

Reasons for delays in the implementation of telephone-assisted bystander CPR for
limited English proficient callers

Lina M. Castro

A thesis submitted in partial fulfillment of the
requirements for the degree of

Master of Public Health

University Of Washington

2017

Committee:

Ian Painter

Hendrika Meischke

Program Authorized to Offer Degree:

Health Services

©Copyright 2017

Lina M. Castro

University of Washington

Abstract

Reasons for delays in the implementation of telephone-assisted bystander CPR for
limited English proficient callers

Lina M. Castro

Chair of the Supervisory Committee:

Ian Painter, Clinical Assistant Professor

Health Services

Study Objective: Early recognition of CPR is crucial given the large burden of out-of-hospital cardiac arrest events in the US and bystander CPR increases patient survival. Limited English proficiency can delay and prevent timely emergency response. This study examines and compares the possible barriers of communication between limited English proficient callers and non-limited English proficient callers and 9-1-1 call receivers (CR) resulting in delays in telephone-assisted CPR (T-CPR) during cardiac arrest calls.

Methods: The cohort of this study consisted of 112 out-of-hospital confirmed cardiac arrest calls, where the call receiver (CR) identified the need for T-CPR, in

King County, Washington between 2010 and 2012. The CPR delays related the CRs recognition of need for CPR and the start of T-CPR were examined in limited English and non-limited English proficient callers. In addition, the reasons why CPR was delayed or not performed were also examined.

Results: Fifty-eight out of 60 (97%) limited English proficiency calls and 34 out of 52 calls (69.4%) of non-LEP calls included delays in performing CPR. Limited English proficient calls had more delays associated with the reporting party (RP) (85% (51/60) LEP vs 51.9% (27/52) non-LEP, $p<0.01$). The RP-related delays in the recognition of need of CRP were due to ambiguous responses to call receiver's questions (20% (12/60) LEP vs 1.92% (1/52) non LEP, $p<0.01$). Three reasons were associated with overall CPR being delayed or not initiated: RP language barrier ($p<0.01$), RP not at scene ($p=0.01$) and RP confusion about patient consciousness state ($p<0.01$). Reporting party delays in the start of T-CPR were observed for more non-LEP calls (40% (12/30) vs 25% (9/36) than LEP calls.

Conclusion: Limited English callers experienced more delays than non-LEP callers related to communication barriers between the RP and 9-1-1 call receiver. Identifying the delays associated with the implementation of bystander T-CPR may provide training opportunities for telecommunicators and help tailor CPR training and 9-1-1 education in limited English proficient communities.

Introduction

Every year, an estimated 350,000 persons in the United States experience out-of-hospital cardiac arrest.^[1, 2] Early initiation of cardiopulmonary resuscitation (CPR) improves survival and neurological function following cardiac arrest ^[1-8] The emergency telephone number 9-1-1 serves a lifeline to the public during emergencies and first responders rely on effective communication between 9-1-1 call receivers and a reporting party to obtain accurate information they can use to provide appropriate care upon arrival.^[9-14] Dispatchers gather information about location and type of emergency as well as provide pre-arrival instruction such as bystander CPR. ^[1, 3, 4, 10, 11, 13, 14]

Limited English proficiency (LEP), culture and health literacy of the caller can severely affect the accuracy of the information obtained by dispatchers and in turn delay or prevent timely emergency response.^[3, 4, 9-15]

After Hurricane Katrina many local, state and federal agencies recognized that low literacy, language barriers and cultural diversity are important measures that can hamper health communication in LEP communities.^[9-16] Many studies have found that LEP populations experience challenges in health care including less access to care,^[4, 13] report less overall health, ^[4, 10] lower health knowledge, misinterpretation of prescriptions,^[15] have different rates of diagnostic testing, receive less explanation ^[13] and have less satisfaction with care. ^[10, 13]

According to the U.S Census Bureau, in 2011 over 60 millions people over the age 5 years in the United States spoke a language other than English at home, a percentage change of 158.2% since 1980. [3, 17] Of the 60 million people, over 9 million speak English “not well”[3, 11, 16]

