Journal of the American Medical Informatics Association, 29(3), 2022, 481–488
https://doi.org/10.1093/jamia/ocab273
Advance Access Publication Date: 13 December 2021
Research and Applications

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Telehealth experiences of providers and patients who use augmentative and alternative communication

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Received 28 June 2021; Revised 5 November 2021; Editorial Decision 24 November 2021; Accepted 26 November 2021

ABSTRACT

Objective: We explore the telehealth experiences of adults who use augmentative and alternative communication (AAC) and clinicians who work with people using AAC.
Materials and Methods: We conducted semistructured, online interviews with 6 adults who use AAC and 8 clinicians who provide telehealth services to people who use AAC between July and September 2020. Participants were located in the United States and the United Kingdom. All participants had engaged in 2 or more telehealth visits in the past 6 months. We used an inductive, thematic approach to analyze the interview data.
Results: Our findings reveal that (1) telehealth is an essential service, (2) technology causes barriers, (3) policies meant to protect actually inhibit, and (4) remote monitoring devices have the potential to mitigate risks.
Discussion: Telehealth systems created for persons without disabilities do not provide equitable access to everyone. Telehealth should be flexible enough to allow patients to use the communication modality that best meets their needs. We suggest that healthcare systems think of the healthcare ecosystem as one which includes a variety of telehealth options in addition to traditional in-person clinical visits.
Conclusions: The benefits of telehealth for people who use AAC are substantial and should be an option for ongoing health care. However, the accessibility of telehealth technologies needs to be improved. Designers should view telehealth as part of a broad healthcare ecosystem, which includes in-person, telehealth, and remote health monitoring technologies. Designers should also include AAC users in the design and development process. Telehealth policies should encourage multimodality access to health care and address funding concerns.

Key words: telemedicine, telehealth, assistive technology, motor neuron disease, eye tracking

INTRODUCTION

Telehealth services have increased with the COVID-19 pandemic. At the same time, inequities between patients with and without disabilities in accessing telehealth have become more apparent within the medical informatics community.[1] Many telehealth systems, such as electronic health records (EHRs) and video conferencing platforms, assume that patients can use their voice to communicate and are able to use a traditional mouse and keyboard. People who are not able to use their voice to communicate often use augmentative and alternative communication (AAC) systems. The American Speech-Language-Hearing Association estimates that over 2 million people use AAC.[2] In the United Kingdom, Creer et al[3] estimated that 536 people per 100 000 could benefit from AAC use. People who can benefit from AAC include individuals with cerebral palsy, autism, stroke, head injury, Parkinson's disease, multiple sclerosis, or motor neuron diseases, such as amyotrophic lateral sclerosis (ALS).[3–7] Many people who use AAC also have concomitant motor disabilities that limit their ability to use a traditional mouse and keyboard.[8,9] Often, these individuals have complex health needs, including

compromised respiratory function, and require a variety of ongoing health services.[7,10–12] Many people with ALS and similar conditions need to take extra precautions to maintain their health and safety, particularly during the COVID-19 pandemic, which includes limiting in-person contact. While it is logical that telehealth services could be extremely beneficial to individuals who use AAC and have complex health conditions, little empirical work explores how people who use AAC are actually able to access existing telehealth systems.

RELATED WORK

Telehealth services can include a variety of healthcare applications, including video conferencing, EHRs, phone appointments, and text messaging.[13] Within the different telehealth services, the medical informatics community has frequently highlighted usability concerns specifically related to EHRs for a variety of marginalized populations.[14–18] In a 2017 position paper, Lyles et al[19] called for healthcare systems to collectively work together to pressure EHR vendors to design more user-friendly EHRs, including making EHRs more accessible to individuals with disabilities. More recently, there have been calls for improvements across multiple forms of telehealth for people with disabilities.[1,20,21]

