
An Analysis of Pre-Hospital Communication in Emergency Care

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Abstract

We analyzed a set of pre-hospital communications occurring between the Emergency Medical Services teams and staff at the communication center in a Level 1 trauma center to understand the nature of pre-hospital communication and identify challenges that complicate the en-route communication process. We discuss potential ICT solutions to address the observed challenges and support the sharing of critical pre-hospital patient information.

Keywords

Pre-hospital communication, emergency care, ICT.

ACM Classification Keywords

H.5.3 Group and Organization Interfaces—Computer-supported cooperative work.

Introduction

Communication is an essential component of work in high-risk, information-intensive and dynamic settings, including emergency care [6]. Much of this communication is often *informal*, occurring spontaneously, and involving rich content and informal language. Such communication plays an important functional role in organizational collaboration and

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system running [3], and supports information flow and interaction among medical teams [4].

In this position paper, we focus on the communications between two distributed teams—Emergency Medical Services (EMS) teams and Emergency Information & Communication Center (ECIC) teams in a Level 1 trauma center. The former refers to a wide range of emergency medical services, including first responders, paramedics and air-ambulance crews. The latter refers to staff in a communication center located in the hospital's emergency department (ED), whose role is to relay information between the EMS crews and ED and trauma teams. Information exchange between EMS and ECIC teams—also called pre-hospital communication—occurs en route, as the EMS crews transport the patient to the hospital. The information conveyed during this process is not officially documented but rather summarized in brief messages and then relayed via pager notifications and phone. Understanding the nature of this communication as well as the challenges that complicate the process can lead to ICT solutions that support the sharing of critical patient information.

Methods

Our research site was a regional Level I trauma center that provides the highest level of trauma expertise and 24-hour trauma care. We audiotaped 24 pre-hospital communications between EMS crews and ECIC teams over a four-month period (June-September, 2009).

Audio recordings were transcribed by experts in trauma resuscitation at the hospital and then analyzed by the authors using Atlas.ti, a program for organizing, storing, and manipulating qualitative data. The transcripts were analyzed using open coding technique

to uncover common information types and challenges that both teams faced. We also applied Kraut et al. [3] *formality dimension of communication framework* to identify informal aspects of the pre-hospital communication.

Findings

Information Types

Our analysis showed that EMS crews report a great deal of information during en-route communication. The ECIC staff relays this information to ED physicians and trauma teams, who then use the relayed information to prepare for the patient arrival. The reported information can be organized into six high-level categories, including transportation information (e.g., estimated arrival time), patient demographics (e.g., age, gender, medical history), mechanism of injury, injuries and symptoms (e.g., type, number and locations of injuries), physical findings (e.g., breath sounds, vitals) and treatments (e.g., medications). These information types are included in the report based on their availability and are usually conveyed in a free-form, storytelling manner, as shown below:

"10 year old male struck by vehicle. Vehicle speed approximately 25 miles per hour. Damage noted to the vehicle's hood, patient does have a positive loss of consciousness on the scene. Currently he is alert and oriented times three. Complaining of pain in the back. Vitals are as follows: blood pressure 134-88, heart rate 96...02, attempt to start IVs en route. ETA with this Priority Two patient is eight minutes." [Event #23]

Informal Nature of Pre-hospital Communication

Kraut et al. [3] found several variables that distinguish informal from formal communication. Although pre-

hospital communication is considered a standard procedure, our findings showed that it also shares the characteristics of informal interactions.

Unarranged agenda and random participants: The timing, participants and agenda of pre-hospital communications are neither scheduled nor pre-defined. The agenda and length of communications differ depending on the severity of patient injuries, complexity of the accident, and other medical and non-medical factors. Although ECIC staff is constant, the EMS teams change dynamically.

Interactive and rich content: The en-route information exchange between EMS and ECIC teams is primarily verbal, fluid and subject to change, allowing for questioning, as well as for new information to be added [2]. The initial EMS report about the patient status is rarely complete and is typically followed by a discussion to clarify ambiguous issues and add new information. For example, in one event, the EMS crew described the mechanism of injury as follows: *"The patient is a one and a half year old male who fell from a second story balcony onto his head on a flower pot."*

This description, however, did not provide clear indication of the injury, leading to an interactive follow-up exchange to clarify the information:

"ECIC: Uh, once again you advise patient fell from a second story window and fell on to a flower bed area and hit the flower pot?"

EMS: That's correct, he fell head first off a balcony from second story on to a flower pot. Broke the flower pot but did not suffer any loss of consciousness."

Informal language: At times, the language used by EMS teams was informal, leaving ECIC staff to discern what was going on. In event #4, for example, the EMS crew used the following phrase to describe the patient's neurological status: *"Patient is somewhat conscious at the time."* The phrase "somewhat conscious" was informal and ambiguous, making it difficult for the ECIC team to discern the patient's neurological status. Shortly after, the ECIC requested clarification: *"Can you advise, do you believe the patient had positive LOC?"* Even so, the EMS crew continued to use informal language: *"Yeah, at this time, LOC is kinda... seems to be kinda going in and out of consciousness, not responding appropriately."*

Communication channels: The most commonly used channels for pre-hospital communication are the phone and 2-way radio. Because the phone and radio communications are by nature more interactive and richer than computer-mediated communication, and as a consequence, more informal [3], the fact that EMS and ECIC teams use these channels makes their communication informal.

Communication Challenges

Our study revealed several challenges that complicate the communication process between EMS and ECIC teams. For instance, noisy environment is one of the major challenges, often leading to communication breakdowns. The noise comes from different sources, including the siren, patient, and parallel conversations. Another challenge lies in the use of inefficient communication technologies, such as phones and 2-way radios, posing various limitations (e.g., the radio signal is not always stable). Finally, we found that EMS crews tend to elaborate on the injury history for the

reporting purposes. This additional detail, however, increases complexity and length of communication, as well as the workload for ECIC teams.

Conclusion

Prior research has demonstrated a number of innovative technologies to support collaborative teamwork and informal interaction [1][5]. Given the challenges in pre-hospital communication, we believe that adopting advanced technologies can support impromptu interaction for both teams.

Face-to-face communication is more efficient and effective in terms of imparting information than that conducted by other means, including radio and telephone [7]. We believe that technologies allowing for the efficiency of face-to-face communication can support informal communication during en-route exchanges between EMS and ECIS teams. To date, telemedicine has been increasingly used as shorthand for remote electronic clinical consultation. Due to its advantage in supporting spontaneous and virtual interaction, we believe telemedicine can play an important role in pre-hospital communication. Even so, some of the challenges we identified, such as noisy transmissions and elaborate reports, remain and mandate additional solutions.

We presented the informal aspects of pre-hospital communications and discussed several challenges that complicate the en-route communication process. However, our understanding of the pre-hospital communication process and how best to support it is still limited. Participating in this workshop will allow us to further discuss the following issues: (a) different

approaches to overcome the challenges in pre-hospital communication; (b) potential positive and negative effects on work practices after introducing ICT solutions; and (c) implications for studying informal communication of distributed medical teams and their relevance to CSCW research and community.

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