In 2015, the estimated population of King County, Washington, where this study is set, was about 2 million people.[18] During that time more than half of the population’s growth was due to immigration of foreign born individuals. [19] About 25.4% of residents spoke a language other than English and 10.9% of them had limited English proficiency. [19] King County residents speak over 170 different languages and the most common languages are Spanish, Chinese, Vietnamese, Korean and Tagalog. [19] In fact, over the course of 2014 in King County 9-1-1 call receivers recognized cardiac arrest 96% of the time and 72% of arrests received either bystander CRP or T-CPR[1] compared to 32% nationwide. [20]

To address the growing disparities and to help improve overall health outcome and quality of care in LEP communities, professional language interpretation services are utilized in health care settings.[13] During emergency calls, 9-1-1 dispatchers have access to over- the- phone interpreter (OPI) who can interpret instruction in the appropriate language; however the three -way calls can be stressful and hard to maintain.[1, 9, 11]

Even when language barriers are not present, communication breakdowns can result in critical time delays and preventable adverse outcome, such as patient death.[10] Communication challenges occur during the call because the call receiver

and the reporting party have differing and possibly conflicting goals. ^[10] 9-1-1 call receivers collect information to dispatch appropriate help and prepare first responders, and callers are desperate for assistance and it is difficult to understand that help is on the way (even if the phone call is continuing).^[1, 10] Competing needs, in addition to language barriers, can intensify the communication challenges between the caller and the dispatcher. Recent studies found that LEP populations are less likely to receive bystander CPR^[1, 4, 11] and that the time to begin dispatcher assisted CPR is longer.^[4, 11, 21]

The purpose of this study was to examine and compare the possible barriers of communication between LEP and non-LEP callers and 9-1-1 call receivers during cardiac arrest calls. Specifically, it investigates the reasons for delays in 3 categories: the delays that affected the recognition of the need for CPR, delays in the process of introduction of T-CPR and the delays in start of T-CPR (even when it was recognized by CR) between LEP and non-LEP callers. It explores the reasons for delays related to the dispatcher and the caller and their association with CPR delays within each delay category.

Methods

Setting

This study was part of a larger study (funded by the CDC) on extending emergency response skills to limited English proficient populations. The study was a partnership of the Northwest Center for Public Health Practice and Medicine/ Emergency Medical Services (EMS)-Seattle and King County in King County, Washington. This study was approved by the Institutional Review Board at the University of Washington.

Population

One hundred and twelve 9-1-1 out-of-hospital cardiac arrest emergency calls received by the North East King County Regional Public Safety Communication Agency (NORCOM) and Valley Communications Center (VALLEY) during the years 2010 -2012, where the need for T-CPR was recognized, were used for this study. Of the 112 calls 52 were classified as non-LEP and 60 were classified as LEP calls.

Data collection

The calls for this study were chosen from 152 out-of-hospital cardiac arrest calls that were received at VALLEY and NORCOM dispatch centers as part of a study to examine the timeliness of dispatcher assisted CPR before and after a dispatcher protocol script change. These calls included 76 LEP calls and 76 matched English proficient calls collected from two time periods. The first time period (pre-script

change) was from January 2010 to June 2011 and the second time period (post-script change) was between July 2011 and August 2012.

Data from the calls was taken from the Computer Aided Dispatch (CAD) system, the Medical Incidence Report Form (MIRF) and through abstraction from the call recordings. The CAD is a computer system used by dispatchers to collect information about the call and it assists in the dispatching of emergency vehicles and paramedics. ^[22] Other data abstracted from the CAD includes year of the call, sex and age of the patient and dispatch center. The MIRF is a specific form used by the Emergency Medical Services (EMS) to collect data about each paramedic and Emergency Medical Technician (EMT) emergency medical response. ^[23] In addition to etiology, the location of the patient was also abstracted from this form.

Research coordinators identified LEP calls and matched an equal number of English proficient calls to the LEP calls. LEP calls were identified by a LEP field contained in the CAD reports; this field is checked by the call receiver (CR) as part of the call if the CR subjectively determined that the reporting party (RP) had limited English proficiency. The original study identified 42 LEP calls during first time period and 34 calls during the second time period and each were matched to an English proficient call. Matching was attempted on patient age, etiology (Cardiac vs. non-cardiac) and dispatch center and whether multiple speakers communicated with the CR. Exact matching on these factors was not possible for 5 match cases: one pair did not match on etiology and 4 pairs did not match on dispatch center.

Data abstracted from the call recordings included data on caller information, process of obtaining caller address, questions about patient status (including assessment of consciousness and breathing status, reasons for delays in identifying the need for CPR, reasons for delays in the start of CPR instructions and reasons why CPR was delayed or not performed Table 1 lists specific variables used in this study.