Empirical studies on people with disabilities and telehealth are sparse. A review of international studies of people with disabilities in underserved areas found that the majority of papers were case studies with 4 or fewer participants, covering a wide range of disabilities.[22] The range of accessibility needs for people with disabilities is great and cannot be addressed in a "one-size-fits all" needs analysis or design. Therefore, we must understand the unique needs and challenges of different user populations. For example, few empirical studies have focused on how people who use alternative methods for computer access, such as eye control, use telehealth technologies. Eye control, the ability to use your eyes to move the mouse and type with an on-screen keyboard, is a common form of assistive technology used by individuals who have motor disabilities, such as people with ALS.[9,23–25] Yet, we do not know how eye control or other alternative access methods can be used with telehealth systems, leaving a gap in knowledge for telehealth designers and developers.

Individuals with complex conditions involving motor and speech disabilities might also require alternative solutions for verbal communication and computer access. AAC tools are often used in conjunction with alternative computer access methods, such as communication software paired with eye control.[8,24] Often, people who require AAC also have complex health needs, such as individuals with cerebral palsy, ALS, primary lateral sclerosis, stroke, or other motor or neurological conditions.[4] Health, communication, and accessibility needs can be complex and intertwined for these patient populations, making communication with healthcare providers especially challenging, even during in-person visits.[10] To best support AAC users and clinicians who provide services to AAC users during telehealth visits, we need a deeper understanding of the challenges they face.

The patient's ability to communicate and access technology are essential components for successful use of all telehealth systems. A survey of ambulatory clinicians who provided telehealth services found that patients with communication problems related to speech, hearing, and cognition faced the most nontechnical barriers to accessing telemedicine, most notably, telephone-based health care.[26] If communication problems are a high barrier to accessing telehealth, we question how people who use AAC, and clinicians with patients who use AAC, access telehealth services. A study of 8 people with ALS and their communication partners demonstrated that video-based telehealth services for AAC assessments can provide much needed access to specialist AAC services.[27] However, very little research exists to help us understand the benefits and barriers of the various telehealth systems available to people who use AAC. As a result, designers and developers of telehealth systems are not able to make informed design choices to address the needs of people who use AAC and alternative computer access systems. In this study, we investigate how clinicians and AAC users currently utilize telehealth and explore the benefits and barriers to telehealth based on their perspectives.

MATERIALS AND METHODS

We recruited participants through existing networks within the AAC community. We purposefully sought out clinician participants from different healthcare systems to provide insights on a range of telehealth provision for patients who use AAC. The purpose of our research was to understand the broader impact of access to telehealth on AAC users, rather than a technical analysis of different telehealth systems. We included clinicians from both the United Kingdom and the United States, but due to complications related to the pandemic, we only recruited AAC users in the United States. All participants received a gratuity for their participation in the study. We continued recruitment of participants until we reached data saturation, in which gathering new data no longer revealed new insights.[28,29]

We used semistructured interviews to investigate both clinicians' and AAC users' experiences with telehealth (see Tables 1 and 2 for interview guides). Interview questions were designed to elicit information regarding the benefits and barriers of telehealth, learn about current practices in telehealth, address changes in telehealth because of COVID-19, and discover design features that could improve telehealth experiences. We offered to email interview questions to all AAC user participants in advance of the interview.[10,27,30] All participants were also asked to complete an online survey, which provided demographic information, telehealth usage information, and ratings of participants' comfort with technology. All interviews were conducted via the video conferencing platform of the participant's choice and recorded. Our study was reviewed and approved by the sponsoring institution's review board, and all participants provided consent to participate in the study.

