# Healthcare stakeholder perceptions of broadband and telehealth influences in Telehealth Broadband Pilot Program communities

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## Background

Telehealth has the potential to increase healthcare access among the patient population in rural and other underserved communities.[1,2] However, telehealth is only a feasible option for healthcare service delivery if broadband internet is accessible and available to healthcare providers, patients, and other relevant telehealth stakeholders residing within those communities.[3,4] The Telehealth Broadband Pilot (TBP) Program examined broadband needs in 25 target counties to assess and address gaps in broadband service that limit access to telehealth services in rural communities. As part of the evaluation of the TBP Program, interviews with healthcare providers, healthcare Chief Information Officers (CIOs) and Information Technology (IT) managers, and other telehealth stakeholders in TBP target counties were conducted to identify influences on both broadband and telehealth adoption and utilization.

**Key Findings:**

- Healthcare stakeholders in Telehealth Broadband Pilot Program communities perceive that poor or inconsistent broadband quality in clinics increases provider and staff workload and risk to patients.
- Quality broadband increases the types of services clinics offered, the number of patients served, clinic revenue, and the reliability of healthcare services, while also decreasing paperwork.
- High costs, poor or inconsistent access and quality, less investment, and delays in repairs impede community broadband access.
- Telehealth adoption and utilization are influenced by broadband access and quality, individual characteristics of providers and patients, software and hardware, usability of tools, telehealth champions, as well as availability of training.

**Methods**

      Sixteen semi-structured, qualitative interviews were conducted either virtually or in-person with healthcare stakeholders across the four TBP states: Alaska, Michigan, Texas, and West Virginia. Interviewees represented healthcare providers, clinic CIOs and IT managers, and other healthcare stakeholders, such as telehealth specialists and electronic health record (EHR) IT staff. Interviewees were recruited with assistance from TBP program staff and TBP Community Lead Partner connections to healthcare stakeholders in the TBP target counties. Interviews lasted an average of 79 minutes (range: 54 to 102 minutes).

      Interviews were audio-recorded and transcribed verbatim. Transcripts were uploaded into MaxQDA qualitative analysis software for inductive coding to identify emergent themes and sub-themes regarding factors influencing clinic, provider and staff, patient, and community broadband, as well as factors influencing telehealth utilization. Coding was conducted collaboratively among four coders to establish an initial codebook. Later stages of coding were conducted independently by two of the coders, and discrepancies were resolved through discussion among all coders. The final codebook emerged through collaborative discussion and consolidation. Themes and subthemes were identified and described. Themes represent general topics that emerged through qualitative coding and analysis (e.g., benefits of broadband in clinics), and sub-themes represent more specific categories within those topics, if any (e.g., increased types of services offered, more patients served, etc.). Themes and sub-themes within a category are presented in order of frequency, with the most frequently identified themes and sub-themes presented first. The project was determined non-human subjects research by the University of Arkansas for Medical Science's Institutional Review Board (#262566).

**Results**

      A summary of the emergent influences on broadband and telehealth utilization can be found in Table 1.

Table 1. Influences on clinic broadband, provider and staff home broadband, and TBP community and patient broadband.

| | Theme | Sub-Theme |
|---|---|---|
| **Clinic Broadband** | Broadband issues delay clinic workflow and healthcare service delivery | Increases workload (e.g., switch to paper charting, then re-enter in EHR) |
| | | Decrease healthcare service quality |
| | Determinants of clinic broadband choice | Decision makers (leadership, IT, committees, hierarchical decision tree) |
| | | Limited choice of internet service providers (ISPs) |
| | | Cost of broadband service(s) to the healthcare entity (cost of service and grant funding availability) |
| | Benefits of broadband in clinics | Increased types of services offered (including telehealth services) |
| | | More patients served |
| | | Less paperwork |
| | | More reliable healthcare service |
| | | Increased revenue |
| | Strategies to improve clinic broadband | Filtering traffic to keep broadband open for healthcare |
| | | Low Earth Orbit satellite broadband adoption |
| | | Implementing backup networks, systems |
| **Provider and Staff Home Broadband** | Broadband issues delay workflow and healthcare service delivery | Poor or inconsistent broadband access and quality |
| | | Virtual private network (VPN) connection issues |
| **Patient Broadband in TBP Communities** | Barriers to obtaining and maintaining broadband access | Poor or inconsistent broadband access and quality |
| | | High cost of broadband |
| | | Delays in broadband service repairs |
| | | Less broadband investment in rural communities |
| | Facilitators to obtaining and maintaining broadband access | Good or improving broadband access and quality |
| | | Funding to increase broadband access |
| | | Increased Low Earth Orbit satellite broadband options |

*Broadband Influences*

**Clinic broadband**

      **Influences affecting broadband in healthcare clinics** identified by healthcare stakeholder interviewees included **broadband issues delaying clinic workflow and healthcare service delivery** (including *increases in workload* and *decrease healthcare service quality*), **determinants of clinic broadband choice** (including and *decision-makers*, *limited choices in internet service providers [ISPs]*, *cost of broadband services to the healthcare entity*), **benefits of broadband in clinics** (including *increased types of services offered*, *more patients served, less paperwork, more reliable healthcare services, increased revenue*), and **strategies utilized to improve clinic broadband** (including *filtering traffic to keep broadband open for healthcare, low earth orbit satellite broadband adoption,* and *implementing back-up networks and systems*).

      Healthcare stakeholders described many situations of when **broadband outages affected clinic workflow**. Broadband outages *increased provider workload*, for example, by forcing a switch to paper charts, which then had to be later re-entered in the EHR when broadband was restored. In another example of outages that affected clinic workflow, one interviewee described being unable to access a report in their clinic's EHR system and was told by IT not to try to access reports between 8:00 AM and 2:00 PM, limiting the ability of this provider to perform their job duties. Another interviewee described a further example of this influence, describing how broadband outages could force the closing of a clinic location for the day, requiring providers to switch all scheduled visits to telehealth from another location. Stakeholders also said that they installed Wi-Fi repeaters in an attempt to improve the broadband connection throughout the clinic. Interviewees reported that broadband issues can *decrease healthcare service quality*. For example, one interviewee described a recent failure of a promising telehealth service in the Neonatal Intensive Care Unit (NICU) due to insufficient clinic broadband (see Box 1). Interviewees also described delays in healthcare service delivery due to broadband outages. Outages in Alaska were described as causing particularly long delays (see Box 2 for an example), but this issue was described in multiple TBP target states.

