

Development of a computer-based communication tool for voiceless patients: AyMeSES

Abstract

Mechanically ventilated patients struggle to communicate their demands to caregivers and nurses because of sound production issues. If the communication problem is ignored, it leads to distress, frustration, and rage. This problem poses a challenge not only for patients but also for healthcare team members. Communication difficulties increase the possibility of not applying the proper treatment, neglect of treatment and care and medical error. All these threaten patient safety and reduce the quality of treatment and care, further increasing the need for additional tools for effective communication between patients and caregivers. Mainly, touch-screen electronic communication tools can be used to communicate with patients. In this article, we describe the designing, development and evaluation of a computer-based software (AyMeSES) that enables voiceless patients to communicate with their caregivers.

Keywords: AyMeSES, computer-based communication tool, mechanical ventilation, intensive care, communication, patient.

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Introduction

Endotracheal intubation, tracheostomy, need for non-invasive positive pressure ventilation, head and neck surgery, stroke, sedation and sensory impairment, and different language are the common reasons for not being able to communicate, including with healthcare professionals.¹ Up to 40% of patients in the intensive care unit reported communication difficulties.² Another study this rate was 16-24%.³ In addition, personal protective equipment used in intensive care during the COVID-19 pandemic made communication difficult by blocking speech sounds and hiding lip movements and facial expressions.¹

During mechanical ventilation, patients temporarily lose their speech function because of intubation. Voiceless is a critical problem especially for patients who are conscious and connected to a ventilator.^{4,5} In the last decade, changes in sedation practices favour patients, but mean that there will be more conscious patients in the mechanical ventilation.⁶⁻⁹ Voiceless patients perceived loss of control and individuality, and experience anxiety, fear, panic and disappointment.¹⁰⁻¹² In a study, patients felt very uncomfortable not being able to speak during the intubation process.¹³ Patients who cannot express themselves give up trying to communicate after a while.¹⁴ Caregivers, on the other hand, find it difficult to identify patients' needs accurately and meet them effectively. In one study, nurses reported difficulty communicating with 35% of patients.¹⁵ In another study, this rate was 84.8%.¹⁶ Communication difficulty with patients may lead the healthcare team to make their judgements based on prediction, possibly leading to wrong decisions about the patient. This can have serious detrimental consequences for patients, such as exposure to inappropriate treatment, lack of access to appropriate treatment, and the possibility of medical error.¹⁰

Healthcare professionals generally use non-verbal communication methods in communicating with voiceless patients. The most common methods they use are lip-reading, interpreting head and arm gestures and facial expressions and writing.¹⁷ However, communicating through these methods is often ineffective.¹⁸ Besides, patients may still not be able to express their wishes despite several efforts, wasting their energy to no avail.¹⁹ Effective communication is acknowledged as one of the most essential steps in the treatment protocols of mechanically ventilated patients.¹⁸ Effective communication of the healthcare

team with the patient in the intensive care unit is critical in reducing the patient's stress and anxiety.^{10,17} It can positively affect patients' recovery process and reduce the length of stay in the mechanical ventilator and intensive care unit.²⁰ More effective communication can be established with patients in intensive care units using assistive communication methods (alphabet or word board, communication cards, computer-based communication tools, etc.).^{4,21,22} Therefore, there is a need for new communication techniques that will allow the patient to communicate, most accessible, most easily and efficiently and contribute to the healthcare team in the effective use of their time.^{23,24}

With this in mind, printed communication tools were first developed to communicate with voiceless patients. Appel-Hardin created the first simple printed communication tool in 1984.²⁵ In the following years, various printed communication tools were developed and tested in different countries.^{20,22,26,27} Printed means of communication were followed by electronic means. Examples of electronic communication tools include CALD Assist, At Elements ICU, CommuniCare ICU, ICU Communication App, Patient Communicator, SmallTalk Intensive Care, Talkboard-Communicator, VidaTalk and YoDoc.¹ The common feature of these communication tools is that they allow expressing what is wanted to be conveyed by touching a screen.

Studies have reported that using electronic communication tools with voiceless patients provides effective communication, reduces fear and anxiety, and increases patient comfort.^{5,23,28} They also increase patient satisfaction and ensure patient safety.¹⁸ There is no electronic communication tool developed for intensive care patients in Türkiye. Here, we describe the design, development and evaluation of AyMeSES, an application that allows patients who are mechanically ventilated but conscious to communicate with their caregivers. The development process of AyMeSES consists of 3 stages: (1) design, (2) development and implementation, and (3) evaluation.

Phase I: Design

Initial design concept: The design was based on a total of 4 high-level requirements: (1) simple to use, (2) individualized, (3) highly visual, and (4) comprehensive content.

The things that the patients would want to convey were placed on the 10 interfaces on the left side of the tablet. There are two different

designs, intended for intensive care patients and other patients in AyMeSES. In these two designs, the requests, demands and problems are located in different interfaces. When the desired interface is clicked, images are displayed on the screen. There are also written phrases on the images conveying the circumstance it aims to reflect. It is intended with the software that when the patient touches an image on the screen, the message corresponding to that image will be transmitted audibly. It was very important that the images used in the software did not create undesirable feelings such as fear and anxiety in the patients. In addition, considering possible illiterate patients, even the images alone had to be able to convey what was meant to be conveyed. Blue colour was preferred in the background of AyMeSES due to its relaxing effect. The size of the images and texts were designed so that they could be viewed easily. It was also decided that when a patient clicks on any image on the screen, the specific patient doing this and what he/she wants would appear on the main computer screen at the nurse's desk. We worked with a graphic and a web designer for the design and development stages of AyMeSES.