Validity of call abstraction was assessed for a sample of 30 calls by having a 2nd research coordinator abstract the calls. Interrater reliability (Kappa) for nominal variables assessed ranged from 0.91 to 1.0.

This study used a subset of 112 out of the 152 calls where the call receiver identified the need for CPR,

Analysis

The data were extracted into IBM SPSS Version 19 (IBM, Armonk, New York, USA). Descriptive summary statistics were used to describe patient, RP characteristics, etiology and location (Table 2). Previous analyses showed no statistically significant differences in delays between the pre-protocol script change and post protocol script change time periods and for this reasons data were combined across the two time periods.

Three sets of analyses were conducted: Reasons for delays in recognizing the need for T-CPR, reasons for delays in starting T-CPR for calls where CPR was performed

once the need was recognized, and reasons why T-CPR was either delayed or not started once the need was recognized. Within each of these sets of analyses delays were further categorized into whether the delays were associated with the reporting party (RP), the call receiver (CR) or neither (such as patient in different room). Two additional variables were analyzed, whether any RP related delays occurred and whether any CR related delays occurred.

Of the 152 calls, the need for CPR was recognized in 112 calls included in this analysis. Because the analysis looks at the subset of calls, the matches between LEP and English proficient calls may not necessarily be included in the subset of calls. For this reason Fisher's exact test was used to assess associations between LEP and non-LEP calls.

Hypothesis of interest were examined:

1. Limited English proficiency calls is associated with more CPR delays than non-LEP calls
2. LEP calls experience delays in the recognition of the need and performing T-CPR.
3. LEP calls is associated with reporting party related delays

Results

Patient and RP characteristics

The majority of patients were male (61%) older than 50 years of age (79.5%). About 64% of the patients suffered from cardiac arrest at their home (71.4%). A slight majority of the RPs were female (54.5%) that were calling from the same room (86.6%) where the patient was located and 27.6% of the time reporting party was the patient's spouse, 23.1% was patient's caregiver and 15.1% was a child (Table 2).

Association between LEP status and reasons that delayed the recognition of need for CPR by the call receiver

Reasons for delays in recognizing the need for T-CPR are shown in Table 3. Four RP related delays were observed to be associated with LEP status, and the odds of each type of delay occurring were higher for LEP calls. High (but not statistically significant) odds ratios were observed for delay type 'RP was not at scene' (OR=Inf, $p=0.122$), 'RP left phone' (OR=3.8, 95%CI: 0.8-19, $p=0.103$) and 'RP did not know the answer to questions' (OR=1.1, 95% CI; 0.3-4.3, $p=1.00$). In 20% of the LEP calls (OR=12.8, 95%CI: 1.6-101.8, $p < 0.01$) the RP provided ambiguous responses to CR questions preventing the CR from initially recognizing the need for CPR compared to 1.92% of the non- LEP calls.

Furthermore, RP delays were associated with LEP status (OR=3.2, 95% CI: 1.3-7.7, $p=0.01$), with 40% of the LEP calls having any RP related delay compared with 17.3% of the English proficient calls.

Out of 8 CR related delays, 7 had high, but not statistically significant, odds ratios associated with LEP status. The only CR reason that was statistically significantly associated with LEP status and CPR recognition delays was 'CR missing that the patient was unconscious' (OR=9.0, 95% CI: 1.1-73.7, p=0.01) Although any CR delays were not statistically significant with LEP status, 60% of the LEP calls and 44% of the English calls had CR related delays.

Associations between LEP status and reasons for delay after CPR introduction and the start of first CPR instruction

Reasons for delaying the start of CPR instructions are shown Table 4. None of the CR or RP reasons related to the delay of the start of CPR introductions were statistically significantly associated with LEP status, however high odds ratios were observed for variables 'RP expressing concern that they do not know CPR' (OR=2.5, 95% CI: 0.3-25.9), 'CR asking if CR wanted to do CPR' (OR=2.0, 95% CI: 0.5-8.6) and 'patient in a different room' (OR=Inf, p=0.46). Interestingly, 'any RP delays' were observed in 40% of the English calls compared to 25% of the LEP calls.

Associations between LEP status and reasons with CPR being delayed or not occurring

The reasons for CPR being delayed or not occurring are described in Table 5.

