Pre-hospital Information Use during Trauma Resuscitation

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Abstract
Information about incoming patients received from the ambulance crews and pre-hospital staff is critical in assisting emergency medical teams prepare for the patient care. Yet few studies have focused on the importance of this pre-hospital information in the care of critically ill patients. In this study, we examine the use of pre-hospital information during trauma resuscitations. Our analysis of communication during seven actual resuscitation events revealed several challenges in sharing and recalling pre-hospital information. Using these findings, we discuss design opportunities for improving the use of pre-hospital information during resuscitations.

Keywords: information use; communication; emergency medicine; trauma resuscitation


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1 Introduction
Trauma resuscitation is a complex, high-tempo medical domain, with an ad hoc multi-disciplinary team (trauma team) treating life-threatening injuries and developing a plan for subsequent patient care in a short time period. To accomplish these goals, trauma teams must manage a large amount of information about a patient from multiple sources at different times. Information about a critically injured patient collected in the field and en route to the hospital (pre-hospital information) plays a critical role in the process. Currently, resuscitation settings lack the mechanisms by which pre-hospital information is synthesized and preserved for use in a timely manner. Information is mainly accessed and shared using verbal communication and short-term memory [4]. Computerized solutions may be beneficial in allowing for easier access to pre-hospital information, but their design will first require an understanding of how trauma teams access and use pre-hospital information in the real world.

Our long-term research goal is to design and develop information and communication technology (ICT) solutions to support more efficient pre-hospital information access and use during the resuscitation. In this study, we observed trauma teams using pre-hospital information during preparation work before resuscitations began, and also while providing periodic summaries of the patient status during resuscitations. We also identified several challenges in acquiring and sharing pre-hospital information. The key contribution of this poster is the description of the mechanisms by which trauma teams make use of pre-hospital information before and during resuscitations.

2 Related Work
Prior work has highlighted the importance of having access to pre-hospital information during trauma resuscitations. Sarcevic et al. [6] found that trauma teams make their initial decisions about patient management based on pre-hospital information. Zhang et al. [10] further examined the importance of pre-hospital information and identified six categories of information types that are critical in patient care, including mechanism of injury, patient demographics, physical findings and treatments en route. Another set of studies has shown that trauma teams experience difficulties in retaining information from pre-hospital calls and paramedic reports for subsequent use [1,5,8,9]. A study of paramedic reports to physicians quantified the retention rate of pre-hospital information and found that only 34% of information verbalized by paramedics was recalled by receiving physicians after verbal handover in a resuscitation setting [7]. While prior studies have recognized the importance of pre-hospital information for efficient patient care, fewer studies have examined the ways in which pre-hospital information is accessed and used during resuscitations.

3 Methods
We analyzed video records of seven actual resuscitation events obtained from a pediatric trauma center in the US mid-Atlantic region. The events were transcribed to provide a linear list of utterances, tasks and
interactions among team members. During the first pass through the transcripts, we identified core tasks and statements related to the acquisition and use of pre-hospital information. We then used an open coding technique to uncover the mechanisms by which teams make use of pre-hospital information and the barriers they experience in acquiring and sharing pre-hospital information during resuscitations.

4 Results

Our results are presented in two parts. First, we describe how trauma teams use pre-hospital information during resuscitations. We then discuss the challenges and barriers to accessing and sharing pre-hospital information.

4.1 Pre-hospital information use during resuscitations

We observed teams using pre-hospital information for both preparation work and patient care during the process. In particular, prior to patient arrival, ED physicians briefed team members about incoming patients based on the information they received from the paramedics. The resuscitation teams then used this information to anticipate patient needs, and in turn, prepare necessary equipment. The following excerpt shows how an ED physician used the pre-hospital information prior to patient arrival to decide which team members and procedures may be needed:

The physician walks into the trauma bay and announces “[This is] a trauma transfer.” Radiology follows up by asking “It’s a transfer?” The physician immediately responds: “It’s coming from [hospital name], trauma stat pending. Yes, you need to be here.” Shortly after, a medication nurse asks about planned procedures and needed medications: “Do you want to intubate [the patient]? Etomidate and succinylcholine, that’s what we have as options. Is that good?” The physician confirms: “Yeah, that’s what we are supposed to use.”

