LETTER TO THE EDITOR

Communication with Patients on Mechanical Ventilation: A Review of Existing Technologies

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Editor Sir, it was a very learning and eye-opening experience to go through the recently published article "iPad-based Apps to Facilitate Communication in Critically Ill Patients with Impaired Ability to Communicate: A Preclinical Analysis"[1] and "iPad and iPad based Apps: An Optimal Communications Tool in the Intensive Care Unit."[2] We would like to discuss a few recent Android apps as well as technological advances with regard to patient communication. We would especially like to stress on repurposing the free to download app "look to talk" on Google Play Store for use in patient communication with ventilated patients in resource-constrained settings.

> "Words—so innocent and powerless as they are, as standing in a dictionary, how potent for good and evil they become in the hands of one who knows how to combine them."
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> —Nathaniel Hawthorne (American novelist)[3]

Communication is not just strings of words written or vocalized to present one's thoughts to people around us. Its true value can be appreciated the most by losing the ability to communicate at all. Humans with the intellect to perceive, analyze, and urge to communicate when are left incapable of communication undergo suffering of agony which is beyond description in words.

Recently during the coronavirus disease-2019 (COVID-19) pandemic, a need for communication with patients on ventilators was recognized with greater importance in the critical care community around the world. Usually, bedside assessment of intubated or tracheostomized patients provides a chance of interaction. The patient is somehow able to tell basic things with hand signs and facial expressions, such as the desire to drink water, any pain with localization, and if the patient wants to meet someone. But anyone who has tried communicating by these visual cues with patients knows that it is not always easy or accurate and sometimes is frustrating for both healthcare provider and the patient.

Then comes the use of pen and paper, literate patients try to communicate by scribbling on a piece of paper but this is also not easy *per se*. As many cannulas and monitors are attached to patients' hands, and the patients are usually not in a comfortable position to write down with good hand-eye coordination. A good subset of patients in ICU on ventilators have very weak muscle power due to the nutritional deficit, critical illness neuropathy/myopathy or myasthenia graves and a few of them like patients have quadriplegia as in Guillain-Barré syndrome, advanced motor neuron diseases or trauma patients with the various contraption in place are unable to purposefully move their limbs.

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Society of Critical Care Medicine provided a "Patient Communicator" app available free of cost on both Apple AppStore and Google play store.[4] This app allows patients to communicate by touching the screen regarding pain, the intensity of pain, and location. It also has provision to tell by touching the screen about basic needs such as water, food, restroom use, etc., along with communicating regarding feelings like if the patient is feeling better, worse, anxious, and if the patient wants to see someone. All this can be done in 18 languages. There is a diary function, where patients can keep records of their feelings. Another app developed by doctors of Cambridge is available free of cost only on Apple AppStore as "myICUvoice."[5] It also uses touch screen technology and the patient can communicate about pain and feelings as well as basic needs by touching onscreen images and phrases. This app converts the selected phrases to voice and also has one on-screen keyboard which can be used by patients to convert typed sentences to voice.

VidaTalk™ is another app with similar touchscreen technology and is available free of cost on both Apple AppStore and Google play store.[6] It provides speech solutions by using common phrases used in hospitals. It also has a keyboard as well as a provision to draw on-screen to help better communication. All these apps are literally proof of concept of using touch screen technology to help patients communicate better, but at the same time needs the patients to be educated as well as have good hand-eye coordination.

An Israeli start-up has gone one step further and developed "Eyecontrol," a screenless, wearable, infrared eye movement tracking technology along with a bone conduction feedback system

that helps in converting eye movements into speech.[7] The company claims that the learning curve of using this technology is very less and it has also won prizes from European Innovation Council. The technology although promising and pioneering seems not to be available free of cost or at a cheaper cost in future which can be an issue with acceptability in developing economies.

We would like to draw attention to a simple free app "Look to Speak" available on Google play store made by Google creative lab, which can be repurposed for patient communication in ICU.[8] This app combines the best of both technology of eye-tracking by using the mobile phone front-facing camera and vocalizing an editable list of phrases. The patient can be trained to use it in a few minutes and just by moving eyes to the side the options being displayed, which is selected and again redistributed in two groups. By repeated selection of side containing the desired phrase, the final selection of the phrase is achieved and the google text-to-speech engine on phone reads the selected phrase in a human voice in language installed for the speech engine. We used this app in ICU with our Guillain-Barré syndrome patient who was unable to move any of her limbs and achieved satisfactory results as well as patient satisfaction. The mobile phone is kept in front of the patients face by a stand fixed to the bed. The patient can lock and unlock the function of using the app by eye movement itself. Further studies on the patient as well as patient's attendant satisfaction and behavior can be done comparing all these technologies. The future of using various applications and technology for patient communication seems promising as it will improve patient satisfaction and allow the healthcare provider to provide better care to the patients. This aspect of human interaction in critical care will make the practice more patient-centric than data-centric. The application of Artificial Intelligence as well as machine learning in this realm needs to be explored and offers great challenges as well as rewards.

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