      Interviewees also described several **determinants of clinic broadband choice**, including *broadband decision-makers* (such as clinic leadership, IT providers, committees, and hierarchical decision trees), *limited choice of broadband service providers*, and *cost of*

> **Box 2. Example from Alaska: Broadband issues delay healthcare service delivery, decrease healthcare service quality**
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> *"We have 100 [Mbps] in the big sites. [In a small Alaskan island community], before fiber, we were getting 0.43 megabyte per second speed. Just so you understand how slow that really is: two and a half hours to send an X-ray image from [this community] to Anchorage. You want to talk about a barrier to health care? [Say] I broke my arm, maybe. How long does it take to find out? Two and a half hours."*

> **Box 1. Example: Broadband issues delay healthcare service delivery, decrease healthcare service quality.**
>
> *"We also attempted to…[install] little cameras that you can put into each of the NICU beds and so the parents can connect, because we had that issue with travel…We could not even, in the hospital, get enough broadband…to have those cameras in each of our rooms, so it just wouldn't work. We tried. We got the funding. It was approved from the hospital…It would have been excellent for us because the transportation issue in the state, but we just—it just won't work."*

*broadband service to a healthcare entity.*
*Decision makers* such as clinic leadership, clinic and hospital IT, and hierarchical decision-making processes were described as major drivers in clinic broadband decision-making in clinics; however, involvement of healthcare providers in clinic broadband decision-making was mixed. One interviewee described how broadband-related IT decisions were primarily driven by IT managers, with little to no input from clinicians. While medical directors provided some input, they described that the decisions were usually made within the IT department and then rolled out to clinic providers, rather than the providers giving input to IT. Hierarchical decision-making was described by several interviewees, although the specific members within the hierarchy varied. For example, one interviewee in a provider role described being outside of that hierarchical decision-making, noting that they must consult with administration and IT before any final decisions are made.

> **Box 3. Example: Benefits of broadband in clinics, more patients served**
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> *""I feel like with telehealth, we do have a fuller schedule now, because they are able to book in on that a little fuller on the schedule, because we do a 15-minute slot time for just a general issue that's not extensive, and because of that, sometimes some of the providers do have a double-booking, because they do have the telehealth and then an in-office patient. They'll always start out with the in-office patient, and then while the in-office patient is having their labs and things like that drawn and done, they'll go ahead and jump on with a telehealth that they've got scheduled at that time as well."*

Several interviewees described *limited choice of broadband service providers affecting clinic broadband*. One interviewee described formerly having a satellite back-up system for broadband in case their primary broadband service experienced an outage; however, they lost that back-up when the ISP stopped providing service. In another example, an interviewee described several clinics in their healthcare network who also lacked a back-up system due to a lack of other ISPs in the area. Interviewees also described the *cost of clinic broadband as an influence on choice of broadband in clinics.* Often high cost of overage fees from previous broadband providers prompted clinics to switch to more affordable and reliable providers. One stakeholder highlighted the limitations of their old plan, which capped their data at seven gigabytes per month, which they described as equivalent to watching about three movies over streaming video. The cap drove up overage fees to make their monthly bill more than $1,200 per month when employees used more data to perform work tasks on an already slow network.

Interviewees described several **benefits of broadband in clinics**, including *increased types of services offered*, *more patients served*, *less paperwork*, *more reliable healthcare service*, and *increased revenue*. One interviewee described broadband as "*expand[ing service types] drastically*." Several individuals described how broadband enabled telehealth services, which expanded specialty care availability in many rural and underserved communities. Several Alaskan interviewees said that broadband enables specialty care for patients in frontier communities. Prior to broadband, patients who needed to see a specialist provider, such as a cardiologist, had to travel to Anchorage, which created logistical challenges and added cost. With improved broadband, a cardiologist can now consult remotely, increasing the availability of cardiology services. Other specialties, like orthopedics and dermatology, have broadened their reach via broadband in Alaska, making it easier and more efficient for people in rural areas to access specialty care. *The ability to serve more patients* was described by interviewees as another benefit of broadband in clinics. One individual described how broadband has enabled providers to maintain full schedules of in-person visits while incorporating telehealth visits in

between the in-person visits (see Box 3). An interviewee described another example of this influence, explaining that if an in-person patient cancels or no-shows, the provider can quickly schedule a telehealth visit in its place, making their use of time in clinic more efficient and ensuring continuity of care. This practice minimizes no-shows, prevents patients from being penalized or removed from the clinic for repeated no-shows. In another example of this influence, one interviewee described broadband as increasing the number of mental health patients they were able to serve who would otherwise go without care due to transportation issues

*Less paperwork* for providers and clinic staff was also described as a benefit of clinic broadband. For example, one interviewee described decreasing the amount of printing needed for patient care by completing more tasks through their EHR system. Another interviewee in an IT role described how recent clinic broadband improvements reduced EHR charting delays, improving clinic workflow and increasing provider satisfaction. Broadband improvements were also said to decrease paperwork and facilitate hospital administrative tasks, such as paid time off approvals. Broadband was said to facilitate *more reliable healthcare service delivery*, such as more timely and cost-effective healthcare for patients in remote areas. For example, broadband has enabled higher-quality care for rural communities, particularly after the declaration of the COVID-19 public health emergency (PHE). One interviewee described how policy changes during the PHE allowed for reimbursement of more audio-only telehealth services, which were more reliable for many healthcare services.

Broadband was also said to facilitate *increased revenue* in clinics. One interviewee described how broadband increased the number of billable telehealth services their clinic could offer, which in turn increased revenue. In a unique example from Alaska, many villages participate in the Community Health Aide Program (CHAP), where local villagers receive training "to assess and provide emergent, acute, and chronic medical care in remote Alaskan communities."[5] Interviewees described how the role of the CHAP has expanded with technology advancements and broadband, which has increased both the quality of healthcare and revenue. One interviewee explained that CHAPs have previously worked more autonomously, now providers are able to contribute to nearly every visit, enabling billing for services that were not previously billable, thus boosting revenue. (See Box 4 for another example of broadband facilitating more reliable healthcare service delivery in Alaska.)

