Adequacy of bystander actions in unconscious patients: an audit study in the Ghent region (Belgium)

Ines Lamote[a], Paul Calle[b], Cathelijne Lyphout[c] and Patrick Van de Voorde[c,d]

Objectives **Early recognition and appropriate bystander response has proven effect on the outcome of many critically ill patients, including those in cardiac arrest. We wanted to audit prehospital bystander response in our region and identify areas for improvement.**

Patients and methods **We prospectively collected data, including Emergency Medical Services dispatch center audio files, on all patients with a decreased level of consciousness presenting to the Ghent University Hospital prehospital emergency care unit ($n = 151$). Three trained emergency physicians reviewed the bystander responses, both before and after dispatcher advice was given. Suboptimal actions (SAs) were only withheld if there was 100% consensus.**

Results **SAs were recognized in 54 (38%) of the 142 cases, and most often related to delayed ($n = 35$) or inaccurate ($n = 12$) alerting of the dispatch center. In seven cases, the aid given was considered suboptimal in itself. Importantly, in 21 (25.9%) of the 81 cases where a clear advice was given by the dispatcher, this advice was ignored. In 12 cases, a general practitioner was present at scene. We recognized SAs in 80% of these cases (8/10; insufficient information, $n = 2$). Cardiopulmonary resuscitation was started in only 29 (43.3%) of the 67 cases of cardiac arrest where dispatcher-assisted cardiopulmonary resuscitation was indicated at the moment of first Emergency Medical Services call.**

Conclusion **We audited bystander response for unconscious patients in our region and found a high degree of suboptimal actions. These results should inform policy makers and healthcare professionals and force them to urgently reflect on how to improve the first parts of the chain of survival.** ***European Journal of Emergency Medicine*** **00:000–000**

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[a]Department of Emergency Medicine, Jan Yperman Ieper, Ieper, [b]Department of Emergency Medicine, Maria Middelares Hospital, Ghent University, [c]Department of Emergency Medicine, University Hospital Ghent and [d]Federal Department of Health, Emergency Dispatch Centre 112 Eastern-Flanders, Ghent, Belgium

Correspondence to Patrick Van de Voorde, MD, PhD, FERC, Department of Emergency Medicine, University Hospital Ghent, De Pintelaan 185, 9000 Ghent, Belgium
Tel: +32 93 324 906/+32 48 842 0841;
e-mails: patrick.vandevoorde@uzgent.be, patrick.vandevoorde@health.belgium.be

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Introduction

Early recognition of cardiac arrest, an accurate call for help, and provision of bystander cardiopulmonary resuscitation (CPR) are important determinants of outcome in out-of-hospital cardiac arrest (OHCA) [1]. As many bystanders have poor CPR knowledge and skills, dispatcher-assisted CPR has become part of the chain of survival and is regarded as a key element in most emergency medical services (EMS) systems [2]. Previous studies have identified many problems hampering bystander actions. Information transfer from witness to dispatch center might be delayed or disturbed owing to panic or emotional distress, the urgency might be underestimated or overestimated by lay persons, and most importantly OHCA might remain unrecognized by the caller [3–6]. These factors may subsequently lead to misjudgment by the dispatcher and thus delay in appropriate care.

The aim of this study was to gain more insight in the alert of the EMS system and the care administered on site by bystanders (before and after being given advice by the EMS dispatch center). Thus, we wanted to evaluate the opportunities for improving the first link of the local 'chain of survival' [2].

Patients and methods

Between 1 June 2014 and 31 May 2015, we prospectively screened all patients treated by the physician-staffed mobile emergency care unit based in the Ghent University Hospital. Patients were included if 16 years of age or older and having had a decreased level of consciousness [only responding to pain or (presumed) Glasgow Coma Score ≤ 8 or Glasgow Coma Motor Score ≤ 4] for at least 5 min between the first contact with the bystander and the final arrival at the hospital. Ethical committee approval was obtained. Clinical data were extracted from the prehospital and hospital files of the individual patients; if deemed necessary, additional information from the attending care givers was gathered. In addition, the outprints and audio files from the EMS dispatch center were systematically reviewed. For each case, a two-stepped structured audit on anonymized data was performed and points of improvement, further on called 'suboptimal actions [SAs]', were formulated. In step 1, all cases were reviewed independently by three trained emergency physicians (P.V.D.V., P.C., I.L.; spring 2016) based on the current available scientific evidence and to their own knowledge and skills [7]. Actions were scored per period (i.e. before and after the

