Clinical Paper

A standardized template for measuring and reporting telephone pre-arrival cardiopulmonary resuscitation instructions[☆]

Christian Dameff[a], Tyler Vadeboncoeur[b,*], Jeffrey Tully[a], Micah Panczyk[c],
Aaron Dunham[a], Ryan Murphy[a], Uwe Stolz[e], Vatsal Chikani[a,c],
Daniel Spaite[e], Bentley Bobrow[a,c,d]

[a] University of Arizona, Phoenix, AZ, United States
[b] Mayo Clinic, Jacksonville, FL, United States
[c] Arizona Department of Health Services, Phoenix, AZ, United States
[d] Maricopa Medical Center, Phoenix, AZ, United States
[e] University of Arizona, Tucson, AZ, United States

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ABSTRACT

Background: Bystander cardiopulmonary resuscitation (CPR) improves out-of-hospital cardiac arrest (OHCA) survival. Telephone CPR (TCPR) comprises CPR instruction given by emergency dispatchers to bystanders responding to OHCA and the CPR performed as a result. TCPR instructions improve bystander CPR rates, but the quality of the instructions varies widely. No standardized system exists to critically evaluate the TCPR intervention.

Methods: Investigators analyzed audio recordings of suspected OHCA calls from a large regional 9-1-1 dispatch center and applied descriptive terms, a data collection tool and a six metric reporting template to describe TCPR. Data were obtained from October 2010 to November 2011. Dispatcher recognition of CPR need, delivery of TCPR instructions, and bystander CPR performance were documented.

Results: A total of 590 calls were analyzed. Call evaluators achieved "near perfect agreement" with 5/6 reporting metrics and "strong agreement" on the 6th metric: percentage of calls where need for CPR was recognized by dispatch. CPR was indicated in 317 calls and already in progress in 94. Dispatchers recognized the need for TCPR in 176 of the 223 (79%) remaining calls. CPR instructions were started in 65/223 (29%) and bystander CPR resulting from TCPR instructions was started in 31/223 (14%).

Conclusion: We developed and demonstrated successful implementation of a simple data collection and reporting system for critical evaluation of the TCPR intervention. A standardized methodology for measuring TCPR is necessary to perform on-going quality improvement, to establish performance standards, and for future research on how to optimize bystander CPR rates and OHCA survival.

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1. Introduction

Bystander initiated cardiopulmonary resuscitation (CPR) has been shown to increase survival,[1] however it is performed in less than half of all out-of-hospital cardiac arrests (OHCA).[2,3] Dispatch-assisted CPR, also known as Telephone CPR (TCPR), has been shown to double rates of bystander CPR[4] and provides an opportunity to systematically increase bystander CPR rates and survival on a large scale.[5] Previous work by Clawson et al. describing the development of pre-arrival instruction protocols for OHCA and subsequent quality improvement measures have improved bystander TCPR rates.[6] TCPR instruction is defined as real-time CPR guidance offered to callers by emergency dispatchers or other trained call takers. The goal is to provide bystanders with "just-in-time" instructions to (1) identify whether the victim is in cardiac arrest and (2) instruct the bystander to perform CPR prior to the arrival of trained rescuers. Many believe that one of the system factors responsible for the enormous variability in OHCA outcomes across communities is the quality and timeliness of the TCPR process.

The importance of collecting dispatch center characteristics, identifying barriers to bystander TCPR delivery, and standardized reporting of TCPR has been proposed by Castren et al. as a means

to compare and improve bystander TCPR delivery among dispatch centers worldwide.[7] This work seeks to further standardize the method of recording and reporting TCPR by describing the application of descriptive terms, a codified measurement tool, and a standardized reporting format for assessing the quality of TCPR. The measurement tool and reporting template were applied to baseline data prior to a dedicated quality improvement initiative. The goal is to promote a reporting system which enables on-going provider and system-level feedback, system-to-system comparisons and to aid in answering important research questions in order to improve the critical intervention of TCPR.

2. Research methods

2.1. Study population and setting

Audio recordings of emergency dispatch calls were obtained from a large regional combined fire, EMS, and law enforcement dispatch center serving a population of approximately 712,000 people in Arizona.[8] The agency registered 40,118 medical calls in 2011. This center employs an automated medical computer aided dispatch (CAD) system [Incident Management, version 8.1.3, Intergraph, Huntsville, AL] and functions horizontally with both call takers and dispatchers working in parallel. Call takers at this center do not dispatch units. Once the call taker identifies the location and classification of a call the information is automatically and electronically sent to the dispatcher through the CAD. Dispatchers may choose to act temporarily as call takers while also dispatching calls during high call volume periods.

