"), we did not consider that uttering one of the words listed above was a declaration of death. We did not consider that using the word "dying" was a declaration of death, due to the inflection –ING implying an action in progress (dying moments) rather than concluded (death).

Statistical analysis

We used the chi-square test to analyse (1) the association between individual modality patterns expressed in CPR-opening and caller agreement to perform CPR, and (2) the

association between callers' declaration of death and modality in dispatchers' CPR-openings. We dropped from overall tests the modality patterns which had expected values <5. The association between modality and caller agreement (#1 above) was also stratified by whether the caller declared the patient dead. The Fisher Exact test was used as an alternative to 2 x 2 chi-square tests if any cell count were less than 5.

The number of CPR-openings delivered per call was summarised as medians and interquartile ranges (IQR). The Mann–Whitney U test was used to compare the differences in medians by group (agreed to CPR vs. declined CPR). 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 SJA-WA Research Advisory Group.

Results

During the study period, SJA-WA paramedics attended 3,514 OHCA cases, and of those, 840 cases met the initial inclusion/exclusion criteria (Stage 1). After listening to the 840 selected calls, we further excluded 416 calls (Stage 2). Consequently, this study was conducted on 424 calls (69 different dispatchers). A flowchart for the data collection is presented in Fig. 1.

Number of CPR-openings per call

On average, 1.8 CPR-openings per call were delivered by dispatchers. There were significantly more CPR-openings ($p < 0.001$) when callers initially declined to perform CPR (median 3, IQR 2–4) than when callers initially agreed to perform CPR (median 1, IQR 1–2).

Caller agreement to perform CPR

Overall, 84% (358/424) of callers initially agreed to perform CPR in response to the CPR-opening (Fig. 2). Additionally, 38% (25/66) of callers who had initially declined to perform CPR, eventually agreed. In total, 90% (381/424) callers eventually agreed to perform CPR (NB: in addition, there were two calls where the caller initially agreed, but subsequently declined). Callers declined CPR for a variety of reasons: perceived unviability of the patient ("*I think it's too late*", 32 calls), perceived physical barrier ("*I can't move him*", 23 calls), lack of skills ("*I don't know how to do it*", 3 calls), patient's wishes ("*he doesn't want to live*", 2 calls), fear of contact ("*no I don't wanna touch him*", 2 calls), fear of hurting ("*I'll break his ribs*", 1 call), and suggesting another intervention ("*I think he needs some ((DRUG))*", 1 call). In 2 calls, callers did not give an explicit reason for declining CPR.

Linguistic modality

The distribution of modality patterns in the data and corresponding examples are presented in Table 1. Pattern A corresponds to the phrasing of the scripted CPR-opening ("*I'll tell you how to do resuscitation*") or any alternate phrasing in which futurity was the only modality expressed (e.g. "*we're going to do CPR*"). Pattern A was the most common in the data

(206/424) and the most successful, with 97% (199/206) of callers agreeing to perform CPR. Caller agreement was high (>80%) for all modality patterns except two: when only words of willingness were used (pattern C, 43%, 29/67) and when none of the modalities were expressed (pattern G, 56%, 9/16). When the opening expressed futurity (patterns A, D, E, F), most callers agreed to perform CPR (96% agreement, 274/286). When the opening contained words of obligation (patterns B, D, F), 89% of callers (114/128) agreed to CPR. When neither futurity nor obligation were expressed (patterns C and G), only 46% (38/83) of callers agreed to CPR. As a linguistic pattern, pattern C (willingness only) was comparatively rare, as it was found in only 16% (67/424) of CPR-openings. However, this pattern represented 58% (38/66) of cases where callers declined CPR. Overall, there was a significant association ($p < 0.001$) between the dispatcher's choice of modality and the caller's agreement to perform CPR. For this overall test, we dropped three modality patterns (E, F, G) which had expected values < 5 .

Declaration of death

Caller agreement to perform CPR was significantly lower ($p < 0.001$) when callers had declared the patient dead (65% agreement, 62/95) than when callers had not declared the patient dead (90% agreement, 296/329). Overall, there was a significant association ($p < 0.001$) between the caller's declaration of death and the dispatcher's choice of modality pattern. For this overall test, we dropped three modality patterns (E, F, G) which had expected values < 5 . Notably, there was a strong association between the caller's declaration of death and modality pattern C (willingness only). Dispatchers chose this pattern in 38% (36/95) of calls with a declaration of death and 9% (31/329) of calls with no declaration of death ($p < 0.001$). The relative levels of caller agreement in relation to futurity (highest agreement rate of CPR openings), obligation, and willingness (lowest agreement rate), were independent of whether callers declared the patient dead (Table 1). Among calls where the patient was *not* declared dead, agreement was highest for futurity-only (97%, 162/167), then obligation-only (85%, 41/48), and lowest for willingness-only (55%, 17/31). Similarly, where the patient *was* declared dead, caller agreement was also highest for futurity-only (95%, 37/39), then obligation-only (71%, 5/7), and lowest for willingness-only (33%, 12/36). The difference in agreement between futurity-only and willingness-only was statistically significant, both when the patient was declared dead (Fisher Exact, $p < 0.001$) and when they were not declared dead (Fisher Exact, $p < 0.001$). Formal tests were not used in relation to obligation-only cases, as there were only 7 such cases when the patient was declared dead.