**Strategies to improve clinic broadband** included *filtering traffic to keep bandwidth open for healthcare*, *Low Earth Orbit (LEO) satellite broadband adoption*, and *implementing backup networks and systems*. *Filtering traffic* was also described as a means to keep broadband open for healthcare service delivery, both by segmenting networks into dedicated and guest networks, and blocking traffic to certain websites to keep connections open for necessary healthcare services. Several interviewees, particularly in Alaska, described the potential of *LEO satellite technology* as a way to improve clinic broadband. For many healthcare locations in rural areas, few ISPs serve their area, and LEO satellite broadband is an exciting possibility for these healthcare stakeholders. For example, one interviewee described how an

active implementation of an LEO satellite connection at their clinic would be both faster and more reliable than their current broadband service. Finally, many healthcare organizations *implement backup networks and systems* to ensure broadband access for clinics in the event of an outage of their primary network. However, as described above, some interviewees shared that there were no alternative ISPs available to act as a backup network.

**Provider and staff home broadband**

      **Broadband issues at provider and staff homes** **delayed workflow and healthcare service delivery**, specifically due to *poor or inconsistent broadband access and quality* and *virtual private network (VPN) connection issues*. A lack of sufficient broadband at the homes of healthcare providers and staff delayed healthcare service delivery and workflow, preventing providers and staff from serving patients and performing

> **Box 5. Example: Barriers to obtaining and maintaining broadband access in TBP communities, high cost of broadband**
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> *"We do direct-to-patient home visits. The limiting factor is connectivity, and if a patient is not able to do a direct-to-home visit, they can come into their local clinic and do a visit from there, essentially just using the clinic's video equipment. Sometimes, in some communities, the school and the clinic are the only places that have Wi-Fi or good connectivity. It's really, really expensive in some of our regions to have personal home internet, to the tune of $375 a month, so that's a big, big prohibitive factor for a lot of our patients."*

the duties of their roles. For example, one individual described how providers and staff working from home encountered new issues that delayed healthcare service delivery, necessitating the use of the personal cell phone data or a clinic-provided hotspot. Another interviewee described challenges supporting providers working from home when the issue was the slowness or quality of their home broadband connection. However, one interviewee in a provider role described how LEO satellite technology enabled them to continue providing healthcare services from anywhere, including while traveling in remote areas that lack cellphone signals. *VPN connection issues* for providers and clinic staff were described by stakeholders interviewed as *delaying healthcare service delivery and workflow*. Use of a VPN was commonly required by many of the interviewees' affiliated healthcare organizations to securely access healthcare information outside of the dedicated healthcare network. However, interviewees also described issues that arose with the use of VPNs that delayed healthcare service delivery and workflow. For example, one interviewee described issues with VPN connections, explaining that VPN connections often do not work well with video platforms used for telehealth visits, specifically when providers are using the VPN from home and remoting into a work computer that is located in clinic or the hospital. In another example, an interviewee in an IT role described how few satellite connections worked well with the healthcare system's VPN client, which made working from home for providers and staff challenging.

**Patient Broadband in TBP Communities**

      Interviewees described several **influences on obtaining and maintaining broadband for patients in TBP communities**, including **barriers** (such as *poor or inconsistent broadband access and quality*, *high cost*, *delays in broadband service repairs*, and *less broadband investment in rural communities*) and **facilitators** (such as *increased LEO satellite broadband options*, *funding to increase broadband access*, and *good or improving broadband access and quality*). *Poor or inconsistent broadband access in rural communities* was described by

interviewees as a **barrier to obtaining and maintaining broadband for patients in TBP communities** and was described by several interviewees as related to the high cost of broadband. For example, one interviewee described a lack of ISPs in their TBP community, with some residents having only satellite connections available, leading to poor quality services at higher broadband costs for patients. Interviewees also described how a lack of accessible broadband throughout TBP communities limited the types of healthcare services their patients could receive, such as patients visiting the clinic to upload remote patient monitoring data because they lacked home broadband. Patients were also unable to participate in direct-to-consumer telehealth services. One healthcare stakeholder interviewee provided an additional example of this influence, describing a persistent digital divide between rural and urban areas in their TBP community. In many rural or remote areas, broadband access is limited to central areas like towns, which leaves the surrounding area with little to no reliable connectivity. Another interviewee described an attempt to reduce the high cost of broadband for consumers in their community that was underutilized because the program was advertised online, which was inaccessible for the residents most in need of the program. Despite investment in connectivity in towns, this lack of coverage in outlying areas remains a significant problem.

*High cost of broadband* was also an identified barrier to patients in TBP communities, making broadband access unreliable or inconsistent. Interviewees described how some patients at their clinics could not afford a smartphone. Others had smartphones, but either could not afford a data plan or elected to turn off their phones when they hit a data cap. Interviewees also described how some patients facing financial challenges had to prioritize other expenses and go without home broadband (see Box 5 for an example).

Where patients did have broadband access in TBP communities, interviewees described *long delays in service repairs.* Interviewees described instances of outages in TBP communities that took days or even weeks (in the case of Alaska) for the ISP to resolve. These delays resulted in patients lacking home broadband access for extended periods, even when paying for a broadband service. Interviewees described many of the logistical challenges in servicing or constructing new broadband connections in rural communities, such as limited transport options in Alaska during the winter and the mountainous terrain of West Virginia. One interviewee in Texas described an outage that lasted over a week due to an accidental fiber cut on a farm, leaving many in the TBP community without broadband access for an extended period of time. *Less broadband investment in rural communities* was also identified as a barrier to obtaining and maintaining broadband access for patients in TBP communities. One interviewee provided an example of this influence, describing a long-standing lack of broadband investment in rural communities in their state, including TBP communities, where health disparities were present and broadband infrastructure was lacking. Another interviewee described how the only quality broadband in some rural communities was located at places like the local clinic. While progress is slowly being made, it has taken a significant amount of time for broadband to reach these underserved areas.