Interviews occurred between July and September 2020 and ranged from 1 hour to 2.5 hours in length. Interview duration was often influenced by the communication method used by the participant. Participants who used AAC systems and those who required alternative computer access tended to have longer interviews than participants who used their voice to communicate. In addition, the approach used for the semistructured interviews differed based on the communication methods used. For example, interview questions for participants who communicated with AAC and used alternative computer access were modified when needed to minimize participant fatigue.[30–32] In one instance, an interview participant's 2 sentence response took 10 minutes for them to compose in part, because the video conferencing software was interfering with their AAC system. As a result, the interviewer modified questions to include as many yes/no questions as possible with the participant's permission. Due to the significant effort required by some AAC users to communicate, responses from AAC users to interview questions are less verbose than those of clinicians, resulting in greater amounts of qualitative data generated by clinicians, as represented in the quotes used in the Results section.[32–34]

Table 1. Semistructured interview guide for clinicians

Interview questions for clinicians
• Tell me about how you provide telehealth services to your AAC patients.
• What works well?
• What is challenging?
• How often do you encounter technical problems when providing telehealth?
• Who provides help with technical support?
• What types of training did you receive regarding telehealth?
• Did you provide services via telehealth before COVID-19? If so, have things changed?
• What kind of system would you like to have to communicate with your patients?
• What features are most important to you?

AAC, augmentative and alternative communication.

Table 2. Semi-structured interview guide for AAC users[a]

Interview questions for AAC users
• Tell me about how you communicate with your medical providers while you're at home.
• What works well?
• What is challenging?
• When was your most recent telehealth interaction?
• How often are your technical problems due to the operating system? (for people more comfortable with technology)
• Does someone help with technical issues?
• Did you access telehealth before COVID-19? If so, have things changed?
• What kind of system would you like to have to communicate with your medical providers?
• What features are most important to you?

AAC, augmentative and alternative communication.
[a]Note that the actual interview questions for AAC users differed based on their fatigue levels and communication abilities.

All interviews were conducted by the first author. At the conclusion of the interviews, the first author engaged in member checking with the AAC user participants via email.[10,30,35] The first author also emailed clinicians, giving them an opportunity to amend or add any information to their interviews.

Analysis

We analyzed data using an iterative, inductive approach.[36] The first author wrote memos for the interviews and then began developing open codes. The first author engaged in reflexivity during the initial coding process,[28,37] recognizing that their background as an AAC specialist provided them with unique insights. The third author reviewed 2 transcripts, 1 from an AAC user and 1 from a clinician, and developed open codes based on those 2 transcripts. After the initial phases of coding, the first and third authors reconciled their initial open codes to develop a refined set of codes. To ensure that the codes were understandable to researchers unfamiliar with AAC, we shared quote excerpts from both AAC user and clinician participants with a small group of researchers working in medical informatics, who provided input that further refined the existing coding schema. After multiple passes of data review, all 3 authors developed a set of broader themes through consensus, encompassing earlier codes and categories, which are presented in our findings.

RESULTS

Participants

We interviewed 6 adults who used AAC (AAC1–6) who lived in the United States. Participants' ages ranged between 35 and 64 years. Four participants identified as men, one as a woman, and one chose "other" and did not specify their gender identity. The majority of AAC users had a motor neuron disease, such as ALS. Four participants used eye control for computer access, one participant used a head mouse, and one participant was able to use their hands to access a standard keyboard/mouse and phone app. One participant used their voice to communicate during the interview but used AAC for communication at night. All participants had engaged in telehealth services 2 or more times in the last 6 months. Two participants had caregivers/family members actively engaged and present during their interviews. It is common for AAC users to choose a familiar communication partner to assist with their communication as a part of their "alternative" (AAC) communication strategy. However, the focus of the interview remains on the perceptions of the AAC user rather than the caregiver.[8,30]

We interviewed 8 clinicians (C1–8) who provided telehealth services to patients who used AAC. Clinicians include the following professions: physician, nurse, speech-language pathologist, and assistive technology professional. Five clinicians were based in the United States and 3 were based in the United Kingdom. Six clinicians identified as women and 2 identified as men. Participants provided services in a variety of settings and client populations including adult, pediatric, home health, outpatient, nonprofit, and private practice. Clinicians' ages ranged from 25 to 65 years and their experience in providing telehealth services ranged from <1 year to >6 years. All clinicians reported having 11 or more patients who use AAC on their current panel.