In addition to being used for preparation work, pre-hospital information is also used during the resuscitations. We observed many instances in which the trauma team needed particular pieces of pre-hospital information to administer treatments. For example, medication nurses asked physicians or scribe nurses about the amount of administered fluids during patient transport several times. Knowing this information helped teams decide about subsequent fluid administration. We also observed physician leaders using pre-hospital information when providing periodic summaries of the patient status and administered treatments: “So, we completed the primary and secondary survey. We have [age] old child that fell. Apparently hit the head against the car door. Had some altered mental status and most notably the vomiting on the way”. These periodic summaries help teams establish common ground and make decisions about the next steps, so having past and current patient information easily accessible is important to facilitate this practice.

4.2 Barriers to accessing and sharing pre-hospital information

Although pre-hospital information plays a critical role in the process, there are still challenges in accessing and sharing this information. For example, information from the field was sometimes incomplete due to missing information or partial reports from the paramedics. This lack of information impeded preparation work and caused frustration among resuscitation team members, as illustrated below:

The medication nurse asks the physician as he walks into the room: “Do you know anything?” The physician answers: “In general, no. About the patient? Sick.” Team members appear surprised, as several ask simultaneously: “That’s it?!”

We also observed ED physicians repeating the pre-hospital information several times as team members were assembling in the trauma bay and inquiring about the incoming patient. In those situations, ED physicians would repeat only a fraction of information they received from paramedics and then wait until the entire team assembled to provide a more detailed report. In one case, we observed the ED physician repeating pre-hospital information seven times to seven different people, including the scribe nurse and critical care fellow who arrived late. Repeating the pre-hospital report was not only time consuming but also caused interruptions. Furthermore, we observed several instances when both ED physicians and paramedics failed to report some information before the resuscitations began. For example, in one case, the ED physician stated in the middle of a treatment: “One more piece of medical history that we didn’t tell you guys. It sounds like maybe two weeks ago [the patient] had an episode of some [diagnosis]. We’ve confirmed with [provider] and [the patient] has not seen them, she’s not had an episode since.”

This
added information appeared critical since it altered the treatment—the bedside physician asked if he should administer a certain medication to account for this condition.

5 Discussion and Conclusion

Our findings highlight the critical role that pre-hospital information plays before and during patient care. The information obtained from paramedics is used for both team activation and preparation, as well as for planning and completing tasks and activities during the resuscitation process. Given the scope of this study, we cannot offer any conclusions regarding the types of pre-hospital information that are most critical for patient care. Rather, we found that resuscitation teams need different types of information at different stages throughout the process. For example, before patient arrival, there is a need for the injury information to anticipate patient needs and make necessary adjustments to the team (e.g., call a specialist, obtain blood products). In comparison, once they complete the physical assessment, team members will know what are the injuries so their need for the pre-hospital injury information fades away. Instead, the team may need the information about treatments administered en route to make decisions about subsequent fluid or medication dosages. Even though pre-hospital information is important, there are still challenges in accessing and sharing this information. Reports from the field are either missing or incomplete. Physician leaders need to repeat the information several times as team members assemble in the trauma bay when some arrive late. Time pressure also plays an important role, causing paramedics to skip some pieces of information that may be needed while giving verbal report.

The time-critical nature of the resuscitation process and the observed challenges highlight the need for ICT solutions to facilitate pre-hospital information acquisition and use. We hypothesize that interactive digital boards displaying pre-hospital information in real time as it is being gathered can benefit teams by enabling faster and easier access to important pieces of information. The boards could also benefit team members arriving late, thereby minimizing the number of repeated reports and interruptions. Current trends in digitizing medical work provide an opportunity for using interactive digital boards in emergency hospital settings [2,3]. However, the extent to which interactive presentation of pre-hospital information can facilitate information sharing and use among members of the resuscitation team is still unknown. We will build on this preliminary data by conducting observations and interviews with paramedics and resuscitation team members to derive design requirements for system design.

References