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dispatcher's advice) as 'correct' or 'suboptimal'. In case the auditor felt (s)he could not sufficiently judge the case based on the available evidence, (s)he scored as 'insufficient information'. In step 2, each case was discussed face to face by the audit team untill 100% consensus. Actions were only scored as 'suboptimal' if they were considered avoidable, not justifiable by the circumstances, and if the registered data were considered sufficient. To have consistency in the decision-making process, certain decision rules were defined during evaluation. Most of these were related to the different expectations for lay persons versus medically trained ones. For instance, we expected medically trained bystanders, but not lay persons, to place a patient in a recovery position when needed. Ignoring the given advice was only taken into account when it was reasonably possible for the bystander to do so.

All data were reported as absolute values or percentages of the total. Cases where there was insufficient information to make a decision were not considered in the calculation of percentages. Given the descriptive nature of the study, we did not further analyze our data statistically.

Results

Description of study population

During the study period, a total of 151 cases met the inclusion criteria. Patients ranged between 16 and 98 years of age, with a median of 70 years. In 61.6% of all cases, the bystander who made the call to the EMS dispatch center was a family member ($n=84$) or a friend ($n=9$). In 15.9%, the caller was an 'unknown' bystander. In all other cases (22.5%), the caller was a 'care provider': either nurse ($n=10$), general practitioner (GP) ($n=12$), police officer ($n=7$), or other ($n=5$). Importantly, in as much as 20 cases, the caller was not near the patient.

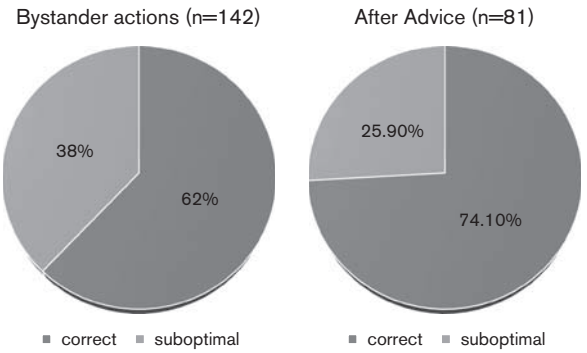
Callers were more often men [98 (65.0%) men]. In only four cases, a language problem was identified, in that the caller did not speak any Dutch, English, or French.

In 111 (73.5%) cases, the Glasgow Come Scale of the patient at arrival of the medical emergency care unit was 3/15. Of these, 76 patients eventually experienced OHCA. In the majority of them [67 (44.4%) of the total group], phone CPR was indicated at the time of the first call. In three cases, the patient further deteriorated and experienced OHCA after EMS arrival. In another six cases, death was presumed irreversible (recognition of life extinct). The main etiology of the events was cardiovascular (35.0%). Other important causes were neurological (15.2%) and traumatological (25.0%). Importantly, (attempted) suicide made up nearly 40% of the total trauma subgroup (14 out of 38). In total, 81 (53.6%) patients died within the 2 months following the EMS intervention.

Adequacy of bystander actions

We eventually recognized SAs in 54 (38%) cases (nine cases excluded for lack of information) before the first call (Fig. 1). More than half of these SAs were related to 'delayed alerting of the EMS dispatch center' ($n=35$), either because of waiting for the situation to improve or first calling relatives, friends, or other (medical) services. In another 12 cases, inaccurate information was provided to the dispatcher, because of language problems, panic, and/or emotions. Finally, in seven cases, suboptimal aid was provided to the patient despite being clearly indicated.