Reporting party delays of any kind were associated with LEP status (OR=5.25, 95% CI: 2.15-12.8, p<0.01), with 85% of the LEP calls having any RP delay compared to 51.9% of the English calls. Of the 14 delays related to the RP 3 reasons were associated with LEP status: RP language barrier (p<0.01), RP not at scene

($p=0.01$) and RP confusion about patient consciousness state (OR=5.4, 95%CI: 1.5-20.1, $p<0.01$) are statistically significantly associated with LEP status. The other 11 delays had high odd ratios but were not statistically significant.

Although 96.7% of all LEP calls were associated with overall delays in performing CPR (OR=12.8, 95% CI: 2.8-59.4, $p<0.01$), more than half (69.4%) of the English calls also experienced CPR delays.

Discussion

In this observational study of out-of-hospital cardiac arrest calls, the barriers of communication between LEP and non-LEP callers and 9-1-1 call receivers during cardiac arrest calls were examined and the reasons for delay in CPR recognition by the call receiver, delays in the start of instructions and overall CPR delays in both LEP and English calls were identified. It was hypothesized that LEP calls experience delays in the recognition of need for CPR and performing T-CPR. Also it was hypothesized that limited English proficiency calls is associated with more CPR delays than non-LEP calls and lastly that LEP calls is associated with reporting party related delays.

Associations between limited English proficient callers and recognition of the need of CPR and performing T-CPR

Early recognition of CPR is crucial, given the large burden of out-of-hospital cardiac arrest events in the US.^[1-3, 5, 6, 20] In this study both limited English proficient and

English callers experienced some type CPR delays however more delays were associated with LEP calls. In particular, limited English proficient callers had a higher rate of reporting party related delays that prevented the call receiver from initially recognizing the need for CPR. During an emergency the reporting party experiences emotional distress^[1, 6], they are desperate for assistance^[1, 10] and can give ambiguous responses or conflicting answers^[1] This study found that ambiguous responses given by LEP callers prevented the CR from initially recognizing the need for CPR: of the calls where ambiguous responses were given, 58.3% of the time the CR initially missed that the patient was unconscious and 78% of the time the CR initially missed that the patient was not breathing normally. Among calls where CPR instructions were given, no statistically significant associations between LEP status and delays related to the start of CPR instructions were observed. This may be in part due to limited statistical power due to the smaller sample size for this part of the analyses. Although no statistically significant delays were observed, the rate of RP related delays was substantially higher for English proficient callers (40% vs. 25% for LEP). If this association is real, one explanation may be the ‘face threat’ associated with questions used by call receiver^[3, 24] to assess if CPR is necessary.

Emergency telecommunicators use a standard “all caller” set of questions to quickly establish the patient state of consciousness and breathing status^[1]. It is possible that the rigidity of the questions can have a negative effect on the caller’s behavior and satisfaction.^[3, 24] In addition, the simple nature of the questions and the use of repetition to obtain a concrete answer can be threatening and frustrating for the

caller [3, 10, 24] About 23.3% of the English callers expressed confusion about whether or not the patient was breathing compared to 8.6% in the LEP calls when starting CPR instructions. For an LEP caller, the lack of vocabulary of the caller may prevent them from arguing and questioning the telecommunicators and therefore they are more likely to follow directions. A previous study that used the parent data from this study found that the time gap between the introduction of CPR and the start of instructions was 70% shorter for LEP callers (p=0.111) than for English proficient callers but the time it took for the call receiver to determine if CPR was needed was longer. [21]

Even though, techniques such as speaking in simple sentences, avoiding the use of jargon, or using an over the phone translator may be used by 9-1-1 call receivers to improve communication with LEP callers [4] delays associated with language barriers were observed with 31.7% of LEP calls.

Associations between limited English Proficient calls and CPR delays

Not all reasons for CPR delays, where associations between LEP status and occurrence of the delay were observed, are directly attributable to communication barriers between the caller and the telecommunicators. In particular, in 11.3% of LEP calls the reporting party was not at the scene and in all the English calls the reporting party was at the scene. Additionally, twice as many LEP callers left the phone compared to English callers (26.7% vs 13.5%). Leaving the phone and not being at the scene may happen if the patient collapsed in a room that did not have a

phone and the caller was in a different room or the reporting party is a stranger, a child or there were multiple speakers.

