

# Using Mobile Devices to Support Communication between Emergency Medical Responders and Deaf People

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## ABSTRACT

Fast and effective communication is crucial during medical emergencies, but patients' disabilities can make it a challenging task for emergency medical responders. This paper proposes a mobile system to deal with the communication barrier between medical responders and deaf patients. The system allows medical responders to quickly browse a collection of emergency-related sentences, and show videos of the corresponding translations in sign language to the deaf patients. The design process involved experts in emergency medicine as well as experts from the deaf community. The evaluation carried out on ten emergency medical responders and ten deaf subjects showed that the system is useful to support communication with deaf people during medical emergencies.

## Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces—*Graphical user interfaces (GUI), User-centered design*; J.3 [Life and Medical Sciences]: *Health*; K.4.2 [Computers and Society]: Social Issues—*Assistive technologies for persons with disabilities*

## General Terms

Design, Experimentation, Human Factors

## Keywords

Computer-mediated communication, sign languages, medical emergencies, mobile devices, deaf people, first responders

## 1. INTRODUCTION

Fast and effective communication is crucial during medical emergencies. For example, emergency medical responders (hereinafter, EM responders) have to quickly and accurately elicit information about symptoms and medical history of patients to provide them with the most appropriate

treatment. However, communication can be a challenging task for EM responders, and becomes even more difficult when communication barriers (e.g., people with sensory or cognitive disabilities, foreign language speakers) are present.

In this paper, we focus on the linguistic barrier between EM responders and deaf people who communicate using a sign language. Sign languages, which vary from country to country, are visual languages that rely on finger, hand, arm and body movements. More precisely, given a specific sign language such as the American Sign Language (ASL) or the Italian Sign Language (LIS), a sign with a particular meaning is uniquely identified by four parameters (i) *handshape*, i.e., the position of fingers or their movement, (ii) *palm orientation*, i.e., the direction towards which the palm is facing, (iii) *location*, i.e., the part of the body or a place close to it where the sign starts to be performed, and (iv) *movement*, i.e., the sequence of positions of the hands in space during performance of the sign. Recently, some sign languages have also introduced *facial expression* to distinguish among signs.

Signs are combined in sign language sentences following a specific grammar, which can be very different from that of spoken language in the same country. Therefore, deaf people whose first language is a sign language can have difficulties in reading and writing in languages used by hearing people [4, 6]. This is particularly critical in emergency situations, since written questions, instructions, and descriptions of the activities that EM responders are going to perform can be misunderstood by deaf people. Moreover, while deaf people can usually rely on interpreters or relatives to have speech translated into their sign language during planned events (e.g., a physical examination or a meeting), they may be alone during a medical emergency.

Despite the communication barrier, EM responders should ask deaf patients some fundamental questions (e.g., about pain location and intensity) to distinguish between different pathologies and administer the right treatments, some activities have to be described by EM responders to deaf patients before being performed (this is mandatory in some countries, since patients have the right to decline treatments), and deaf patients should properly understand some life-critical instructions (e.g., about medicines to take). To help EM responders communicate with deaf people using sign language, this paper proposes a mobile system. The system allows



