Fig. 1



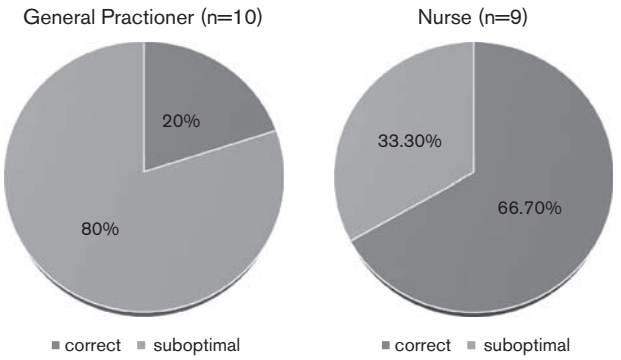
Number of recognized suboptimal bystander actions before the Emergency Medical Services call ($n=9$) and after being advised by a dispatcher ($n=9$) (two cases were excluded for lack of sufficient information; in 68 cases, no extra advice was given).

We further analyzed the subgroup of 32 cases where professional bystanders were involved before the call. In 12 cases, a GP was on site. In only two of these cases, no SAs were recognized, and in two other cases, there was insufficient information to decide whether the action was suboptimal or not. In five cases, there was a significant delay in the EMS alert; in one other case, incorrect information was given; and finally, in two cases, suboptimal aid was given before making the EMS call.

In 10 cases, a nurse was on site before the call. In three of these cases, the care provided was scored suboptimal: one because of delay in alerting and two because of actions performed. In one other case, there was not enough information available. In seven cases, a police officer was on site. For one case, there was not enough information available, but in all other six cases, suboptimal aid was given (five delay in alerting and one incorrect information; Fig. 2).

When we then evaluated the bystander actions after the call was made, we identified that in 21 (25.9%) (two cases excluded for lack of information) of the 81 cases where a clear and feasible advice was given by the EMS dispatcher (e.g. CPR, recovery position, and further information gathering), this advice was not followed by the bystander(s), with a potentially negative effect on survival (Fig. 1).

Fig. 2



Evaluation of the aid provided by general practitioners, nurses, and police officers (two, one, and one case, respectively, excluded for lack of sufficient information).

Importantly, in 67 cases, there was an indication to start phone CPR. In 24 of these, there was never any dispatcher advice to start CPR. Reasons for this were either insufficient or incorrect information ($n = 16$), further deterioration without recall ($n = 6$), or being considered 'outside protocol' (i.e. traumatic arrest, $n = 2$). Phone CPR was thus offered in 43 patients, eight of whom already received (bystander-initiated) CPR at the moment of first call. Only in 29, a bystander actually started (or continued) CPR (67.4% of those offered). In this latter group, eight (27.6%) patients survived beyond 30 days. In the other 38 patients where no CPR was started before EMS arrival, another eight (21.1%) patients survived (30-day survival).

Discussion

With this study, we wanted to evaluate the adequacy of bystander actions as part of the first links of the chain of survival. This in turn might lead to the identification of points for improvement. The used 'audit' methodology does not allow definite conclusions about the identified SAs and any individual patient outcome. However, if we assume that appropriate bystander actions have a proven benefit in terms of outcome, SAs at least have the potential to adversely effect on that outcome [2,4–9]. In this audit, we only evaluated those actions (or the absence of them) that could be categorized as 'bystander response'. Further actions undertaken by bystanders after the initial EMS call, not related to the given advice (e.g. medications administered by a GP), are beyond the scope of this audit. Importantly, as we did not obtain data on the quality of the CPR provided (e.g. adequate depth), this was also not evaluated.

To be as inclusive as possible, we kept broad inclusion criteria. Thus, we included not only patients in cardiac arrest but also patients with other causes of (temporary) loss of consciousness. This generated a very heterogeneous sample, but in view of the study goals, it allowed for proper evaluation of among others recognition and timely alarming. The majority of our sample presented with a Glasgow Coma Scale of 3. Eventually dispatcher-assisted phone CPR was indicated in approximately half of them.

Most bystanders had a direct relation with the victim, being either a family member, friend, or care provider. Whether or not this influenced our findings is impossible to derive from our data and subject to discussion in literature. At least two studies showed a negative effect on outcome when the bystander was a family member [10,11].

