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Reporting of data from out-of-hospital cardiac arrest has to involve emergency medical dispatching—Taking the recommendations on reporting OHCA the Utstein style a step further☆

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ABSTRACT

Objectives: As a part of the chain of survival, the emergency medical communication centre (EMCC) and the emergency medical dispatcher (EMD) has an important role in early identification of out-of-hospital cardiac arrests (OHCA). The EMD may provide instructions to the caller and thereby initiate cardiopulmonary resuscitation in a substantial number of subjects and thus contribute to increased survival. The EMCC provides a response with first responders, ambulances, physician manned units and potentially other health care providers. EMCC in many cases initiates the communication with experts in the referral hospital and provide added value to the post resuscitation care by providing advanced transport, logistics and follow up. In research there is a growing focus on the EMCC/EMDs impact on survival in OHCA. The lack of standards in reporting results from medical dispatching is an obstacle for thorough evaluation of results in this area and comparison of data. The objective for this paper is to introduce a framework for uniform reporting of the dispatching process for quality improvement, collecting and reporting data and exchanging information regarding OHCA.

1. Introduction

In the emergency medical service (EMS), the "medical service" most often begins when an emergency call is received and handled at the emergency medical communication centre (EMCC). The role of the emergency medical dispatcher (EMD) is important to the overall performance of an EMS system. The EMD has to correctly identify the medical need, prioritize and define a response amongst all incoming calls to the emergency medical communication centre (EMCC). In some medical emergencies the EMD can also provide potential life-saving guidance, advice or instructions to the caller, e.g. in cases of out-of-hospital cardiac arrest (OHCA). The scientific interest has concentrated mainly upon the hands-on medical care provided to patients and thus does not include the performance related to dispatching[1] even though the EMD performance is recognized as an essential link in the chain of survival.[2]

Since the first recommended guidelines for uniform reporting of data from OHCA in 1991,[3] the Utstein-style definitions and reporting templates have been used extensively in published studies of cardiac arrest (CA). This has led to a more uniform reporting of data and has increased the understanding of the events associated with resuscitation attempts.

Due to the key role that the EMD has in the initial phase of a medical emergency like OHCA, it has become obvious that dispatching centre variables should be considered when reporting prehospital data concerning OHCA. To really be able to compare results from different systems and resuscitation studies it is important to present details from the dispatching centre and the handling of the emergency call. Without a uniform framework for describing and reporting the EMD process, it is very difficult to compare results and even more difficult to identify best practice.[4] The objective for this paper is to introduce such a framework for uniform reporting of the dispatching process to be used for quality improvement, collecting and reporting data and exchanging information regarding OHCA.

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This current paper builds on a previous publication on reporting on EMD when conducting research in emergency medicine.

2. The dispatching process

When a medical emergency occurs out-side of hospital there almost always is an inherent delay until someone recognizes and realises the situation. The time points of these events are usually difficult to record and thus are often recollections and estimates. After this follows a delay until the EMCC is alerted, usually by a phone call, defined as 'time call received'.[5] As soon as the call reaches the EMCC the following time points and intervals are usually monitored and recorded, enabling measurements with a high level of accuracy.[6] Now follows a series of events that will lead to allocating an appropriate medical response to the specific medical emergency. The severity of the medical emergency should be identified. Without any delay the EMD should identify any immediate life-threatening situation like a CA or acute respiratory distress and impaired consciousness. The site or address of the emergency should be identified. To assure that this is done promptly and as accurate as possible several attempts have been made to introduce structured instructions and guidance for the EMD to perform the interview and gather information as quick and accurate as possible. Examples of such decision supporting systems are dispatch protocols and criteria based dispatching.[7–9] The compliance of EMDs to these protocols is important for the correct identification of OHCA,[9] however the sensitivity of such systems are reported to be variable.[9–12]

When a medical emergency has been identified a priority has to be defined. In cases of obviously life-threatening situations such as suspected CA the assignment will be of highest priority. In such cases an immediate EMS response is initiated, which will differ depending on the organizational structure and the nature of the event. The response can be one tiered or multi tiered, e.g. including some or all of first responders, one or more ambulances, physician staffed cars or helicopters or other resources.