Healthcare stakeholder interviewees also described several **facilitators for patients obtaining and maintaining broadband access in TBP communities**. One such facilitator was *increased Low Earth Orbit (LEO) satellite broadband options*. Interviewees explained that, due to the barriers already described above such as the high cost of broadband, poor or inconsistent broadband access and quality, and less broadband investment in rural communities, LEO satellite broadband was an exciting development for consumers living in these areas. LEO satellite technology is a promising development for broadband expansion in rural communities where terrestrial broadband infrastructure development is challenging. The

position of these satellites in lower orbit may facilitate faster speeds and latencies than other satellite technology connections and would not require expensive terrestrial infrastructure investments.[6] Interviewees expressed optimism that expanded LEO satellite in TBP communities would increase broadband access for patients; however, they also described high start-up costs for LEO satellite service that may be prohibitively expensive for some patients who would most benefit from this service. Interviewees also described existing *state and federal funding programs to improve broadband in TBP communities*, which would further facilitate broadband access for patients. Finally, interviewees also described *good or improving broadband access and quality* in some TBP communities, either generally or due to the expansion of LEO satellite services. For example, one healthcare stakeholder described increased community broadband access as "exciting" and of direct benefit to patients living in TBP communities.

*Telehealth Influences*

**Telehealth usage and modalities**

Interviewees described usage of multiple telehealth modalities in their healthcare clinics and systems, including audio-video, audio-only, remote patient monitoring, and store and forward. Interviewees detailed telehealth use by providers in clinics and in their homes, as well as by patients in clinics and in their homes. Additionally, interviewees described usage of provider-to-provider telehealth consultations, and additional specific telehealth programs.

Table 2 contains the barriers, facilitators, benefits, and decision-making influences on telehealth utilization identified by healthcare stakeholder interviewees.

Table 2. Telehealth influences, including barriers, facilitators, benefits, and decision-making.

| | Theme | Sub-Theme |
|---|---|---|
| **Influences on telehealth decision-making** | Individuals driving telehealth utilization | Providers drive telehealth utilization |
| | | Patients drive telehealth utilization |
| | | Clinic staff drive telehealth utilization |
| | Committee or collaborative decision-making on telehealth tools and software | |
| **Barriers to Telehealth Utilization for Providers and Patients** | Resistance to change among providers and patients | |
| | Broadband-related telehealth barriers | Poor or inconsistent broadband access and quality |
| | Clinic software and equipment-related telehealth barriers | Lack of reliable, functional telehealth-enabled devices and software |
| | | Multiple telehealth software systems |
| | Low digital literacy among providers and patients | Frequently forgotten passwords |
| | Provider and staff training issues | Clinic providers and staff lacking sufficient telehealth training |
| | | Difficulty training providers in remote and rural areas |
| | Staffing shortage issues | Lack of dedicated staff time to support telehealth |
| | | Shortage of credentialed providers willing to provide telehealth |
| **Facilitators to Telehealth Utilization for Providers and Patients** | COVID-19 PHE increasing the need for and use of telehealth | |
| | Community Health Aide (CHAP) role shift (specific to Alaska) | |
| | Telehealth champions | |
| | User-friendliness of telehealth interfaces | |
| | Billing and reimbursement for telehealth services | |
| | History and culture of remote work and care (specific to Alaska) | |
| **Benefits to Providers and Patients Utilizing Telehealth** | Benefits to patients | Reduction in the need for patients to travel long distances for healthcare |
| | | Improvement in patient access to quality and specialty healthcare |
| | | Improvement in the timeliness of care |
| | Benefits to providers | Providers practicing from anywhere |

## Influences on telehealth decision-making

**Influences on telehealth decision-making** included **individuals driving telehealth utilization** (including *providers*, *patients*, and *clinic staff*) as well as **committee and collaborative decision-making**. Multiple interviewees across TBP target states described individual-level influences involved in the decision to utilize telehealth as well as the telehealth modality. *Providers* were described by multiple interviewees as key drivers in telehealth

utilization. For example, one interviewee in Alaska described the decision to have a telehealth visit as a joint decision between a regional healthcare provider and the CHAP. For instance, if a patient has shortness of breath or a rash, the provider can request to see the patient via telehealth, allowing the provider and patient to interact directly. This decision typically involves the input of both the provider and the CHAP, and input from patients is not common. *Patients* also played a role in the decision to have a telehealth visit. Some clinics give patients options for their visit modality based on the patient's readiness and comfort with telehealth, preference for the visit modality, their internet connectivity, and access to affordable broadband. Additionally, *clinic staff*, such as front desk staff and schedulers, were involved in telehealth visit decision-making. In some clinics, clinic staff were trained to convert visits to telehealth if the patient presented with symptoms of COVID-19 infection, emphasizing the priority of safety for their patients while minimizing exposure to others in clinic. In other clinics, clinic staff said they might try telehealth with a patient, but if they encountered technical difficulties during the telehealth visit, they would know for future scheduling that telehealth was not a viable option for that patient.

Interviewees also described **a collaborative influence on telehealth decision-making in determining what tools and software would be available**. Interviewees described the individuals involved in these decisions as similar to those involved in clinic broadband decision-making, such as healthcare system leaders, IT, committees, and hierarchical decision-making processes. Interviewees in Alaska described a unique example of this collaborative influence on telehealth decision-making among providers across the state. Due to the structure of healthcare in Alaska with most specialty care concentrated in one of a few urban locations, regional healthcare providers in Alaska work collaboratively to review and adopt new telehealth technologies to ensure interoperability between themselves and the central medical center, but also to learn from one another. One interviewee described how adopting the same software was "probably the best thing we did was to get everybody using the same platforms, so it's easier for us." Another Alaskan interviewee highlighted how telehealth decision-making was shaped by the need for equity among clinics in a healthcare system. They explained that any decision must consider the ability to offer the same services across the 28 villages in their organization, including 21 village ambulatory clinics. This approach made sure that new initiatives or changes are implemented fairly, while acknowledging challenges of equity across the organization. However, Alaskan interviewees also described how retaining tribal autonomy for individual Tribal Health Organizations (THOs) was also important, which sometimes influenced the collaboration.