It was observed that more LEP callers (40% vs 27.3% English) left the phone when there were multiple speakers or when one of the speakers was a child (20% vs 18.2% English). Multiple speakers may be a factor that is indirectly related to language barriers. More than one caller may be due to an attempt from the reporting party to find someone who is more English proficient. If the caller is a stranger or a child they may have to leave the phone in order to gather the information that the telecommunicators requested or they had to find an adult in order to move the patient or perform CPR.^[7, 8] Another possibility for not being at the scene could be due to a relay call, meaning the bystander calls a friend or a relative and asks them to call 9-1-1 to report the emergency instead of calling 9-1-1 directly. In this case T-CPR would be impossible because the call receiver might not be near the patient to relay information about the arrest or perform CPR.

These delays suggest that additional resources are needed in limited English proficient population to educate the community about the language interpretation services that are provided by dispatch centers, as well as increase availability of CPR training and emergency information in different languages. ^[3, 4]

In order to improve access to emergency services and health care in LEP communities within King County, the Emergency Medical Services (EMS) developed the EMS Vulnerable Population Strategic Initiative (VPSI) in collaboration with Public Health –Seattle King County, fire department, community based organizations and the University of Washington. ^[1, 3] This initiative has a

comprehensive community based approach to improve the interaction between EMS and vulnerable communities^[1, 3]. This partnership provides more outreach opportunities for 9-1-1-education and emergency preparedness in English and other languages as well as development of programs that would improve the coordination of care for mental health, substance abuse, elderly abuse and overall health services. ^[1]

Limitations

This study has some limitations. As discussed in the methods section, the classification of a reporting party as LEP was a subjective decision made by the call receiver. Different call receivers may have different criteria for labeling a caller as LEP, and little is known about the call receiver consistency when labeling a call as LEP or even within reporting party consistency. This study might not be generalizable to the general population because of variation in the makeup of LEP populations in other counties in the United States. The demographics from the dispatch centers service area can also affect how the dispatcher interacts with the caller. VALLEYCOM dispatch center is located in South King County, where more than a quarter of the population speak a language other than English^[18]. It is possible that the dispatcher in VALLEYCOM interact with LEP callers more than NORCOM on a regular bases and they might approach LEP callers different than they do in NORCOM. Additionally, the rate of recognition of CPR and bystander CPR is higher in King County not be comparable to other dispatch centers. Comparing limited English proficient caller and English caller was difficult for some of the

variables due to a small sample size and missing data.

Conclusion

This study identified reasons that delayed the implementation of telecommunicators assisted CPR. Limited English callers experienced more delays related to communication barrier between the caller and 9-1-1 telecommunicators. Although some delays are inevitable, telecommunicators training about the 'face threat' experienced by the caller, increasing CPR training and 9-1-1 education in limited English proficient communities and improving connectivity and usage of interpreter services during emergency calls, may minimize others. More research is needed to understand the impact these approaches will have in bystander CPR delays in emergency settings.

Tables

Table 1. Study variables

Variables related to the recognition of need for CPR
Reporting Party leaving phone
Reporting party was not at scene
Reporting party was emotional
Call receiver asked redundant questions
Call Receiver kept repeating language that Reporting party could not understand
Ambiguous responses given by Reporting Party
Reporting party did not know answer to question
Call receiver not following protocol
Call receiver asked about medical history
Call receiver asked irrelevant questions
Call receiver missed that patient was unconscious
Call receiver missed that patient was not breathing normally
Any reporting party delay
Any call receiver delay
Variables related to the start of CPR instructions
Call receiver asking if Reporting party wanted to do CPR
Reporting party expressing concern that they do not know CPR
Reporting party being confused about whether or not patient was breathing
Reporting party was emotional
Reporting party being confused about whether or not patient was conscious
Reporting Party thinking that help was not coming
Reporting Party leaving phone
Patient in a different room
Any reporting party delay
Variables related to CPR not performed or delayed
Was there a delay in performing CPR (for any reason)
Reporting party confusion about patient consciousness state
Reporting party confusion about patient breathing
Reporting party confusion with instructions
Reporting party not being able to move patient
Call receiver not identifying need for CPR
Reporting party language barrier
Reporting party emotional
Reporting party not being at scene
Patient inaccessible (for example, behind locked door)
Reporting party reporting patient was conscious or breathing
Reporting party left phone
Call receiver failed to elaborate on questions/instructions when not understood
Call receiver not following protocol
Reporting party calling to report a death
Patient being stranger to Reporting party
Reporting party believing patient is dead
Reporting party believing patient is alive
Reporting party strength and or size
Reporting party health
All caller question delays
delays in starting CPR
Any reporting party delay
Any call receiver delay

