A Voice Activated Video Communication System for Nurses to Communicate with COVID19 Inpatients: Notes from the Field

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Abstract

With the relaxing of telehealth regulations from the HIPAA Waiver for Telehealth Remote Communications during the COVID-19 Nationwide Public Health Emergency notification, our organization had the opportunity to pilot an innovative virtual care solution using a modified consumer grade system (Amazon Echo Show) within one inpatient COVID-19 unit. In this brief report, we describe our experiences with implementing the system, general feedback from clinicians, and discuss areas for future development required to enable future scaling of this solution.

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Abstract

With the relaxing of telehealth regulations from the *HIPAA Waiver for Telehealth Remote Communications during the COVID-19 Nationwide Public Health Emergency* notification, our organization had the opportunity to pilot an innovative virtual care solution using a modified consumer grade voice activated video communication system (Amazon Echo Show) within one inpatient COVID-19 unit. In this brief report, we describe our experiences with implementing the system, general feedback from clinicians, and discuss areas for future development required to enable future scaling of this solution.

Our pilot demonstrates the feasibility of deploying a consumer grade voice assistant device into COVID-19 patient rooms. We found the devices engaging due to the voice technologies and Alexa functionalities for both clinician and patient entertainment. To enable future deployment at scale, enhancements to the Echo Show, and data analytics will need to be further explored.

Introduction

Background

The COVID-19 pandemic has resulted in the unprecedented adoption of virtual care tools [1][2][3]. Ideally, virtualizing patient encounters in the inpatient setting can preserve the sense of human contact and increase capacity for human connection with patients while making interactions feel less rushed. [4] Additionally, inpatient virtual care tools were needed to both reduce use of personal protection equipment (PPE), especially when supplies were constrained, and reduce in person content and risk of transmission. Despite the numerous barriers to telemedicine, such as educating staff, cost, reimbursement, access to broadband, and patient digital literacy, telemedicine has flourished during the pandemic, accelerating implementation timelines that otherwise may have taken years without such a catalyst to happen. [5]

In April 2020, Mass General Brigham Health System deployed an in-house developed video intercom communication system (VICS) that allowed clinical staff to connect over video to a securely configured tablet inside of a patient room. [4] This telehealth solution was implemented to address PPE usage and maintain human connection at the bedside. While quite successful, there were some limitations to VICS including requiring training for clinical staff to utilize the technology and it not being a hands-free solution which was an infection control barrier. Solutions in the consumer space, such as Amazon Echo Show devices, addressed the hands-free issue and were familiar to staff already but were historically unable to be utilized in the healthcare space.

With the relaxing of telehealth regulations from the *HIPAA Waiver for Telehealth Remote Communications during the COVID-19 Nationwide Public Health Emergency* notification [3], the opportunity to explore additional innovative virtual care solutions emerged, including solutions leveraging consumer grade systems in the clinical setting. One health system found that “the use of consumer products sourced from local vendors is a viable solution for telemedicine systems focusing on speed, reducing costs, and ease of deployment” [7]. In this brief report, we describe our experiences implementing a voice activated video communication system for clinicians to communicate with COVID-19 inpatients using consumer grade hardware (Amazon Echo Shows).

Methods

Overview

This pilot project was conducted at Brigham and Women's Hospital (BWH), a 736-bed, urban academic quaternary care hospital that is a founding member of the Mass General Brigham healthcare system in Boston, Massachusetts. For the duration of the pilot from September 21, 2020, to November 9, 2020, BWH had a daily average COVID-19 census of 15 patients. In conjunction with nursing leadership, we selected one unit with primarily COVID-19 inpatients (COVID-19 Special Pathogens Unit) to conduct the pilot project. Selection criteria was based on a unit that would consistently treat COVID-19 patients and adequately equipped to house the pilot devices.

BWH had previously deployed the VICS platform using tablets to improve communication with between staff and patients while reducing use of PPE and physical contact time for patients with COVID-19. The configuration of the VICS tablet is locked and has an auto-answer feature enabled so nurses can monitor patients without disturbing them and engage in high-quality two-way conversations whenever needed without the patient having to take any action.