## Telehealth barriers

**Barriers to telehealth utilization** for both providers and patients included **resistance to change among providers and patients**, **broadband-related barriers** (specifically, *poor or inconsistent broadband access and quality*), **clinic software and equipment barriers** (such as a *lack of reliable and functional telehealth-enabled devices* and *multiple telehealth software systems*), **low digital literacy among providers and patients** (such as *frequently forgetting passwords*), **provider and staff training issues** (such as *clinic providers and staff lacking sufficient telehealth training*, and *difficulty training providers in remote and rural areas*), and **staffing shortage issues** (such *lack of dedicated staff and time to support telehealth* and a *shortage of credentialed local providers*).

Healthcare stakeholder interviewees described **resistance to change among both providers and patients** as impeding telehealth utilization and adoption. One interviewee described how the success of telehealth depended on providers and patients adopting tools,

explaining that if newly adopted systems were difficult to use, it would always be a challenge to encourage adoption. Several interviewees described resistance to change as a long-standing preference for in-person care, both for providers and patients. Interviewees described providers preferring in-person care because they were more comfortable delivering in-person services, believed they could deliver higher quality care, or were better able to connect with patients in-person than via telehealth—particularly for pediatric and mental health patients. Provider resistance to change could also influence the choice for more audio-only telehealth over audio-video telehealth because of increased ease and familiarity with the tools, even when the audio-video telehealth was a viable option for a particular situation.

Additionally, **broadband-related telehealth barriers** were described by interviewees, specifically *poor or inconsistent broadband access and quality* for both providers and patients. Many of these barriers described by interviewees were similar to those described above in [Broadband Influences: Clinic broadband](), and included connectivity issues for provider-to-provider consultations when planning and providing care for patients. Broadband issues can delay images being sent or received and prevent video from working successfully with patients. If the provider cannot see the patient when using audio alone, they may feel uncomfortable making assessments for certain conditions, necessitating an in-person visit instead. Some providers and clinics chose not to participate in direct-to-consumer telehealth, specifically because of a lack of sufficient broadband for patients in communities. When clinic broadband, provider home broadband when working from home, or patient broadband fails, it can put a burden on patients and the health system.

Interviewees also described **clinic software and equipment-related barriers to telehealth utilization**. One influence was *a lack of reliable, functional telehealth-enabled devices and software in clinics*. These challenges can delay patient care and ultimately incur costly or burdensome travel for patients. Interviewees described telehealth challenges due to outdated hardware and software, such as computers lacking cameras or old devices being unable to run or update telehealth software. One interviewee described how this lack of up-to-date hardware and software forced providers to use personal devices to facilitate telehealth services, which delays care and may not always be appropriate due to security concerns. **Low digital literacy** among both providers and patients was also mentioned by interviewees as a barrier to telehealth utilization. Interviewees described a lack of provider knowledge of telehealth tools and difficulty troubleshooting telehealth challenges as a barrier to greater telehealth adoption. Low digital literacy among patients was also described as a barrier, including—in the words of one interviewee—"[lack of] capacity, the interest in technology, the concern over security, [and] that their private data is going to be accessible." Interviewees described these concerns as particularly prevalent among the elderly population who they explained would struggle to use a clinic's telehealth technology, leading to more in-person care or audio-only telehealth. In one example, an interviewee described how patients would be prompted to sign-up for telehealth services using a QR code, but the patient did not know how to use a QR code. These issues were compounded by practical issues, like losing the informational handout. Interviewees also described how both providers and patients become frustrated with online health systems due to *forgetting passwords* to access them. One interviewee in an IT support role described forgotten passwords as one of the most frequent issues they supported in their role. Thus, even basic technical issues that are relatively easy to resolve can disrupt or deter the use of telehealth services.

Interviewees also described **provider and staff training issues as barriers to telehealth utilization**. One of these the issues was *clinic providers and staff lacking sufficient*

*telehealth training*. For example, one interviewee described how new telehealth tools necessitate additional training for providers and staff, which is time-consuming for employees who are already busy. The interviewee went on to explain that providers and staff will sometimes revert to using old tools and processes because of a lack of familiarity and training with new tools. In an example of this influence, one healthcare stakeholder from Alaska described how their issues with staff training intersected with staffing shortages and high turnover, creating greater training demands with new or temporarily hired staff. Another interviewee described an example of this influence, explaining how front desk staff had been trained to offer use of a patient portal to all patients, but front office staff often made assumptions about patients and did not follow through on the training. The interviewee shared that one of their projects was to make the patient portal easier to use for patients as well as educating the front desk staff on the importance of offering the portal. Despite the extra training, staff typically did not ask patients for email addresses, assuming patients did not have an email address, which reduced the use of the patient portal. Interviewees also described *difficulty training providers in remote and rural areas*, especially in Alaska where CHAPs and other providers must travel long distances to receive in-person training in an urban area, or a trainer has to travel out to the rural communities to provide the training. Although virtual trainings are also offered, one interviewee explained that "videos and recordings aren't always the best solution. [CHAPs and other providers] all like at-the-elbow support. It is an ongoing challenge."