Comfort with technology influences the use of telehealth.[38–40] Survey results indicated that all participants rated themselves as fairly comfortable or very comfortable with familiar technologies. One participant rated themselves as neutral with new technologies, all other participants rated themselves as fairly comfortable or very comfortable with new technologies.

Our analysis revealed results that are specific to people who use AAC as well as more generalized findings that encompass the overall

telehealth experience. We discuss our findings within 4 themes: (1) telehealth is an essential service, (2) technology causes barriers, (3) policies meant to protect actually inhibit, and (4) remote monitoring devices have potential to mitigate risks.

Telehealth is an essential service

Across both participant groups, telehealth was cited as having many benefits, including safety for both clinicians and patients, decreased travel time for appointments, and an improvement in scheduling and attending appointments. Some of these benefits were felt both by clinicians and AAC users, such as decreased travel time. C1 explained, "*I could do so many more telemedicine visits and reach so many more people in a day…because I have such a large geographical area*." AAC5 and their caregiver explained that telehealth visits saved a great deal of time and fatigue compared to in-person healthcare visits: "[in-person visits] *means like three hours of getting everything together…and it's not very far for us* [to travel to the appointment] *but it's still a huge hassle…for the clinic visits* [AAC5] *refuses to even see all the people he's like, 'come on, come on, hurry up'*." Similarly, AAC6 explained that routine health appointments over video telehealth would be preferable to in-person because "*appointment days in* [clinic's location] *are taxing…it's always a time crunch getting me ready, packing batteries, lunch, etc*."

Some clinicians noted that they experienced an increase in patient scheduling for telehealth. C7 said, "*it actually makes it safer for* [AAC user patients] *because they're getting more care and a lot of patients used to decline coming into clinic because it was too big of a deal*." C4 recognized the importance of telehealth as a safe option for health-compromised patients, "*What if you have a person who is so medically complex that coming into* [clinic] *will get them really sick?*"

While both clinicians and AAC users recognized that telehealth had barriers as well as benefits, participants viewed telehealth as an essential service, particularly during COVID-19. C8 explained, "*we're not putting people at risk and not putting ourselves at risk, but we can still have that contact*." AAC3 and AAC4 noted that they felt having the option to communicate with their providers by text (via email, EHR, or text messaging) instead of voice output was advantageous, particularly based on their communication abilities. AAC4 explained, "*keyboard is faster…for a simple question*."

In addition, clinicians talked about how telehealth services can provide quick access for troubleshooting AAC technology problems. Instead of having to schedule an in-person visit, which can take time, telehealth allows assistive technology professionals to quickly meet remotely with AAC users to provide training and support for their AAC equipment.

Technology causes barriers

While our data show a variety of benefits for telehealth, the technologies used for telehealth can also be barriers to healthcare access. Barriers include physical access to the technology and cognitive barriers to using the technology. These barriers can be experienced by the patient, the clinician, or both.

Five of the 6 AAC user participants were unable to physically access a traditional keyboard and mouse. Participants who were unable to use a traditional computer and mouse experienced major barriers to accessing telehealth technologies. Barriers included the inability to independently access EHRs/PHRs, an inability to independently launch video conferencing platforms, and interference from AAC communication software with telehealth systems. For example, AAC6 explained: "*My issue is using speakers and microphones simultaneously* [on the AAC device]" and that technical difficulties "*caused anxiety and frustration*." Similarly, AAC4 stated: "*My equipment has quirks. This can make video calls fairly unpredictable*."

AAC users discussed how they had to balance their own technical needs with the needs of their healthcare provider. For example, AAC1 shared that a provider only gave the option of a telephone visit as a telehealth alternative to an in-person visit. Because AAC1 required many minutes to type responses on their communication device, the provider on the phone would repeat their question or ask if the patient was still on the phone when they did not receive an immediate response from AAC1. AAC1 explained, "*I would have preferred video* [instead of the phone] *so I could have answered nonverbally*." The ability to respond to yes/no questions nonverbally would have saved time, patient stress and fatigue, and would have improved the communication interaction during the telehealth visit.