Table 2. Reporting party, patient and location characteristics (n=112)

Characteristics	English (n=52)		LEP (n=60)	
	n	(%)	n	(%)
RP Gender				
Male	14	26.9	20	33.3
Female	30	57.7	31	51.7
Both	8	15.4	9	15.0
Multiple Speakers				
Yes	11	21.2	15	25.0
No	41	78.8	45	75.0
Relationship to Patient (Caller 1)				
Caregiver	9	15.0	17	28.3
Child	8	13.3	9	15.0
Coworker	1	1.7	0	0.0
Friend	4	6.7	1	1.7
Grand Child	0	0.0	5	8.3
Landlord	2	3.3	0	0.0
Other	0	0.0	2	3.3
Other Family	4	6.7	4	6.7
Parent	2	3.3	2	3.3
Spouse	20	33.3	11	18.3
Stranger	0	0.0	3	5.0
Unknown	2	3.3	6	10.0
Remote Reporting				
Different Building	1	1.9	5	8.3
Different Room	5	9.6	4	6.7
Same Room	46	88.5	51	85
Patient sex				
Female	19	36.5	25	41.7
Male	33	63.5	35	58.3
Patient Age				
< 2 years	2	3.8	3	5
25-29	2	3.8	1	1.7
30-39	3	5.8	3	5
40-49	5	9.6	4	6.7
50-59	7	13.5	6	10
60-69	8	15.4	7	11.7
70-79	15	28.8	21	35
80-89	7	13.5	10	16.7
90-94	3	5.8	5	8.3
Location				
Home	42	80.8	38	63.3
Nursing Home	9	17.3	18	30
Public Indoors	0	0.0	1	1.7
Public Outdoors	1	1.9	3	5
Dispatch Center				
Norcom	19	36.5	19	31.7
Valley	33	63.5	41	68.3
Etiology				
Cardiac	34	65.4	38	63.3
Non-Cardiac	18	34.6	22	36.7
Year				
2010	17	32.7	16	26.7
2011	16	30.8	18	30
2012	19	36.5	26	43.3

Table3. Reasons for not recognizing the need for T-CPR (n=112)

	English (n=52)		LEP (n=60)		p.value	OR	95% CI	
	Yes		Yes					
	n	%	n	%				
RP was not at Scene	0	0	4	6.7	0.122	inf		
RP provides Ambiguous responses to CR questions	1	1.92	12	20.0	0.003	12.8	1.6	101.8
RP Leaving Phone	2.0	3.8	8	13.3	0.103	3.8	0.8	19.0
RP did not know answer to question	4.0	7.7	5	8.3	1.000	1.1	0.3	4.3
RP was emotional	7.0	13.5	7	11.7	0.783	0.8	0.3	2.6
CR missed that patient was uncounscious	1.0	1.9	9	15.0	0.019	9.0	1.1	73.7
CR did not recognize need for CPR	1.0	1.9	6	10.0	0.120	5.7	0.7	48.7
CR asked about medical history	1.0	1.9	4	6.7	0.370	3.6	0.4	33.7
CR missed that patient was not breathing normaly	6.0	11.5	12	20.0	0.304	1.9	0.7	5.5
CR asked irrelevant questions	11.0	21.2	17	28.3	0.512	1.5	0.6	3.5
CR asked Redundant Questions	19.0	36.5	27	45.0	0.442	1.4	0.7	3.0
CR not following protocol	14.0	26.9	18	30.0	0.834	1.2	0.5	2.7
CR kept repeating language that RP did not understand	0.0	0.0	0	0.0	1.000			
Any RP delays	9.0	17.3	24	40.0	0.012	3.2	1.3	7.7
Any CR delays	23.0	44.2	36	60.0	0.129	1.9	0.9	4.0

Table 4. Reasons for delaying the start of CR instructions (n=66)