Healthcare stakeholder interviewees also described **staffing shortages issues** as a barrier to telehealth utilization, including *a lack of dedicated staff time to support telehealth* and *a shortage of credentialed local providers willing to provide telehealth*. Interviewees described *a lack of dedicated staff time to support telehealth* as a barrier to telehealth utilization. For example, one interviewee explained how in their healthcare system, one IT person supported multiple clinical locations across multiple counties of their state, which made timely resolution of complex IT challenges difficult. In another example, one interviewee in an IT role described the increased workload that results from supporting multiple people working from home, noting that recently an increased number of staff were choosing to work from home. In a system where technological resources are already limited and strained, this shift has required more IT staff to accommodate necessary equipment to work from home, further straining the already limited resources that could be used for telehealth support. Another interviewee described how a shift to an integrated EHR and telehealth system made troubleshooting telehealth issues more complex. They explained that the previous telehealth system was simpler to manage and allowed for IT to easily send troubleshooting links to patients and guide them with connecting to the platform. However, in the new integrated system, replication of issues and providing support for those issues was more challenging, making support much more complex. The interviewee went on to describe how additional telehealth features such as a virtual scribe or an interpreter have introduced further complications that make it more difficult to identify and resolve telehealth issues. A *shortage of credentialed providers* willing to provide telehealth in their rural communities was also described by interviewees as a barrier to telehealth adoption, particularly for specialty care. One interviewee explained that providers must be licensed in the state where they practice, which was a challenge when trying to contract telehealth services to fill gaps in care for their rural community. While out-of-state providers could potentially offer telehealth services if they were licensed in the state where they were practicing, licensing and credentialing is time-consuming and expensive, despite recent efforts to expedite the process. In Alaska, credentialing is handled by individual THOs, which is an important aspect of retaining tribal autonomy, but can also be a barrier to credentialing and thus to patients receiving timely

care. For example, providers outside of Alaska could provide telehealth services to residents of Alaska, but only if they have been licensed to practice within the state. Barriers to licensure and credentialing can therefore also be barriers to telehealth.

**Telehealth facilitators**

Interviewees identified several **facilitators to telehealth utilization**, including **the COVID-19 PHE increasing the need for and use of telehealth**, **a shift in the CHAP role** (specific to Alaska), **telehealth champions**, **user-friendliness of telehealth interfaces**, **billing and reimbursement for telehealth services**, and **a history and culture of remote work and care** (specific to Alaska). Interviewees described how **the COVID-19 PHE facilitated telehealth utilization** among both patients and providers, increasing adoption of telehealth out of the necessity to decrease the spread of infections and reduce the burden of care on overburdened systems. The catalyzing impact of the COVID-19 PHE was also described by healthcare stakeholders, who explained that providers and patients are "definitely more familiar and more comfortable with [teleconferencing software now] than they were before." In another example of the influence of COVID-19 on telehealth utilization, one healthcare stakeholder described how the COVID-19 PHE increased the demand for telehealth, which also drove the development of a dedicated telehealth support staff that persisted after the PHE. Interviewees also described how reimbursement changes made during the COVID-19 PHE further facilitated telehealth by increasing the types of telehealth services that could be reimbursed, such as audio-only telehealth and specialty services, which further increased revenue. Another interviewee described an additional example of this influence, explaining how some telehealth services had decreased since the PHE, but others are still used by patients to receive specialty care, particularly through audio-only visits. In this interviewee's view, the continuation of telehealth services facilitates care for many rural populations who would otherwise have to travel long distances for care (see Box 6 for an example).

> **Box 6. Example: Facilitators to telehealth utilization for providers and patients, COVID-19 PHE increasing the need for and use of telehealth**
>
> *"We're pretty new to the whole telehealth thing. Really, we had been discussing it pre-pandemic, but once COVID hit, it was like we were kind of forced to adopt telehealth just like everybody else. At first, we attempted video visits. We adopted a platform…and it just did not work for our patient base. That has a lot to do with no cell service in a lot of patients' homes, no internet access. The terrain here is very mountainous, so it's really hard for our patients to get service, either internet or cell service. We just decided to mostly do telephone visits, and that's really what carried us through COVID.*

Several recent **shifts in the role of the CHAP in Alaska** have also facilitated telehealth utilization. For example, one interviewee described how CHAPs were recently granted access to the secure provider-to-provider text communication platforming and the dedicated EHR system, which has facilitated telehealth. In contrast to the old, paper-based system, now CHAPs are able to chart quickly and efficiently in the EHR, streamlining documentation. Although a majority of communication is still completed over the phone, the system has simplified providers being able to review notes, document, and efficiently add their own recommendations. **Telehealth champions** were also described by interviewees as facilitating telehealth utilization. Healthcare stakeholders described examples of individual providers championing telehealth services, working to establish processes to reimburse for telehealth services and encourage telehealth

adoption among patients. Examples of such champions in dermatology and orthopedics were described below under **billing and reimbursement for telehealth services**. One interviewee described an additional example of how the efforts of one telehealth champion continued to be felt by that healthcare system years after that provider had left the organization. Another interviewee described another example of this influence, explaining how one provider used their own cell phone to text step-by-step instructions to patients to help them navigate connecting to the telehealth platform. The provider had also written instructions and troubleshooting tips for the front-desk staff when the provider was not available to help, enabling everyone to have a smoother experience. In an additional example of this influence, one interviewee described lasting effects on audiology in rural Alaska because of the influence of an Ears, Nose, and Throat specialist (ENT) who had championed tele-audiology. They explained how a provider in Anchorage had introduced a system to perform remote ear exams, addressing the growing need for audiological physical exams for children in rural Alaska. This champion was able to equip providers with tele-audiology tools as well as the training to use them, enabling providers in remote areas to conduct these assessments, having a lasting positive effect on care delivery for the patients and their families.

Interviewees also described how the **user-friendliness of telehealth interface** facilitated telehealth utilization among both patients and providers. Interviewees described how telehealth systems that were easy to use were more likely to be used by providers and patients, and thus more likely to be successful and further facilitate telehealth adoption. In another example of this influence, one interviewee in Alaska described how the introduction of more user-friendly telehealth systems lessened many of their challenges working with CHAPs out in rural villages, pointing out that new telehealth systems are now easier to use. The simplification of the technology has been significant in improving the usability of telehealth. Healthcare stakeholder interviewees also identified **billing and reimbursement for telehealth services** as a facilitating influence on telehealth adoption. For example, one interviewee highlighted how one dermatology provider had worked to learn telehealth reimbursement rules and was proactive about establishing a strong telehealth program. The provider was able to successfully implement the program and bill for services during a time when this practice was not yet widespread. Similarly, an orthopedic department described by an interviewee found innovative ways to adapt telehealth for their patients, both programs paving the way for broader adoption of telehealth within the system. In another example described by multiple interviewees, reimbursement changes made during the COVID-19 PHE further facilitated telehealth by increasing the types of telehealth services that could be reimbursed, such as audio-only telehealth and specialty services, which further increased revenue. However, interviewees also expressed concerns that the expected expiration of these policy changes would become a barrier to telehealth once they were no longer in place. Billing practices play a significant role in the sustainability of telehealth, but as waivers expire, healthcare systems are seeing insurance providers closing the doors on reimbursement for telehealth services. For instance, a major insurance provider for many of the patients at this interviewee's institution announced that as of December 1, 2023, they would no longer be reimbursing for audio-only telehealth visits, e-visits, and questionnaires. At the time of the interview, the interviewee anticipated even more rollbacks in 2024. This will greatly limit the ability to continue telehealth visits unless legislative action can be taken. The shift highlights an important connection between insurance reimbursement and the continued growth of telehealth programs.