Clinicians, as well as AAC user patients, spend time attempting to overcome technical difficulties with telehealth. For example, some clinicians spoke of the importance for them to view the patient's speech-generating software on their AAC device. C3 said that they "*have trouble with the video panel that shows all the participants getting in the way* [of the communication software they need to view and edit]." As a result, the telehealth experience is diminished because of technical barriers to viewing the screen being shared.

Clinicians also recognized that cognitive barriers could be a factor for some AAC user patients, particularly those who have received new AAC equipment. C2 explained, "*I do find that introducing this initial technology of even just the speech on the* [AAC] *device itself is so complicated for some people…then also being like okay, and here's this thing* [telehealth technology] *and I don't know, it just seems like an extra* [burden]."

Unfamiliarity with telehealth systems can result in a high cognitive load for both the patient and the clinician. AAC4 had to manage their communication abilities and technology preferences with their clinician's technology abilities. For telehealth communication, AAC4 could most effectively communicate nonverbally through video for yes/no questions and use the chat function in video conferencing for more in-depth responses. However, AAC4 stated "[My clinician] *always had issues with reading my answers*" and as a result, they changed video conferencing platforms to one where the clinician was able to more easily use the chat window to read AAC4's responses. In this case, AAC4 and their clinician had to adapt to each other's physical and cognitive barriers with the technology.

Clinicians found that they also needed to adapt their telehealth systems to the needs of their patients who use AAC. Clinicians used a wide variety of telehealth systems with their patients who used AAC. All 8 clinicians used synchronous, live telephone, and video conferencing telehealth visits with patients. Clinicians also used email, messaging through EHR/patient portals, text messaging, Facebook Messenger, What'sApp, and software for remote editing/control of patient's computers or AAC systems. C5 explained that they adapted their telehealth technology to the needs of their patients to overcome both technical and cognitive barriers: "*I found the most effective way to communicate with* [AAC users during telehealth]*…is to use what they use. So if* [patients] *are comfortable with…What'sApp then I'd rather that they communicate through What'sApp…it's the same deal with the video conferencing*."

For clinical appointments, clinicians preferred video-based telehealth services to other telehealth modalities. C2 explained: "[video]

is the closest I can get to having an in-person meeting with them…I can read their faces." However, clinicians noted that they needed to use a variety of strategies to ensure patients were successful in using video-based telehealth by overcoming cognitive barriers. Clinicians created "cheat sheets," talked through the initial video conference setup with patients on the phone, and even remotely controlled patients' devices to ensure that patients could successfully "get in" the video conferencing telemedicine visit. As a result, clinicians could spend a great deal of time assisting their clients with technology access in addition to the actual telehealth appointment itself.

Policies meant to protect actually inhibit

While our analysis reveals that clinicians wanted to use tools that were easiest for AAC users to access, the healthcare system itself could significantly impact clinicians' abilities to accommodate patients' needs. Clinicians spoke of the delicate balance in managing patient privacy with accessibility, such as when C7 explained that they were able to securely meet clients' accessibility needs because "*I have a work iPhone and a lot of people will…just send me a text message* [to the work phone]." Other clinicians spoke of being limited to "secure" tools that were embedded within their healthcare system but were not easily accessible by patients.

C1 explained, "*secure messaging and secure access* [such as through EHR] *isn't available for someone who isn't able-bodied*." C1 shared a story of a patient who was unable to access their EHR to message a clinician about a needed prescription change. Because the EHR was physically inaccessible to the patient and policies did not allow the patient to communicate via email (the communication method the patient was able to access independently), the patient had to ask a paid caregiver to communicate with the clinician on their behalf.