As the EMS has been alerted there is usually a time interval until the teams will reach the site of the event. In order to initiate cardio-pulmonary resuscitation (CPR) promptly, many organizations provide telephone-assisted CPR (T-CPR), by which the EMD gives standardized instructions to the caller on how to perform CPR and assists the caller while waiting for the EMS to arrive at the scene. The key-role of the dispatcher in terms of the initiation of CPR in OHCA was recognized several decades ago. Formal training of EMDs started in the 1970s, when written pre-arrival instructions were introduced for severe medical emergencies, such as OHCA.[10] Telephone-assisted CPR with instructions from the EMD to the caller has been shown to increase the likelihood for the victim to receive bystander CPR.[13]

The sequence of events that make up the dispatching process (the EMD response interval) of medical cases can be summarized[5];

The response interval of the public:
1. The incident occurs.
2. The emergency call is made.

The EMD response interval:
3. The call is answered by the service.
4. A need is identified.
5. The address is identified.
6. A priority is decided.
7. A response is defined.
8. The response/resource is dispatched.
9. Assistance may be given online if indicated, and
10. The call is terminated.

3. Recommended template for recording of data

Emergency medical dispatching is important in the chain of events that eventually may lead to a patient in cardiac arrest outside of hospital surviving the incident.[13] For this reason, EMD should be part of the research and quality improvement processes. When presenting results from prehospital research, or comparing organizations, a description of the EMCC, EMD and the dispatching system is important. Care should be taken to enable comparison and evaluation of the system in a standardized manner. When analyzing the EMD involvement and enable comparison between EMS systems, in OHCA, there are several items, events and also some time points in the dispatching process that need to be defined. Some should be considered as core data while other can be seen as supplemental.

3.1. Background data

It is reasonable to assume that the demographic, geographic and environmental situation in which the EMS operates has substantial impact on the availability of medical emergency recourses and access to the EMS in the population served. It is therefore essential to include a description of the population and community that is served by the EMCC. This should be considered as core data.

Information regarding political–economical system characteristics should include information on whether the EMCC is one physical unit or separated into separate alarm and dispatch centres and if the EMCC is a part of the health care system or belongs to another authority (e.g. the police, ambulance or the fire brigade) (core data) and if the EMCC is public or private financed (supplementary data).

As supplementary data the number of EMDs on duty, the educational and training level of the EMDs as well as how data is collected and recorded, e.g. by automatic recording in a data base, manual recording in a data base or paper based recording provides a complementary description of the system. If the system uses decision support it should be stated. Also, if emergency calls are prescreened by another call-centre (e.g. UK system and Denmark) this should be stated. The number of calls (emergency calls) as well as those defined as emergency medical calls (i.e. ambulance mission), gives an indication of the overall working load at the EMCC.

4. Dispatching process in out-of-hospital cardiac arrest

4.1. The response interval of the public

4.1.1. The incident occurs

The time is often difficult to recall precisely in the majority of cases. It is often an approximation. However, the time when the cardiac arrest occurs should be recorded as accurate as possible in the data set (core data).

4.1.2. The emergency call is made

The time that the EMCC is contacted (when the incoming call is first registered) should be recorded as this defines the beginning of the EMS response interval.[5] This time may be defined as when the incoming call is first registered at the centre answering emergency calls, regardless of when the call is answered. The EMD response interval ends when the EMD activates (dispatches) an EMS unit (core data). See Section 4.2.2 below.