Item list

In determining the list of demands/needs/problems, it was our foremost goal to include all potential circumstances that patients would like to express in AyMeSES. Previous studies^{20,27-29} and expert opinion (translated as an expert panel) were based on when creating the content.

Phase 2: Development and implementation:

Development:

A graphic designer created the images using the CorelDRAW X7 software based on our requests. We obtained opinions from three outside expert who were professors in medical-surgical nursing about the general design and images, and necessary changes were made according to their recommendations. A web designer completed the design of the software following our requests. The software was then voiced. Once development work was completed, opinions were obtained from three experts whose opinions were taken previously as well as from two intensive care nurses and ten patients.

AyMeSES includes 100 images and 147 demands/needs/problems in 10 interfaces (Figure 1). The interfaces feature images and texts related to physical problems and demands, pain and suffering, movement, social and environmental demands, care and personal belongings, psychological state and daily communication (Figure 2). AyMeSES has a keyboard page and a whiteboard page for patients to handwrite using their fingertips. Demands/needs/problems in the software are displayed on the touch screen. According to the patient's preference, it can be voiced with a male or female voice, in Turkish or English.

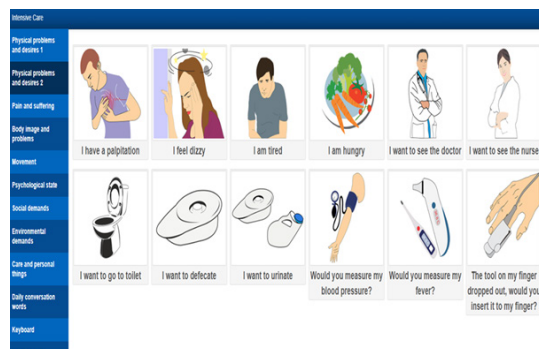


Figure 1 An AyMeSES interface.

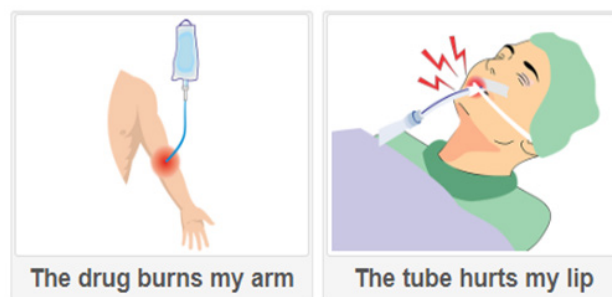


Figure 2 Some images on AyMeSES.

Implementation:

A cardiovascular surgery intensive care unit was selected as a pilot site for the evaluation of the software. Tablets with a 9.7-inch (24.6-cm) touch screen contain and display the communication software. The tablets were set up and ready to use and were placed at the patients' bedsides in the intensive care unit (Figure 3). Also, we provided a link to a computer at nurses' desk so that nurses can monitor and address patients' problems, demands and needs even when they were not with them. Detailed information on the pilot implementation is available in another article.¹⁷



Figure 3 A patient using AyMeSES.

Phase 3:

Evaluation:

The contribution of AyMeSES to communication was tested in a quasi-experimental study with 90 patients. This study determined how many times the patients using and not using AyMeSES communicated with the team during their intubated care. The group using AyMeSES contacted the healthcare team approximately three times more than the group not using it. After the patients were weaned from the ventilator, their anxiety, comfort perceptions and satisfaction were investigated. Of the patients not using AyMeSES, 82.2% had difficulty in communication compared to 20.0% in the group using AyMeSES. In addition, patients who used AyMeSES had lower anxiety and higher comfort levels during the time they were intubated than those who did not. All the patients using the software described it as the best method for communication and were satisfied with it.¹⁷

Conclusion

Developed to help intensive care patients to communicate, AyMeSES is the first of its kind in Turkey. Similar electronic communication tools exist in different countries, and some are currently under development. AyMeSES differs from these products with some features such as having two different designs for intensive care patients and other patients. Thanks to this feature, apart from intensive care patients, it can be used for many patients whose speech

ability may be affected including those with neck surgery, CVO, neurological diseases, muscle diseases, speech impediment. With the increasing popularity of health tourism today, many patients are treated in countries where they do not speak the language. The quality of patient-team communication during in this process relies on the translators' ability to translate health-related terms they are not at all familiar with. The software can also be used by patients who do not speak Turkish. In addition, thanks to the software-control panel connection, patients do not have to wait for the caregiver to come to them to express themselves. Caregivers can also view patients' messages before coming to their side. Our goal is to turn AyMeSES into a mobile application and put it into service outside the hospital as well. We also intend to add more languages to the software. Being a human requires effective communication. AyMeSES will make a significant contribution to patients, their families and healthcare team in meeting this need, which becomes even more important during illness.

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Conflicts of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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