	English		LEP		N/A n	p. value	OR	95% CI	
	Yes		Yes						
	n	%	n	%					
RP expressing concern that they do not know CPR	1	3.4	3	8.3	1	0.622	2.5	0.3	25.9
CR asking if RP wanted to do CPR	3	10.3	7	18.9	0	0.493	2.0	0.5	8.6
RP emotional	4	13.8	3	8.6	2	0.692	0.6	0.1	2.9
RP left phone	2	6.9	1	2.8	1	0.582	0.4	0.0	4.5
RP confused about whether or not patient was breathing	7	23.3	3	8.6	1	0.167	0.3	0.1	1.3
RP concerned help is not coming	0	0.0	0	0.0	2				
Patient in a different room	1	3.3	0	0.0	1	0.462			
RP confused about whether or not patient was conscious	0	0.0	0	0.0	1				
Any RP delays	12	40.0	9	25.0	2	0.289	0.5	0.2	1.6

Table 5. Reasons for CPR not performed or delayed (n=112)

	English (n=52)		LEP (n=60)		p.value	OR	95% CI	
	Yes		Yes					
	n	%	n	%				
RP language barrier	0	0.0	19	31.7	0.000	Inf		
RP calling to report Patient death	0	0.0	2	3.3	0.498	Inf		
RP health	0	0.0	1	1.7	1.000	Inf		
Was there a delay in performing CPR?	34	69.4	58	96.7	0.000	12.8	2.8	59.4
RP confusion with instructions	1	1.9	7	11.7	0.066	6.7	0.8	56.7
RP believes Patient is dead	1	1.9	6	10.0	0.120	5.7	0.7	48.7
RP confusion about patient consciousness state	3	5.8	15	25.0	0.009	5.4	1.5	20.1
RP reporting patient was conscious or breathing	3	5.8	10	16.7	0.084	3.3	0.8	12.6
Delays in starting CPR	8	15.4	18	30.0	0.077	2.4	0.9	6.0
RP left phone	7	13.5	16	26.7	0.103	2.3	0.9	6.2
RP confusion about patient breathing	12	23.1	22	36.7	0.150	1.9	0.8	4.4
RP Physical size and strength	2	3.8	4	6.7	0.684	1.8	0.3	10.2
RP believes patient is alive	1	1.9	2	3.3	1.000	1.8	0.2	20.0
RP emotional	8	15.4	13	21.7	0.471	1.5	0.6	4.0
RP not being able to move patient	10	19.2	13	21.7	0.817	1.2	0.5	2.9
Some other reason	11	21.2	13	21.7	1.000	1.0	0.4	2.6
All Caller delays	22	42.3	25	41.7	1.000	1.0	0.5	2.1
CR did not follow protocol	20	38.5	16	27.1	0.228	0.6	0.3	1.3
RP not at scene	0	0.0	7	11.7	0.014	inf		
PT inaccessible	0	0.0	0	0.0				
CR failed to elaborate on questions/instructions when not understood	0	0.0	0	0.0				
Patient is a stranger	0	0.0	0	0.0				
Any CR delays	20	38.0	18	30.0	0.424	0.69	0.31	1.50
Any RP delays	27	51.9	51	85.0	0.000	5.25	2.15	12.8