4.2. The EMD response interval

4.2.1. The call is answered by the service

The receipt of the call is defined as the time when a person authorized to carry out medical dispatch receives the call and is

Box 1: List of suggested supplementary data.
Any cases defined by the dispatcher as CA but not in CA.
The number of calls per year per dispatcher (mean and min/max).
The priority assigned.
The type of EMS response.
If basic life support is dispatched at a different time than advanced life support.
If CPR instructions are following pre-defined protocol or not.
The time when bystander CPR is initiated.

connected to the caller. This is when the EMD is able to initiate the identification process and should be included as core data.[5]

4.2.2. A need is identified

If the EMD is to perform well in the initiation of the care of an out-of-hospital cardiac arrest victim, it is absolutely essential that the sensitivity for finding these cases is as high as possible.

There are several reasons for the EMD seemingly not identifying a CA correctly. Sometimes patients who do not have cardiac arrest at the time when the call is made to the EMCC may suffer from cardiac arrest while waiting for the EMS to arrive at the scene. The information gathered during the interview might be inadequate or wrong (e.g. caller not present at the scene). At other occasions the EMD may fail to identify an OHCA. The EMD could misinterpret information, agonal gasping may be interpreted as breathing thereby the EMD fails to correctly identify the CA and initiate resuscitation attempts.[14–16] This necessitates a thorough evaluation of the dispatching process in order to define as accurately as possible the sensitivity of finding true cardiac arrest cases at the time of the interview. Ideally this means that the calls have to be analyzed separately, including listening to the actual conversation and analyzed together with data from the EMS.

The total number of calls where the EMD suspects CA cases before and during the call should be defined as accurately as possible (core data). This should be further analyzed by the number of cases correctly recognized by the EMD (Identified CA, core data), as well as the number of cases with CA before or during the call that were not recognized by the dispatcher should be recorded (Not identified CA, core data). Any cases identified by the dispatcher as CA, but with obvious vital signs at the time of the EMS arrival (Not in CA) should also be defined (false positive) as part of analyzing the sensitivity of the system (supplementary data). See Box 1 .

The number of CA calls (mean and max/min) per dispatcher and year affects the survival and should be included as supplementary data. Kuisma et al. showed the effect of experience on survival, showing that when an EMD handled <4 calls per year with OHCA compared to >9 calls per year, the survival rate of witnessed patients in ventricular fibrillation was 22% and 39% respectively.[21]

All cases of OHCA should be defined as witnessed (seen or heard) or unwitnessed (core data). EMS-witnessed arrests are to be excluded, or more exactly – not included in the evaluation of the EMD performance.

4.2.3. A priority is decided

The priority assigned to the cases with suspected and true CA should be given if possible (supplementary data, Box 1).

4.2.4. A response is defined and dispatched

The type of EMS response that is generated should be described (supplementary data, Box 1) and the time for dispatching the response is considered core data (see below) as a part of the EMD response interval. If different basic life support is dispatched at a different time than advanced life support, this should be stated (supplementary data, Box 1).

Box 2: Barriers to T-CPR. The most frequently used reasons why T-CPR instructions did not start or were not completed (references). C, core data; S, supplemental data.

Bystander not at scene[17,18] C
Bystander left telephone, call disconnected[17] C
Bystanders refusal[19] C
Emotional state of the caller makes it impossible[17–20] C
Bystanders difficulty performing instructions C
Impaired due to bystanders physical limitations[19] S
Bystander unable to move the patient[17] S
Inability to listen to instructions and care for the patient at the same time[19] S

4.2.5. Assistance may be given on line if indicated

All cases with CA before or at the time of the call should be analyzed as whether the caller received pre-arrival instructions or not, so that the number of calls where the EMD suspects CA and also gives pre-arrival instructions can be given (core data, see Fig. 1). It is essential to define the pre-arrival instructions per se. The cases when the instructions are classified as having been given in full accordance to the protocol should be recorded as well as the cases that do not follow the pre-defined instructions (supplementary data, Box 1). It is also recommended that the EMD records the time when bystander CPR is initiated, as this has impact on the evaluation of the pre-arrival instructions regarding T-CPR (supplementary data, Box 1). Knowing that clocks are often inaccurate and it is not the time itself but the time intervals to attempted resuscitation that is important,[5] the initial judgements of the time of CA are often estimates whereas it would be possible to more accurately define all time points and intervals occurring after contact have been made with the EMCC/EMD. The ideal situation would also be synchronizing the clocks used at the EMCC regularly.