Bystander-CPR

Bystander-CPR occurred in 85% (360/424) of calls (Fig. 2). Of the callers who initially agreed to perform CPR, 5% (19/358) did not attempt it, for the following reasons: a physical barrier (9 calls), the paramedics arriving (3 calls), the caller retracted their agreement to perform CPR (2 calls), the call being disconnected or the caller walking away from the telephone (3 call). For 2 calls, it was unclear why callers did not start CPR after having agreed to perform it. Of the callers who initially declined CPR, 38% (25/66) eventually agreed when dispatchers delivered additional CPR-openings ("*love are you sure you don't wanna start CPR*"). Of the 23

callers who initially declined CPR saying that it was not possible (physical barrier), 11 eventually agreed to attempt it, and 10 of those did attempt CPR during the call. In those calls, dispatchers offered advice on overcoming the barrier, such as calling a neighbour for help or starting CPR on a bed.

Discussion

In our study of emergency ambulance calls of OHCA patients for whom paramedics attempted resuscitation, we found marked variation in the language used to initiate DA-CPR and an association between the language used by dispatchers in CPR-openings and caller agreement to perform CPR. Our results suggest that the different ways dispatchers phrase CPR-openings has a major impact on caller agreement. Talking in terms of futurity (*"we're going to do CPR"*) appeared to be a highly successful way to phrase the CPR-opening (97% agreement). By contrast, talking in terms of willingness (*"do you want to do CPR?"*) was associated with lower caller agreement (43%).

We found a significant association between callers' declaration of death (e.g. *"I think she's dead"*) and dispatchers' use of words of willingness in CPR-openings (e.g. *"do you want me to talk you through CPR?"*). A possible interpretation is that dispatchers assumed that such declarations of death meant that caller agreement to perform CPR was less certain. Thus, they may have opted for a phrasing reflecting this uncertainty about the caller's wishes. Our results indicate that regardless of callers' declaration of death, there was a consistent association between the way dispatchers phrased CPR-openings and caller agreement to perform CPR. Talking in terms of futurity in the CPR-opening was associated with high caller agreement to perform CPR, even in calls where the caller had declared the patient dead. Talking in terms of willingness in the CPR-opening was associated with low caller agreement to perform CPR, whether the caller had declared the patient dead or not. Talking about CPR as something which will happen (futurity) does not force the caller to perform CPR. Agreeing to perform CPR remains the caller's prerogative. However, we argue that framing CPR in terms of futurity maximises the chances of securing caller agreement.

It should be noted that linguistic modality was closely aligned with question design, i.e. delivering the CPR-opening as a question rather than a statement. Talking in terms of willingness in the CPR-opening seemed to be connected to a reversed word order typical of questions (*"are you willing...?"*, *"do you want...?"*). Though less so, CPR-openings expressing futurity and obligation could also appear in a question format, but more typically through response-mobilising features[29] such as a rising intonation and/or an agreement-seeking particle such as *"okay"* (*"I'm gonna tell you how to do resuscitation okay?"*), rather than reversed word order. Previous research[21] has analysed the language used by dispatchers to talk about CPR from the point of view of an *"assertive"* (telling) vs. *"passive"* (asking) style. Future research should address the challenge of untangling modality from question design, a task greatly complicated by how *"question"* is defined in spoken interaction.[30] Taken together, our results and the results of Capone et al.[21] call for further research on the

language used by dispatchers during DA-CPR, with a methodology suited to the study of spoken interaction.

We found that a high proportion (84%) of all callers initially agreed to perform CPR. Dispatchers often made several attempts at securing caller agreement, and we found that 38% (25/66) of the callers who initially declined CPR, eventually agreed to do it. Thus, the pathway to bystander-CPR is best thought of as a dynamic negotiation between the caller, dispatcher, and situation. A caller declining to perform CPR should not be considered an interactional dead-end, but rather a hurdle[31] which may be overcome. Building on the existing knowledge on the psychological and physical barriers to bystander-CPR, a new avenue of research is to focus on the ways to overcome them. As Eisenberg argued in his recent editorial,[32] when it comes to telephone CPR, “the devil is in the details”. This includes the details of how dispatchers talk about CPR.

This study expands on our recent efforts[22, 23, 33, 34] to provide a deeper understanding of the interactional dynamics between caller and dispatcher during OHCA calls. However, in the context of DA-CPR, a caveat of this study is that we solely focused on caller agreement to perform CPR and the provision of DA-CPR at any point during the calls. While this is an important preliminary step to understanding the impact that the language addressed to callers has on DA-CPR, further research is necessary to understand the factors associated with the continuous provision of high quality CPR as soon as possible and until the arrival of the paramedics. An additional limitation of this study is that we focused on only one CPR-opening per call (i.e., the first CPR-opening to which the caller responded). Consequently, we did not analyse how dispatchers might have rephrased CPR-openings which had been unsuccessful in occasioning a response. Further research is needed to identify the most effective strategies to persuade callers who initially decline performing CPR.

Conclusion

Talking about bystander-CPR in terms of willingness (*want, be willing, would like, be happy to*) was associated with low caller agreement (43%), while talking about it in terms of futurity (*going to, will*) and/or obligation (*need, have to*) was associated with high caller agreement (97% and 84% respectively). Our findings suggest that when it comes to securing caller agreement to perform CPR during CPR-opening, dispatchers need to frame bystander-CPR as something that will or needs to occur, rather than something that depends on someone’s willingness.

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Legend to figures

Fig. 1. Data collection flowchart.

Fig. 2. Pathways to caller agreement to perform CPR following the dispatcher's CPR-opening and the actual provision of bystander-CPR.