We utilized a modified two-way video communication device (Amazon Echo Show 8, Amazon, Seattle WA, USA) configured to allow drop-in video calls to the patient room to help the nurse conserve PPE by communicating with the patient without having to enter the room numerous times per day. In partnership with a third-party vendor, (Aiva Health), a fleet management software system was implemented to enable drop ins, manage accounts, and provide additional security measures across multiple Amazon Echo Show 8 (Echo Show) devices. In a similar manner, the Echo Show devices were programmed to allow drop-ins only from the nurse to the patient room. This drop in function is an instant live connection from staff device to patient device, allowing the clinician to see and speak with the patient and the patient to see and speak with the clinician (link to video demo in appendix). Patients are unable to initiate an outbound audio or video call, they would still need to use the nurse call button in their room to contact nurses.

Amazon Echo Show Device Deployment

Six patient rooms were included in the pilot. We matched each patient room Echo Show device with a nurse station Echo Show device for a total of 12 devices in the pilot. The Echo Show Devices replaced the VICS devices in the respective 6 patient rooms. The nurse devices were set up at the nurse stations outside each of the rooms (Figure 1). The patient devices were placed on a shelf attached to an IV stand inside of the patient room (Figure 2). All Echo Show devices were named based on the building name ("Shapiro") and the assigned number of the device. A new Wi-fi network was used specifically for the Echo Show devices during this pilot as to not interfere with clinical care and for security measures.

We conducted a live training of the Echo Show device with unit staff prior to the go-live date. Along with the live training, tip sheets were provided for both the nurses and the patients. This tip sheet created for the nurses provided an overview, how-to use, important notes, and support guidance. (Figure 3). Nurses could drop-in to a patient room using voice activation by saying "Alexa, drop in to Shapiro Echo 2" or by selecting "Shapiro Echo Show" on the touch screen of the Echo Show device.

In addition to the staff, patients in the pilot rooms were made aware of the pilot via a patient notification sheet affixed to the Echo Show device inside of the room (Figure 4). A user guide was

also created to explain to patients how to operate the Echo Show device in their room (Figure 5).

We did not encourage patients to touch the Echo Show device. Patients were welcome to explore Alexa functionalities such as asking everyday questions (i.e., weather, news, sports) and listen to music, that did not require any personal account information although we did not market this feature for the pilot.

Periodic retraining occurred during onboarding of new staff and throughout the duration of the pilot. We collected nurse feedback through regular rounding on the units. The nursing team and technology team feedback was then synthesized and collated into this report.

Technical Infrastructure and Security

Amazon has a proprietary infrastructure for IP based audio and video calls that uses Session Initiation Protocol (SIP). The session initiation and establishing happens entirely on Amazon's network and the two-way audio/video communication is peer-to-peer between Echo Show devices on the same network which is end-to-end encrypted and does not go through Amazon's cloud.

Additional security measures were put in place to ensure Echo Show devices met the security standards of our institution including:

1. Implementing a fleet management system that automatically deleted all data that originated from the Echo Show devices
2. Configuring the Echo Show devices to connect to a separate WIFI network specifically set up for this pilot to avoid using clinical networks.

Results

Through rounding on the pilot inpatient unit and compiling comments and emails, we gained valuable feedback on the voice activated video communication system. The nurses found the Echo Show devices easy to use and the privacy controls were well received. They also enjoyed the additional available features on the Echo Show devices that the VICS system did not have.

Discussion

In addition to the ease of use for video communications using the Alexa Drop in feature, the most positive feedback received was regarding the voice assistant (Alexa) functionality, which was not a feature we advertised. One nurse described that her patient listened to the radio and programming on the Echo using the Alexa functionality and being from a different country, loved it as it had content she knew and enjoyed. Likewise, nurses enjoyed using the Echo show at their workstation to listen to the radio using the Alexa functionality, increasing their satisfaction for the system.

Challenges and Opportunities to Improve Future Voice Activated Video Communication System Enterprise Deployment

Table 1. Summary of challenges in implementing Voice Activated Video Communication System and potential solutions.

