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## Management of Hearing Loss Through Telemedicine

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### Keywords

Telemedicine; Hearing loss

Hearing loss affects over 360 million people worldwide and has become a major public health and economic problem.<sup>1</sup> The negative impact of untreated hearing loss on communication, education, employment is profound leading to an annual economic burden of disease of over 750 billion dollars.<sup>1</sup> The effective and efficient treatment of hearing loss is complicated by a global disparity in hearing healthcare providers, especially in rural regions of high income countries and throughout low income countries.<sup>2</sup> Changes in policy related to hearing healthcare have mandated improved access to care, enhanced quality of care, and focus on value in healthcare. Shifting practice patterns are influencing how and where hearing healthcare is delivered. Telemedicine, which is defined as the use of communications technology to get the right care to the right people at the right time in the right place for the right price, has great potential to meet the demand and improve delivery of hearing healthcare.

Due to technology refinement, telemedicine has become a prominent player in many healthcare disciplines and will likely become more prevalent in hearing healthcare. In order to improve access for all patients no matter where they live, there is mounting competitive pressure to utilize telemedicine for care delivery. Many large companies, insurance providers, and mega-chain pharmacies have already developed primary care telemedicine programs to extend delivery of care to anyone, anywhere, at any time for their respective employees, clients, and customers. Hearing healthcare services will inevitably be included in these programs, which will dramatically affect hearing healthcare practices. Many hearing healthcare providers have not considered telemedicine as an option for their patients who are economically or geographically isolated from needed services. Telemedicine solutions, specifically tailored for the needs of patients and specialists dealing with hearing loss, have been slow to develop and gain widespread implementation.

The potential benefits and uses of telemedicine in the delivery of hearing healthcare are widespread. Flexibility in location and methodology of accessing care can improve timely

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diagnosis, convenience, and compliance with treatment plans. The applications of telemedicine in hearing healthcare include patient education, otoscopy, audiometric testing, electrophysiological testing, hearing aid fitting, and cochlear implant programming. In this current era of undiagnosed and untreated hearing loss, the development and validation of remote hearing screening through smartphone applications is promising to improve public awareness and access of hearing loss diagnostic testing.<sup>3</sup> Vulnerable populations, such as children from rural areas, may also have expanded access to care through remote video otoscopy and audiometry evaluation.<sup>4</sup> Recent systematic reviews have demonstrated the feasibility and efficiency of telemedicine delivery of programming of hearing aids and/or cochlear implants.<sup>5,6</sup> There is a strong demand for telemedicine school-based care delivery, which is a promising area for both students and schools as school are mandated to provide certain services but may lack the expertise and personnel to deliver services for children with hearing loss. Furthermore, by delivering care within the school-setting, compliance and continuity of care is likely to be favorable. Based on recent policy changes occurring mostly on state-levels, widespread delivery of remote hearing services is not only possible but is probable. There is promising evidence that a variety of telemedicine services may be covered by health insurance plans. Furthermore, the future focus on value-based payment increases the interest in developing efficient and effective delivery models. Constantly improving user interfaces, technology options, and internet connectivity in remote locations may make telemedicine services more appealing to providers.

There are significant barriers, which prevent the widespread utilization of telemedicine. The biggest barriers include licensure challenges, lack of reimbursement for services, and equipment costs. There are no national standards regarding telemedicine licensure requirements. Generally, providers are required to be licensed in the state where the patient is located. If care is delivered across state borders, many states require licensure in both states. Many state audiology boards are investigating models to standardize licensure for telemedicine delivery. Reimbursement is also a significant barrier in telemedicine but varies widely from state to state. Physicians may be able to be reimbursed for providing some medical care remotely (including history and physical examination); however, the Centers for Medicare and Medicaid do not include audiologists as eligible providers for telemedicine. The Medicaid Telehealth Parity Act of 2017 (HR 2550),<sup>7</sup> which is currently under legislative consideration, seeks to expand to role of audiologists as telemedicine providers. The cost of telemedicine setup can vary widely and depends on the type of care being delivered. Videoconferencing technology has become very inexpensive, often integrating into the provider's desktop computer. Currently, there are significant limitations in technology designed specifically for hearing services. An outfitted teleaudiology cart system (FIG 1) can cost over \$20,000, which is a significant amount of capital investment. Remotely controlled audiology testing technology, specifically designed for telehealth applications, has been slow to market and as a result is still quite expensive. Traditional full-featured telehealth technology, including specialty cameras and an electronic stethoscope cost over \$50,000 in the late 1990's. That same functionality can now be added to an existing computer for under \$5,000 and some simple telehealth applications can be done with a desktop computer, smartphone or tablet with no capital expenditure. There is a lack of research clearly demonstrating the cost-effectiveness of telemedicine, which directly

influences the sustainability of telemedicine services. Some providers are hesitant to implement such services since the delivery of remote hearing healthcare lacks standardized protocols. Furthermore, most of the research in hearing healthcare telemedicine lack strong evidence and rigorous methodology.<sup>6</sup> Additional gaps in telemedicine research include patient (and provider) perceptions regarding the quality and value of the care they receive (deliver).

Considering the public health burden of hearing loss, providers must explore ways to provide care to the poorly reached and underserved. A multidisciplinary and multi-pronged approach is in order to address hearing health inequity, of which, telemedicine plays a role. How can a provider consider the role of telemedicine within their practice, healthcare system, or community? Providers should be asking questions about local health disparities. Who is not being reached? Who could be reached? Why are they not reached? Next, consider ways that telemedicine could overcome those barriers. This could range from dialogue with primary care providers regarding use of phone-based applications for their patients with follow-up referrals to the investment in a comprehensive telemedicine hearing system cart to deliver diagnostic/therapeutic services (Figure 1). Each provider should consider legal and regulatory challenges to proposed services and create a justifiable business model. Additional considerations include assessment of infrastructure requirements for a telemedicine venture, such as space, network, equipment, software, personnel, remote community partners. Ultimately, it may require providers to pilot-test the feasibility and the acceptability remote hearing healthcare delivery within their practice setting and interact with other colleagues within the region or state to modify the program to provide the highest quality accessible care in a consistent manner. Improving access to the best hearing healthcare is the responsibility of every provider; however, this task may seem daunting. By leveraging technological advancements and experts within the telemedicine field, hearing healthcare providers can become leaders in innovative telemedicine models of hearing healthcare delivery that improve access to care for those who need it most.

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**Figure 1 –.**  
Telemedicine hearing healthcare diagnostic and device cart.

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