AAC2 no longer attempted to access their EHR themselves, explaining that "*a lot of that kind of software requires you to be able to hover* [with the mouse]" which was not possible with eye control. Instead, AAC2's caregiver conducted EHR communication on their behalf. While participants recognized that telehealth systems often included encryption, which provided additional security and privacy, the inability of patients to independently access those systems negated the effectiveness of keeping data private.

Even when an EHR is considered accessible and working correctly, built-in privacy and security controls can inhibit access. AAC6 described how "*my messages can take…* [up to] *60 minutes to compose*" using eye control. However, AAC6 explained that their EHR times out after 30 minutes of inactivity so they need to compose and save their message in a different application and switch between applications and the EHR to send a secure message. The extra steps of composing a message in a separate application ultimately increased the total time and effort required for AAC6 to communicate with their clinician independently.

In addition to policy barriers regarding privacy and security, the ability to provide telehealth services is inhibited by a lack of funding, both for services and equipment. C1, C3, and C4 explained that billing codes for patients who use AAC are complicated, because not all treatment and diagnostic procedures are allowable as telehealth services. These billing restrictions can prevent some patients who use AAC from receiving telehealth despite telehealth being a safer alternative to in-person visits. C3, C5, and C8 shared concerns that older patients who use AAC and lower-socioeconomic patients did not have access to the necessary equipment for telehealth services and might not be scheduling needed health appointments as a result.

Remote monitoring devices have potential to mitigate risks

Clinicians and AAC users identified that a serious risk of using telehealth was the risk of missing critical medical information that could not be captured except during in-person visits. C7 explained: "*I think the biggest fear is that we're missing something…if we can't see the whole person and do the whole physical assessment. That's why we push pretty hard for video instead of phone*."

AAC1 explained that they felt that wearable monitoring technologies, such as oxygen monitors, could be a solution to improving telehealth services and health services in general: "*So if I ever stopped breathing at night. There is not a dead body in the morning*." Both AAC1 and AAC2 expressed concerns related to their health conditions and the need for ongoing monitoring outside of traditional in-person visits. In these instances, the potential for telehealth systems to incorporate monitoring data was seen as an opportunity to address medical needs that are not currently being met through either "traditional" telehealth or in-person care. However, not all participants responded favorably to the idea of using wearable devices for long-term medical data monitoring. Participants were more favorable to the use of remote health monitoring if they had control of when and how the data was collected. AAC3 explained that "*temporary sending days* [of data]*…is no problem, maybe when I'm sick, it would make sense to send it more frequent*[ly]."

DISCUSSION

Patients with disabilities are more likely to experience poorer health outcomes than their nondisabled peers.[41–44] Our research provides novel insights into an under-explored patient population: people who use AAC. Our findings show that telehealth has the potential to improve AAC users' healthcare access but that there are a number of barriers that need to be addressed to increase healthcare equity.

In contrast to prior work, which points to comfort with technology as a key component for success in telehealth usage,[38–40] our findings indicate that having a high degree of comfort with technology does not matter when the alternative access methods used by a patient are incompatible with the EHR or video conferencing system. To increase telehealth access, we urge designers to follow web accessibility guidelines and consider a variety of access methods that patients use.[45]

The medical informatics community has discussed the balance of caregiver-patient privacy and access to healthcare systems within the context of parent–child relationships.[46–48] Our research broadens the privacy discussion beyond parent–child to include adults. Although some AAC users are comfortable with having a trusted caregiver access telehealth systems on their behalf, we cannot assume that all AAC users feel that way. Due to the nature of their disability, AAC users are at risk for abuse.[49–51] The option for private, independently accessible healthcare communication should be a fundamental right for everyone, particularly for vulnerable populations.

Telehealth technology designers should also consider that people who use alternative access methods require additional time to complete tasks, as shown in our findings. People who use alternative access with AAC, such as eye control, must perform many actions in a serialized manner. For example, adjusting the volume cannot be done while simultaneously communicating. Therefore, we recommend that designers of telehealth technologies strive to include AAC users and users of alternative computer access methods in the design, development, and testing of telehealth applications.