2.2. Data collection

All medical calls received by this dispatch center are assigned a "call type" when initially processed. Call types can either be assigned to "med" or "code." A "code" designation signified that the caller reports the victim as not breathing and not conscious. Call takers are also educated to triage as a "code" if there is any suspicion of an OHCA. If responding EMS units discover a "code" that was not reported by the caller or occurred after the call then the "call type" is amended retrospectively and applied to the call recording database. Calls are not always amended if the arrest occurs after leaving the scene during transport.

On duty dispatch center staff reviewed all medical calls recorded from October 1, 2010 to November 6, 2011 and searched the "call type" field for the term "code." The audio recordings corresponding to the resulting search were copied onto encrypted flash drives for analysis. Call date/time and unique response "run" numbers, corresponding to each call, were entered into an Excel spreadsheet [Excel v14.5, Microsoft, Redmond, WA]. This was accomplished during regular overnight shifts in addition to their usual responsibilities.

This agency participates in the Save Hearts in Arizona Registry and Education (SHARE) Program which has been previously described in detail and includes a voluntary Utstein-style OHCA EMS database linked with in-hospital post-arrest process and outcome data from hospitals.[9] SHARE collects data as part of a statewide cardiac arrest quality-improvement initiative sponsored by the Arizona Department of Health Services and the University of Arizona. The SHARE Program has created measurement tools modeled after the Utstein OHCA template to allow epidemiologic, clinical, and outcomes analyses of OHCA and TCPR.[10] These tools are available online at www.azshare.gov.

OHCA has been designated a major public health problem by the Arizona Department of Health Services. Thus, the SHARE Program initiatives and its data collection are exempt from the Health Insurance Portability and Accountability Act. By virtue of SHARE being a health department–sponsored public health initiative, the Arizona Department of Health Services' Human Subjects Review Board and the University of Arizona Institutional Review Board have determined that neither the interventions nor their evaluation constitutes human subjects research and have approved the publication of de-identified data.

Here we apply and report TCPR baseline data as a means to assess our measurement and reporting tool. Additionally, the baseline data serves as a benchmark from which to measure improvements in process metrics. The impact of such gains on patient outcomes can be subsequently gauged by linking process data with prehospital and hospital records.

2.3. Call processing

Investigators developed a standardized call-evaluation process and utilized an electronic web-based 21-element data collection tool (Appendix 7.1) to capture relevant dispatcher/caller interaction data in cases of suspected OHCA.[11] Evaluators independently processed 10 of the same 9-1-1 recordings and compared findings to assure consistency. Examples of data elements include: victim status assessment, dispatcher recognition of CPR need, delivery of TCPR instructions, and the verification of performance or non-performance of bystander CPR. Please refer to Appendix 7.2 for detailed descriptions and definitions of the 21 data elements.

The indication for performing CPR was defined as the bystander reporting that the victim was not conscious and was not breathing "normally." Not breathing normally was defined as the caller describing either complete absence of breathing, agonal breathing or a rapid or slow respiratory rate. Investigator identification of audible agonal breaths was also considered not breathing normally. Calls where CPR was in progress or initiated spontaneously by bystanders were excluded from key metric percentage and time analysis. Call taker recognition of the need for CPR is when they say any of the following in connection with a response to the patient's condition: "cardiopulmonary resuscitation," "CPR," "chest compressions," "compressions," "continuous chest compressions," "hands-only CPR," "CCR," "rescue breaths," "rescue breathing," "ventilations," or "rescue ventilations." TCPR instructions are defined as any portion of dispatcher-to-caller communication that detailed the delivery of either chest compressions and/or rescue breaths. Performance of bystander TCPR was defined as any chest compressions delivered to the victim in response to TCPR instructions (i.e., ventilations without chest compressions were not counted as TCPR performed) and the time is noted when the first compression is audible or the caller/rescuer indicates he or she has started compressions (i.e., by counting with dispatcher).

Audio recordings were analyzed using QuickTime [Version v.10, Apple Inc. Cupertino, CA]. Relevant data elements were recorded in the secure, web-based MySQL data collection system and stored in encrypted form on password-protected Windows 2008 servers only accessible to approved IP addresses. Six key performance metrics were derived from the current American Heart Association (AHA) dispatch CPR scientific statement and European Resuscitation Council (ERC) resuscitation guidelines[12,13]:

1) Median elapsed time interval from call receipt to dispatcher recognition of CPR need (time zero defined as the second at which the caller was acknowledged by the call taker on the recording).
2) Median elapsed time interval from time zero until start of CPR instructions.
3) Median elapsed time interval from time zero until first chest compression actually performed by bystander.