**In Alaska, a long history and culture of remote work and care** was identified by Alaskan interviewees as a facilitator for telehealth utilization. Because of the difficulty reaching

many of the remote villages in Alaska, Alaskans have a history of distance care innovation, including healthcare delivery with CHAPs over radio.[7] However, as one interviewee described, the success of the CHAP model has inspired adaptation to other services, such as legal services. Interviewees described how this history and general support of distance services has streamlined the provision of these services in Alaska, further facilitating telehealth. However, one interviewee described the Alaskan history of providing tele-services for many years as a barrier to adoption of new technologies, as systems and people could become entrenched in outdated ways of delivering services.

**Benefits to providers and patients utilizing telehealth**

Interviewees described several **benefits to both patients and providers** utilizing telehealth, including *reduction in the need for patients to travel long distances for healthcare*, *improvement in patient access to quality and specialty healthcare*, *improvement in the timeliness of healthcare*, and *providers practicing from anywhere*. Interviewees described **benefits of telehealth utilization to patients**, such as *telehealth reducing the need for patients to travel long distances for healthcare*. One interviewee explained how telehealth saved time for patients who otherwise would not be able to have an in-person visit, often due to a lack of reliable transportation. They described patients living in rural areas, sometimes located miles from care without reliable transportation to get to their appointment. Another interviewee described how telehealth benefited elderly patients in particular, for whom traveling long distance in a car for an in-person visit could be challenging. Telehealth is also beneficial for working patients. As one interviewee described, telehealth allows these patients to use their break time to complete their telehealth appointment, avoiding having to take leave to complete a provider visit. One interviewee in Alaska described an example of the high cost of travel for in-person care in rural communities. They described that the geography of Alaska makes costly air travel the only option for accessing care. Alaskan weather frequently disrupts such flights, which can increase the duration of a patient's stay, which also incurs costs. Reducing the time and money required for such travel makes telehealth especially valuable to this population by providing accessible care.

Interviewees also described *an improvement in patient access to quality and specialty healthcare* as a benefit to patients utilizing telehealth. For example, one interviewee in a provider role described how video-enabled telehealth services allowed for provider examination of wounds, lacerations, and tissues facilitated timely care delivery and reduced the need for patients to travel long distances. The provider emphasized the high quality of care available to remote locations and this is directly attributable to telehealth. The interviewee went on to describe additional examples of how telehealth enables higher quality care for patients in emergency situations in rural areas, benefitting patients as well as local providers by enabling specialty support. This type of access brings reassurance to providers working in remote areas, making them feel less isolated. Another provider described an example of the benefit of telehealth to patients by improving the quality of care for very remote regions of Alaska. They explained that telehealth enables them to deliver excellent care across an enormous and diverse area. Interviewees also described how *telehealth improved the timeliness of care* for **patients**. Interviewees described how telehealth facilitates access to care—particularly specialty care—for patients living in rural communities who might otherwise delay appointments due to the time and cost of travel. One Alaskan healthcare stakeholder described an example of how telehealth facilitated timely healthcare delivery to a patient with a COVID-19 infection while reducing the risk of infection to a CHAP. The CHAP would leave a disinfected telehealth-

enabled device outside the patient's home with instructions on how to connect to the telehealth visit via the device. This setup allowed the patient to receive care while allowing the CHAP to keep a safe distance during the PHE, ensuring both the patient and CHAP were protected and the patient was able to access the care they need.

One interviewee described an example of the **benefits of telehealth for providers** allowing *providers to practice from anywhere*, explaining how a lack of healthcare providers in one rural part of their healthcare network could be addressed via telehealth with a provider in another community. This process reduced the burden on parents who do not have to travel long distances to get care for their child. A provider described an example of this influence, explaining how the use telehealth over LEO satellite connections facilitated emergency services in rural areas.

## Discussion

As part of an evaluation of the TBP Program implemented in 25 target counties of Alaska, Michigan, Texas, and West Virginia, interviews with 16 healthcare stakeholders in TBP communities revealed perceptions of broadband and influences on telehealth. Interviewees described how poor broadband quality in clinics increased provider and staff workload and risk to patients. Additionally, healthcare stakeholders explained that quality broadband increased the types of services clinics offered, the number of patients served, and the reliability of healthcare services. Interviewees reported limited choices in broadband service providers, high costs of broadband services, and involvement of decision-makers as having an influence on choice of broadband in clinics. They also reported several strategies to increase or maintain broadband in clinics, such as adopting LEO satellite technologies, filtering traffic to keep broadband open for healthcare, and implementing backup networks and systems.

Healthcare stakeholders also reported poor broadband quality and access and VPN connection issues for providers practicing from home as delaying healthcare service delivery. Additionally, interviewees described barriers for patients in TBP communities obtaining and maintaining broadband, such as high costs, poor or inconsistent broadband access and quality, less broadband investment in rural communities, and delays in broadband service repairs. However, TBP communities described several facilitating influences for patient and community broadband, including good or improving broadband access and quality, funding to increase broadband access, and increased LEO satellite broadband availability.

