By Dave Davis

Tele-diagnostics in audiology has been gaining momentum over the last several years, with more and more institutions and companies exploring this as a means of furthering their hearing care practice model. Many articles on tele-audiology have been published in the last few years, and I've been active in promoting it through various talks, presentations and articles as well. Many who extoll the virtues of tele-audiology talk about it as though it is a great possibility for the future. But as someone who is actively involved in projects and helping organizations implement it today, I can tell you that it is here, helping overcome time and distance barriers, and improving patient care already.

While telehealth implementations of video otoscopy have been around for decades, the remote administration of patient diagnostic testing wasn't really feasible until 5-10 years ago. I founded and ran a telemedicine company in the late 1990's and can attest that telemedicine in those days was expensive and long-term costs were difficult to justify. In that same time period, the advent of the "store and forward" model took hold and teleconsultations between generalists and specialty care physicians began to grow rapidly. With both real-time and the asynchronous mode offered by store and forward software systems, the telecare delivery model of services for many specialties flourished. But audiology, among others, lagged in advancing to a more robust implementation model, due largely to the misfit with either of the real-time and asynchronous modes. Today, due to the widespread availability of broadband Internet access, and the maturity of web conferencing technology, tele-diagnostics for the hearing care industry is ready for prime time. While reimbursement and licensure issues still exist, both are beginning to move toward opening the door to broad-based adoption and rapid growth over the next few years.

So what are the keys to implementing a successful tele-diagnostics program? There are many, and they generally can be grouped into the following categories: planning, clinical issues logistics, and technical issues. Let's discuss each of these and the do's and don'ts associated with them.

Planning

I often encourage people to spend more time planning a tele-audiology project than they usually think is warranted. Of course, you'll need a time and resource plan, but you'll also want to include ample time for the clinical staff and avoid the typical "borrowed time from other clinical duties" trap that's so tempting to fall into. Your clinical staff will need to devote a good bit of their time to the daily setup and checkout activities that are part and parcel to a tele-diagnostics configuration, and that can be time consuming. It isn't just the actual testing time with patients, but also the prep, instruction time, and verification of the equipment prior to commencing the patient testing process. All of this adds up, and is typically forgotten in the overall planning process. Make sure you define clear goals and objectives for the study and deployment of the tele-diagnostic systems. A good metric to consider is equivalence in testing time with in-person testing. This may be a bit unrealistic in the early stages of the project, but over time would be a desirable goal in order to optimize your productivity and further blur the line between hearing care delivery modes.

Also, if you're running a study to compare, for example, in-booth versus outside the booth testing, pay close attention to the study design to ensure a true apples-to-apples comparison. I've seen instances where different equipment is used, and while the equipment should produce comparable results if properly calibrated, there's really no substitute for eliminating this variable if you want a valid comparison.

You'll also need access to Information Technology (IT) specialists, and potentially other technical resources throughout the early stages of the project. Too often, these resources are hard to obtain and scheduling conflicts can easily occur. The more routinized you can make your startup and test procedures, the less IT help you may need, but it is still important to have quick access to technical help and troubleshooting resources during patient testing sessions.

Clinical Issues

Clinical workflows for tele-diagnostics will likely be similar to your normal routine, but will probably require some small adjustments to account for the virtual interactions. For instance, some additional time may be required for instructing the patient prior to commencing the testing process. The role of an audiology assistant co-located with the patient and the need for routine switching of communication between the remote audiologist and assistant or direct to the patient requires some extra time and will smooth out over time with practice. We recommend focusing a great deal of attention on this portion of the delivery of care model, as the flow of communication, switching of equipment and the assistant's ability to act as an extension of you in this model is really the key to patient satisfaction and accuracy of the test results.

There are a myriad of ways that interruptions can occur in a typical testing scenario such as this, ranging from patients needing to pause, to the communications, equipment, or software issues that invariably occur. To minimize interruptions that affect the testing time and process quality, spend time at the beginning of the project, brainstorm what interruptions are possible and develop a Pareto analysis to address those that are most likely and time consuming. A good place to begin this is a well-documented and optimized startup and shutdown checklist. If something does cause an interruption, such as a software glitch or communication failure, a quick restart and return to the testing can be completed, and wasted time minimized. A daily or session check can also be used to ensure a smooth patient testing process, by ensuring all the equipment is operating properly before engaging with the patient.