Even though identification of OHCA victims is usually reasonably high, only a portion of these are given T-CPR instructions.[21,22] Reasons for not giving pre-arrival instructions should be specified since there are obvious barriers to T-CPR (Box 2). This may explain why compliance to protocols may seem to be incomplete (core data).

It is essential to evaluate if the instruction do lead to return of spontaneous circulation (ROSC) or to on-going CPR when the EMS arrives at the scene (core data). Sign of ROSC include;

1) Breathing (more than an occasional gasp),
2) Coughing, or
3) Movement.

Obviously, when EMS arrives it may also include evidence of a palpable pulse or a measurable blood pressure.[6]

5. Discussion

It is obvious that early identification of CA victims is crucial for delivering optimal care, with speed and quality. The EMD is crucial in this process, having the possibility not only to alert the adequate EMS recourses, but also assist the caller in initiating and performing immediate resuscitation attempts while waiting for qualified help. As the consensus statement from American Heart association (AHA) in 2011 states, a comprehensive on-going surveillance of OHCA, including EMD is necessary to identify opportunities to

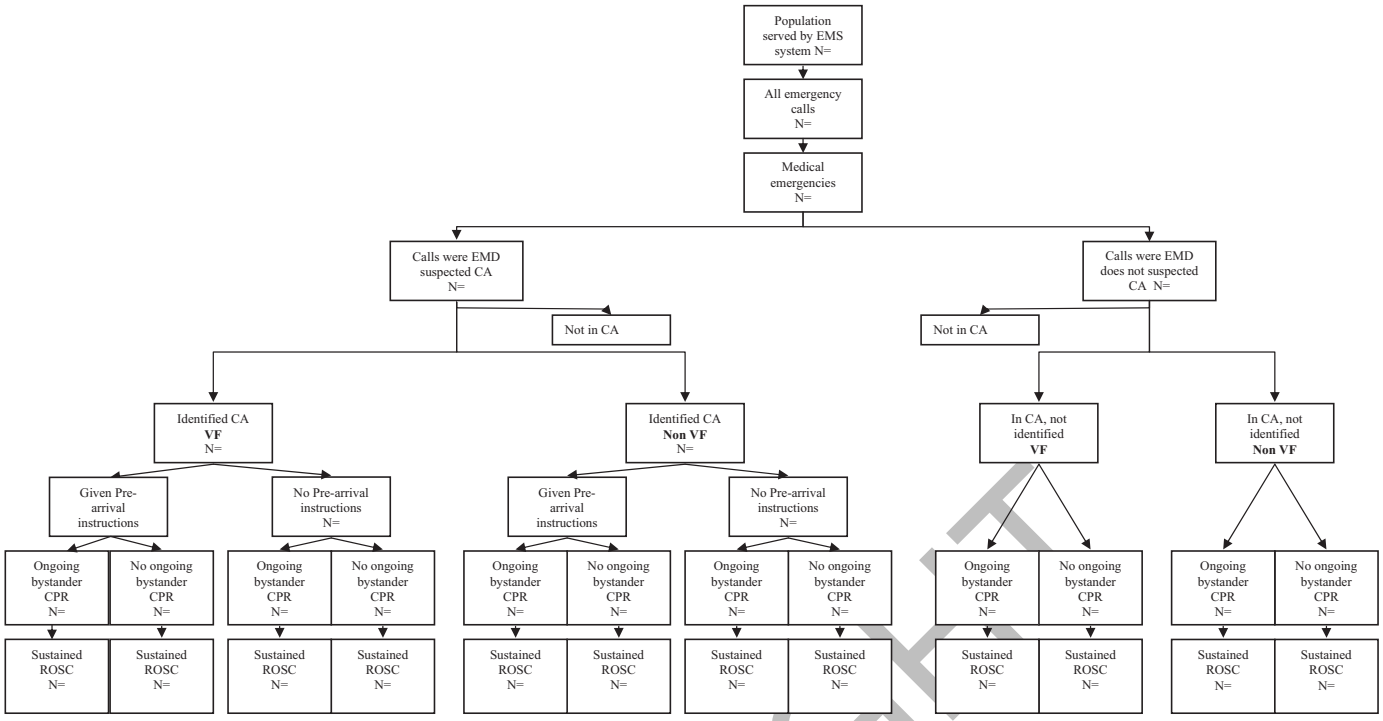

Fig. 1. Reporting template of data from out-of-hospital cardiac arrest when evaluating the EMD process. The data required in the boxes in bold are also included in the original Utstein template on OHCA. Cardiac arrest witnessed by the emergency medical service (EMS) is included in the group not in cardiac arrest when EMS crew arrives on scene. OHCA – out-of-hospital cardiac arrest, CPR – cardiopulmonary resuscitation, VF – ventricular fibrillation, EMD – emergency medical dispatcher.

improvement[23]. The statement identifies dispatch assisted CPR as a key element and they mentioned median for rate of initiating bystander CPR after dispatcher instructions as a possible benchmark. When analyzing this process it is important to take into account the differences the EMD faces compared to someone at the scene. The main difference is that the EMD acts indirectly, talking to a bystander. The EMD can only act on what he/she hears and by asking questions to clarify the situation, a situation that is very different from the one giving instructions at the scene. It has also been shown that even when giving T-CPR instructions, the performance of the CPR is usually of poor quality.