Telehealth decision-making influences were identified by interviewees as including patients, and clinic staff, all of whom played roles in determining whether telehealth would be utilized. Telehealth tools and software adoption were influenced by committee or collaborative decision-making in telehealth systems. Healthcare stakeholder interviewees also described barriers to telehealth utilization for providers and patients, including poor or inconsistent broadband access and quality, clinic software and equipment-related barriers, provider and patient resistance to change, low digital literacy among providers and patients, staffing shortage issues, as well as provider and staff training issues. Interviewees additionally identified several influences that facilitated telehealth utilization, including a history and culture of remote and distance work and care specific to Alaska, the COVID-19 PHE increasing the need for and use of telehealth, billing and reimbursement for telehealth services, user-friendliness of the telehealth interface, the shifting role of the Alaskan CHAPs, and telehealth champions. Finally, interviewees identified benefits of telehealth utilization for providers and patients, including permitting providers to practice from anywhere, improving patient access to quality and specialty

healthcare, reducing the need for patients to travel long distances for healthcare, and improvement in the timeliness of patient care.

The telehealth facilitators identified by healthcare stakeholder interviewees in TBP communities align with previous results demonstrating similar facilitators, including the COVID-19 PHE, reimbursement, broadband access and quality, user-friendliness of systems, and having a telehealth champion.[8–11] Several of the barriers to telehealth utilization have also been supported by previous findings, such as poor or inconsistent broadband access and quality, training issues, hardware and software issues, low digital literacy, and lack of telehealth support staff.[12–15] Many of the influences identified as related to broadband access and quality for clinics, providers, and patients have also been replicated in prior research, such as cost, lack of broadband options, and increased availability of LEO satellite technologies.[16,17]

Across semi-structured qualitative interviews with healthcare stakeholders in TBP target counties, reliable and consistent broadband access was found to have multiple benefits to healthcare systems, providers, and patients. However, a number of barriers to obtaining and maintaining broadband access for providers and patients were also described, as well as barriers to telehealth utilization. These findings support the need for increased, affordable broadband options for clinics, providers, and patients to facilitate telehealth service utilization. The results of this study also support a continuation of reimbursement for telehealth services to increase access to healthcare for residents in TBP communities. Additionally, ongoing training and dedicated staff time to support technical assistance for telehealth are also factors that would continue to support telehealth in TBP communities. Evidence from healthcare stakeholders also demonstrated that support for digital literacy is needed, both for providers and patients. Finally, increasing access to a consistent broadband-enabled device would also benefit patients to ensure continuity of healthcare services, both in clinic and at home.

**References**

1. Marcin JP, Shaikh U, Steinhorn RH. Addressing health disparities in rural communities using telehealth. *Pediatr Res*. 2016;79(1-2):169-176. doi:10.1038/pr.2015.192

2. Butzner M, Cuffee Y. Telehealth interventions and outcomes across rural communities in the United States: Narrative review. *J Med Internet Res*. 2021;23(8):e29575. doi:10.2196/29575

3. Bell N, Hung P, Lòpez-De Fede A, Adams SA. Broadband access within Medically Underserved Areas and its implication for telehealth utilization. *J Rural Heal*. 2023;39(3):625-635. doi:10.1111/jrh.12738

4. Tilhou AS, Jain A, Deleire T. Telehealth expansion, internet speed, and primary care access before and during COVID-19. *JAMA Netw Open*. 2024;7(1):E2347686. doi:10.1001/jamanetworkopen.2023.47686

5. Community Health Aide Program. Alaska's health aide model.

6. Rachfal CL. *Low Earth Orbit Satellites: Potential to Address the Broadband Digital Divide, R46896*.; 2021. https://crsreports.congress.gov/product/pdf/R/R46896

7. Patricoski C. Alaska telemedicine: Growth through collaboration. *Int J Circumpolar Health*. 2004;63(4):365-386. doi:10.3402/ijch.v63i4.17755

8. Almathami HKY, Than Win K, Vlahu-Gjorgievska E. Barriers and facilitators that influence telemedicine-based, real-time, online consultation at patients' homes: Systematic literature review. *J Med Internet Res*. 2020;22(2). doi:10.2196/16407

9. Terry DL, Buntoro SP. Perceived usefulness of telehealth among rural medical providers: Barriers to use and associations with provider confidence. *J Technol Behav Sci*. 2021;6(4):567-571. doi:10.1007/s41347-021-00215-5

10. Lieneck C, Weaver E, Maryon T. Outpatient telehealth implementation in the United States during the COVID-19 global pandemic: A systematic review. *Medicina (B Aires)*. 2021;57(5):462. doi:10.3390/medicina57050462

11. Haque SN, DeStefano S, Banger A, Rutledge R, Romaire M. Factors influencing telehealth implementation and use in frontier critical access hospitals: Qualitative study. *JMIR Form Res*. 2021;5(5):e24118. doi:10.2196/24118

12. Broffman L, Harrison S, Zhao M, Goldman A, Patnaik I, Zhou M. The relationship between broadband speeds, device type, demographic characteristics, and care-seeking via telehealth. *Telemed e-Health*. 2023;29(3):425-431. doi:10.1089/tmj.2022.0058

13. Rabbani M, Bogulski CA, Allison MK, Eswaran H, Hayes C. Telehealth and willingness to pay for internet services. *Telemed e-Health*. 2024;30(7):1880-1891. doi:10.1089/tmj.2023.0692

14. Jonasdottir SK, Thordardottir I, Jonsdottir T. Health professionals? Perspective towards challenges and opportunities of telehealth service provision: A scoping review. *Int J Med Inform*. 2022;167:104862. doi:10.1016/j.ijmedinf.2022.104862

15. Phimphasone-Brady P, Chiao J, Karamsetti L, et al. Clinician and staff perspectives on potential disparities introduced by the rapid implementation of telehealth services during COVID-19: a mixed-methods analysis. *Transl Behav Med*. 2021;11(7):1339-1347. doi:10.1093/tbm/ibab060

16. Reddick CG, Enriquez R, Harris RJ, Sharma B. Determinants of broadband access and affordability: An analysis of a community survey on the digital divide. *Cities*. 2020;106:102904. doi:10.1016/J.CITIES.2020.102904

17. Akcali Gur B, Kulesza J. Equitable access to satellite broadband services: Challenges and opportunities for developing countries. *Telecomm Policy*. 2024;48(5):102731. doi:10.1016/j.telpol.2024.102731