Challenge	**Potential Solution**
The devices only support WPA2 networks	Updating future devices to support EAP TLS authentication
Many nurses were accustomed to using the existing VICS solution so they were less	Provide more live trainings of Echo Show device or completely replace VICS solution

interested in adopting the Echo Show device	with Echo Show device
Device placement on IV pole was suboptimal as it was not sturdy and was not always facing the patient	Creation of custom mounts for the Echo Show Device that can affix to the IV pole and pivot
Lack of data analytics made it difficult to understand usage or efficacy of pilot	Ability to extract and summarize key metrics by device, unit, and user, such as number of drop ins, length of drop in, and number of time voice activation was used

During the pilot, there was interest by nursing leadership to deploy these devices in another building following a COVID19 cluster outbreak. However, this was not feasible due to several challenges with the current consumer version of the Echo Show devices [Table 1].

The Echo Show devices support Wi-fi Protected Access 2 (WPA2) encryption, which only requires a single preshared key (PSK) to connect to a network. Learning this single PSK could lead to a system compromise. Future versions of the Echo Show device can address this by enabling access to WPA2 Enterprise that requires a unique username and password and a preinstall unique encryption key, thereby providing additional security and enhancing ease of scalability. [8]

One of the barriers with implementation was the lack of an official enterprise fleet management solution for the Echo Show devices. A third-party vendor, Aiva Health created a custom fleet management solution that provided limited enterprise support that was not native to the device. This resulted in the setup of each device to be a time-consuming activity, taking 1-2 days as each Echo Show device needed to be configured and tested individually and then brought online by the Amazon and Aiva Health teams with the drop in feature turned on. If this pilot were to have been expanded, additional dedicated team members would be required to manage the implementation.

Due to the HIPAA waiver for telehealth remote communications in place, this Echo Show device could only be used in COVID-19 patient rooms and had to be removed from the room and unplugged when a COVID-19 patient was discharged. This made it very difficult for staff to track the devices. No Echo Show devices were lost during the pilot program, but a fleet management solution that included some type of asset tracking system would have improved the experience.

Echo Show device mounting and placement in the rooms and the fixed camera on the device lead to additional challenges. The nurses felt that the placement of the Echo Show device on the IV pole was not sturdy and, depending on the placement of the IV pole, the camera viewing angle from the device could be suboptimal. This led to situations where the Echo Show device was not always facing the patient when the nurse dropped in.

Lastly, there were no built-in data analytics in the Echo Show devices such as number of drop-ins, length of drop-in, and number of time voice activation was used to officially track device usage. This would have been helpful in understanding the function and usage of the Echo Show device from a quantitative perspective and to measure the efficacy of this device and compare it more effectively with usage of the VICS system.

The barriers that previously limited enterprise scaling of voice assistant systems like Amazon Echo Shows are beginning to soften. Third party vendors, such as Aiva, address healthcare specific fleet management solutions for Alexa devices. Further work needs to be done on future devices to support wireless network configurations such as enterprise WPA2 before these devices can truly be

considered for “out of the box” enterprise scaling. Currently, without enterprise WPA2 support, deploying these devices requires close consideration on how to create a safe and secure connectivity plan. For this pilot, we addressed this through the creation of a stand-alone WIFI network specifically for the Echo Shows. We are hopeful that support for these standards will be adopted in future iterations of the Echo Show hardware.

One of the limitations of this paper is that this is a feasibility pilot in a single unit – more formal research needs to be conducted to help understand and inform further implementation and use of voice activated video communication systems. Further, we did not formally solicit direct patient feedback on the use of the device. Patient experience is an important area to explore in subsequent research. Finally, this implementation was possible under the HIPAA Waiver for Telehealth Remote Communications –additional privacy and security review may be necessary for broader healthcare use in the future [6].

Conclusion

Overall, this pilot demonstrates the feasibility of deploying a consumer grade voice assistant device into COVID-19 patient rooms. Although there are a variety of technologies that can be used to deliver similar two-way video communication, we found the Echo Show device engaging and differentiates itself due to the voice technologies and Alexa functionalities for both clinician and patient entertainment [9]. To enable future deployments at scale, security and privacy enhancements to the Echo Show, and data analytics will need to be further explored.

Appendix

Images uploaded in Multimedia Appendix

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Supplementary Files

Multimedia Appendixes

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