Patients' abilities impact their use of healthcare technologies and services.[1,27,52–54] Healthcare providers should ask: "Which communication modality best meets the patient's needs at this time?" The answer could be anything within the healthcare ecosystem: in-person visit, phone, video, text messaging, email, or sharing remote health monitoring data. Our findings indicate that telehealth should be considered as an equal option to in-person office visits. The patient's current health needs, fatigue levels, accessibility needs, and relationship with the clinician should determine the modality of care provided. The idea of the healthcare ecosystem was inspired by AAC1's suggestion of including wearables that generate health monitoring data as a supplement to in-person and telehealth clinical visits.

The use of health monitoring data can help ensure that clinicians are not "missing something," a concern raised by participants in our study as well as by clinicians in prior work on telehealth.[40] Emerging research and development have investigated remote health monitoring and sensor data for a variety of applications.[55–60] Healthcare organizations have an opportunity to partner with researchers to guide the development of these technologies into practical healthcare tools. While prior work has highlighted the inequity of many healthcare tools, none have focused on AAC users and clinicians who use telehealth with AAC users.[61,62] Our findings suggest that incorporating feedback from AAC users, particularly those who have complex health needs, on the development of these types of remote medical monitoring technologies would be valuable to improving the overall healthcare ecosystem.

Our research reveals that healthcare systems and policies have a significant influence on AAC users' access to health care. We urge healthcare policymakers and administrators to solicit feedback from AAC users and clinicians when creating and implementing healthcare ecosystems and policies regarding the use of those systems. AAC users have unique needs that require additional technical accommodations. Healthcare policies should recognize and allow clinicians to be reimbursed for any extra time required to ensure that AAC users are able to equitably and privately access telehealth.

Limitations and future work

This study targeted a specific patient population, adults who use AAC, the majority of whom also used alternative computer access methods. Therefore, we have a small participant population which is consistent with prior qualitative studies involving people who use AAC.[8,30,31,33,63] Future work in telehealth could investigate whether designs that are accessible for people who use AAC also meet the needs of broader patient populations. Future work could also investigate the telehealth experiences of AAC users who do not report comfort with technologies.

CONCLUSION

Interviews with clinicians and patients who use AAC highlight the benefits telehealth can provide, including decreased time and fatigue involved in attending healthcare visits, increased health safety, and the ability to use preferred communication methods to interact with healthcare providers. However, adults who use AAC experience several barriers in accessing telehealth. Clinicians and patients also have concerns about "missing something" with telehealth. Remote monitoring and sensor technologies should continue to be explored as an additional modality for use with telehealth. While the promise of telehealth is great, the actual implementation continues to need work to improve accessibility. We encourage designers of telehealth systems to include AAC users and clinicians in telehealth design and development, including individuals who use alternative access methods. We also encourage policymakers and administrators to consider broadening funding options to ensure that AAC users have equitable access to telehealth.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

AUTHOR CONTRIBUTIONS

EB contributed to the conceptualization and design of the study, data collection/data analysis, interpretation, drafted the original manuscript, and provided critical revisions to the manuscript. AP contributed to the conceptualization and design of the study, data collection/data analysis, interpretation, and critical revision of the manuscript. WP contributed to the data analysis, interpretation, drafting, editing, and critical revisions of the manuscript. All authors approved the final version of the manuscript.

ACKNOWLEDGMENTS

The authors thank the participants in this study for their significant contribution to this under-represented area of research. They also thank the iMed research team at the University of Washington, for their feedback regarding our iterations on the coding schema.

CONFLICT OF INTEREST

The authors have no competing interests to declare.

DATA AVAILABILITY

The full data set underlying this article cannot be shared publicly to protect the privacy of individuals that participated in this study. Data will be shared on reasonable request to the corresponding author.

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