References

1. Services, P.H.-S.a.K.C.D.o.E.M., *2015 Emergency Medical Services Annual Report*. 2015. p. 69.
2. Bryan McNally, R.R., Monica Mehta, Kimberly Vellano, Amy L. Valderrama, Paula W. Yoon, Comilla Sasson, Allison Crouch, Amanda Bray Perez, Robert Merritt, Arthur Kellermann, *Out-of-Hospital Cardiac Arrest Surveillance --- Cardiac Arrest Registry to Enhance Survival (CARES), United States, October 1, 2005--December 31, 2010*, in *Morbidity and Mortality Weekly Report (MMWR)*. 2011, Centers for Disease Control and Prevention July 29, 2011. p. 20.
3. Hendrika Meischke, B.I., Ian Painter, Devora Chavez, Mei Po Yip, Steven M. Bradley, Shin-Ping Tu, *Delivering 9-1-1 CPR Instructions to Limited English Proficient Callers: A Simulation Experiment*. *J Immigrant Minority Health*, 2015. **17**: p. 6.
4. Steven M. Bradley, C.E.F., Hendrika Meischke, Judith Allenb, Megan Bloomingdaleb, Thomas D. Rea, *Bystander CPR in out-of-hospital cardiac arrest: The role of limited English proficiency*. *Resuscitation*, 2011. **82**: p. 4.
5. Thomas D. Rea, M., MPH; Mickey S. Eisenberg, MD, PhD; Linda L. Culley, BA; Linda Becker, MA, *Dispatcher-Assisted Cardiopulmonary Resuscitation and Survival in Cardiac Arrest*. *Circulation*, 2001. **104**: p. 3.
6. Samantha R. Hauff, B., et al., *Factors Impeding Dispatcher-Assisted Telephone Cardiopulmonary Resuscitation*. *Annals of Emergency Medicine*, 2003. **42**: p. 7.
7. Linda L Culley, J.J.C., Mickey S Eisenberg, Mary Pat Larsen, *Dispatcher-Assisted Telephone CPR: Common Delays and Time Standards for Delivery*. *Annals of Emergency Medicine*, 1991. **20**: p. 5.
8. John F. O'Neill , C.D.D., *Evaluation of telephone CPR advice for adult cardiac arrest patients*. *Resuscitation*, 2007. **74**: p. 5.
9. Lauren N Carroll, R.E.C., Cleo C. Subido, Ian S. Painter, Hendrika W. Meischke, *Serving Limited English Proficient Callers: A Survey of 9-1-1 Police Telecommunicators*. *Prehosp Disaster Med.* , 2013. **28**(3): p. 106.
10. Hendrika W. Meischke, D.C., Steve Bradley, Tom Rea, Mickey Eisenberg, *Emergency Communications with Limited-English Proficiency Populations* *Prehospital Emergency Care*, 2010. **14**(2): p. 6.
11. Hendrika W. Meischke, R.E.C., Mei-Po Yip, Shin-Ping Tu, Ian S. Painter, *The effect of Language Barriers on Dispatching EMS Response*. *Prehospital Emergency Care* 2013. **17**(4): p. 5.
12. Dennis P. Andrulis, N.J.S., Jonathan P. Purtle, *Integrating Racially and Ethnically Diverse Communities Into Planning for Disasters: The California Experience*. *Disaster Medicine and Public Health Preparedness*, 2011. **5**(3): p. 7.
13. Dorian Ramirez, k.G.E., Tricia S. Tang, *Language Interpreter Utilization in Emergency Department Setting: A CLinical Review* *Journal for Health Care for the Poor and Underserved* 2008. **19**(2): p. 10

14. Nancy Gordon, G.G.-B., Susan Dean, Antonia Torreblanca., *CA8-05: Communication Problems and Preferences of Limited English Proficient Spanish Speakers in a Predominantly English-oriented Medical Setting*. *Clinical Medicine and Research*, 2012. **10**(3): p. 1.
15. Dennis P. Andrulis, C.B., *Integrating Literacy, Culture, and Language to Improve Health Care Quality for Diverse Populations*. *American Journal of Health Behaviour*, 2007. **31**: p. 11.
16. Bureau, U.S.C., *New Census Bureau Report Analyzes Nation's Linguistic Diversity*. 2010.
17. Ryan, C., *Language Use in the United States: 2011*, E.a.S. Administration, Editor. 2013, US Census Bureau. p. 16.
18. Felt, C., *South King County's Changing Demographics*, S.a.B. King County Office of Performance, Editor. 2014.
19. Felt, C., *King County Changing Demographics-A View of our Increasing Diversity*. 2013.
20. Association, A.H. *CPR Statistics*. CPR & Sudden Cardiac Arrest (SCA) Fact Sheet 2011; Available from: http://www.heart.org/HEARTORG/CPRandECC/WhatisCPR/CPRFactsandStats/CPR-Statistics_UCM_307542_Article.jsp-.WLzmMxS4yf4.
21. Stutman, D., *Time Delays on the Identification of the Need for CPR for Limited English Proficient 9-1-1 Callers*, in *School of Public Health*. 2016, University of Washington. p. 25.
22. (LEITSC), L.e.I.T.S.C., *Standard Functional Specifications for Law Enforcement Computer Aided Dispatch (CAD) Systems*.
23. County, P.H.-S.K. *Medical Incident Report Form (MIRF)*. 2017 May 6, 2016 March 3, 2017]; Available from: <http://www.kingcounty.gov/depts/health/emergency-medical-services/planning/mirf.aspx>.
24. Tracy, S.J., *When Questioning Turns to Face Threats: An Interctional Sensitivity in 911 Call-Taking*. *Western Journal of Communication* 2002. **66**(2): p. 28.