Logistics

If your equipment configuration requires a cart system or mobile access and flexibility, you'll also need means to ensure consistent and reliable setup and testing. When mobility is involved, it increases the need to predict interruptions, especially due to the communication links and movement of equipment – with the resulting shifts and connection issues that may result. For cart systems in particular, a well-integrated and secured design that keeps all equipment stable during transport can be key to project success.

Further, there are small adjustments that can be made to make the assistant's role more efficient, such as a foot pedal for actuating the otoscope image capture if movement becomes an issue. Remote audiometry is challenging due to the need to provide multiple communication pathways (face to face with the patient over the videoconferencing link versus patient communications pass through and speech testing, and scoring under headphones). Time spent in verifying these pathways, and efficiently switching between them, will help ensure a smooth testing process. When it comes to immittance testing, assistants will need to be well trained and practiced on the art of ensuring a good seal for the probe to obtain accurate measures.

Technical Issues.....

Security is a frequent concern, and can usually be addressed by looking at firewall limitations. We've implemented both private (entirely behind firewall) and shared resource projects that use the public Internet as medium for remote testing. Any reputable service for web conferencing will have encryption built-in, but private network installations as well as HIPAA compliance need to be fully planned into a project design.

We recommend using dedicated PCs for most projects, and not using the same laptop or desktop you use for all other daily work. This is often hard to sell conceptually, as most hearing care professionals would like to make use of their PC for flexibility in their daily routine. But dedicating the equipment to tele-diagnostics has clear benefits, including minimizing the chance of testing problems due to things like too many active programs, resource conflicts and the like.

Wi-Fi has become our go-to for ease of access, but there's a penalty for the flexibility it provides. Whenever feasible, use hard-wired connections to avoid the variability and speed differences found with Wi-Fi connections. We often forget, but there can be a real performance penalty when using Wi-Fi, due largely to interference and distance issues that arise. This can cause retransmission and error correction, resulting in performance problems. Since the main objective is to emulate a real-time face-o-face interaction, any degradation that can occur and be managed should be reconsidered.

A small, but significant, issue is screen resolution matching between the audiologist station and the equipment, and patient location PC screen. If the resolutions are not the same, the conferencing product has to do extra work to interpolate the screen contents and replication. This can have a significant impact on performance as well, and is easily cured by changing screens to a common resolution – typically between 1024x768 and 1366x768.

Finally, the available network bandwidth and traffic can pose a significant threat to the testing process, and must be considered carefully during the planning and testing stages of the project. While large institutions often have robust and scalable bandwidth, the network traffic that you're competing with can dramatically affect the testing process. Videoconferencing is a notorious bandwidth hog, and if your remote control of the diagnostic equipment is competing on a network with a volume of other users and unknown activity, problems will likely occur. Your IT and networking department staff often have bandwidth analysis tools and methods to predict or allocate bandwidth to a particular task, and this will be a real benefit to ensure consistent performance across time and distance.

This article covers many of the important elements in defining and implementing a successful tele-diagnostics project, but they are by no means the only issues you'll encounter. It's best to start small and perfect the operational aspects of your project before deploying on a large scale basis. By planning well, brainstorming the possible problems and planning for them, and documenting ways to recover from problems, you'll increase the likelihood of your project success greatly. ■

Dave Davis is president and CEO of RemotEAR. He can be reached at ddavis@remotear.com. RemotEAR was founded in 2011 by Dave Davis and is the only company in the hearing care industry that is solely focused on tele-audiology. The company holds key patents for tele-diagnostics, and offers licensing of its intellectual property to companies and public and private institutions who wish to implement tele-diagnostics as part of their hearing care delivery model. RemotEAR also offers consulting services for planning, clinical and technical project management as well as design and integration of custom solutions ranging from cart systems to mobile/handheld tele-diagnostic systems.