[24,25] This implicates that developing the way instructions are given may have impact on performance and out-come. The barriers why T-CPR sometimes cannot start (Box 2) are important and these have to be analyzed, since they account for the fact that it is unlikely that T-CPR will ever be initiated in a very high percentage of cases. To perform such an analysis it is essential to study the whole chain of events, ideally including listening to the telephone call itself. The suggested core data would enable a thorough analysis of the events during the dispatching process. This also enables making realistic goals for evaluating the compliance to protocols. It will also provide the basis for analyzing missed cases and the true potential that the system may has in initiating T-CPR. Without such documentation and evaluation of the chain of events that take place during the dispatch process it is unlikely that improvements in T-CPR can take place.

Even when using decision support systems in the EMD process, the sensitivity of the dispatching mechanism to detect OHCA may be moderate as shown by Cairns et al. with a sensitivity of 68.9%,[12] although obviously better than using free text descriptions.[8] Nurmi et al. report that the EMD had compliance to the medical protocol about 48% and identified 80% of the OHCA cases.[13] In contrast Heward et al. could verify 97% protocol compliance and 53% identification of OHCA.[9]

It is well known that witnessed OHCA is associated with increased survival compared to if no one saw or heard the collapse.[26] It should therefore be of interest to know the witnessed status at the EMCC level, but it is a challenge to get that information during the emergency call because of the amount of essential information exchange between the caller and the EMD. The witnessed status is probably not essential at this stage, it is the symptoms of the patient that shall lead the EMD to appropriate actions and it is reasonable that the witnessed status can be gathered by EMS personnel at scene.

It becomes clear that in the evaluation of the EMD process information and data has to be gathered not only from the EMCC but also from the EMS and from the receiving hospitals. To enable an evaluation of the EMD it is also many times important and necessary to analyze the interview itself. If this is done and we are able to compare and use data for meta analyses in future research, it could be possible to optimise the process and increase compliance as well as outcome from T-CPR. For the sake of OHCA victims we all need to take on this challenge.

Conflict of interest statement

None of the authors have conflict of interest

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