We eventually identified SAs in just over one-third of all cases. The majority of these were related to a delay in recognition and/or alarming of the EMS system. Bystanders often waited for spontaneous improvement or first called another relative or care provider. Even when recognizing critical illness, proper action did not follow, presumably because of either panic or too often, a fear of doing something wrong [12]. In addition, once having called the emergency number and having been given proper advice, one in four then did not follow that advice, likely for similar reasons.

Most surprisingly, we encountered a significant percentage of SAs in the subgroup of care providers. GP alerted the EMS dispatch center not always fast enough, underappreciated emergencies, or provided inaccurate information. Because dispatchers tend to question physicians less, this incorporates a higher risk of misinterpretation and underestimation (e.g. if the GP actively mentioned the presence of breathing, often no further exploration was done concerning the possible presence of gasping).

In the subgroup of patients who would clearly benefit from (dispatcher-assisted) bystander CPR less than half received it. This is similar to reports from other regions, but far less than in certain countries where broad public campaigns and teaching initiatives have led to bystander CPR ratios of as much as 70–75% [13–15]. As expected, those receiving bystander CPR had better outcome. Potential reasons for this relatively low percentage in our sample are probably the same ones as those described in literature: lack of recognition, fear of doing something wrong, unfamiliarity, and lack of training or education [16,17]. Per protocol, no phone CPR is started in traumatic cardiac arrest in Belgium, and this might need to be reconsidered. Furthermore, in nine cases (of which three after EMS arrival), cardiac arrest happened after the end of the initial call because of subsequent deterioration. Dispatchers always ask bystanders to recall when this happens but they rarely seem to do.

The primary goal of any audit is to identify points of improvement and define a trajectory how to make this happen (and then re-evaluate with a second audit later on). We identified defaults in the first steps of the chain of survival, most often related to recognition and proper EMS alarming. This was equally so for lay bystanders and professionals. From a public health perspective, training lay people in recognition, early alarming, first aid provision, and basic life support should be a priority for policy-

level executives [18]. 'Passive' measures, that is, not requiring individual action, are more likely to have an effect. One proposed way is by making this a mandatory topic to teach in secondary school [19]. In turn, these youngsters could then further train their family members. Importantly, there should be no doubt that any victim may rely on at least those with a duty to respond (physicians, nurses, police officers, etc.). In reality, for Belgium, most of these professionals receive training only during their initial education but never thereafter. It is well-known that regular retraining is mandatory for these professionals to be able to respond appropriately with a (for them rare) medical emergency [2].

Finally, although beyond the scope of our current study, dispatcher guidance is recognized to be of great value but the scientific fundaments of how, what and when are still weak. It is likely an area where improvements might lead to improved outcome [20].

This study should be interpreted with several limitations taken into account. Although we do not think this decreases the relevance of our findings, our study only concerns a relatively small and heterogeneous sample and lacks information on for instance the reason(s) of the individual bystander for their (lack of) actions. Because of our methodology, although we tried to be as inclusive as possible, we might have missed eligible cases and thus our sample might not be representative for the larger population. Furthermore, an audit, even when well-described and standardized, always incorporates a risk of bias. Reviewers only focused on obvious defaults, for which sufficient and accurate data were available and made decisions in full consensus. As such, this methodology is conservative in nature and rather underestimates the true incidence of defaults. We, for instance, did not evaluate the quality of CPR provided by a GP, only the fact that they recognized cardiac arrest and started or not started doing CPR.

We only identified SAs as such, not how these affected an individual patient's outcome. This said, adequate bystander actions (recognition, alarming, and first resuscitative measures) constitute the first parts of the well-known chain of survival, with a proven positive effect on outcome [2,13]. Our results showed clear defaults and thus areas for improvement. Policy-level executives and healthcare professionals should urgently reflect on appropriate measures to make these improvements happen [18]. Focus should equally be on every citizen as a potential lay bystander as on the prehospital care provider who might be first on scene (GP, police officer, etc.).

Acknowledgements

Conflicts of interest

Patrick Van de Voorde is the co-chair for the Pediatric Science and Educational Committee of the European Resuscitation Council and a member of the ILCOR Pediatric Task Force. For the remaining authors, there are no conflicts of interest.

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