Teleaudiology: Are patients and practitioners ready for it?

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...the provision of health services from one location to another using a telecommunications medium...

Source: Darkins & Carey, 2000
“I do tech support for a HA manufacturer. I have fit patients over a telephone/internet connection several provinces away. I have been able to sort out their issues in less than 30 min without travelling. Weird at first but wonderful!”

Audiologist with 28 years of experience
“I have done some pediatric ABRs via videoconferencing and upon talking with some families, they are more likely to get their children tested when they don't have to drive as far.”

Audiologist with 2 years of experience
“I believe testing and fitting aids via [the] internet will reduce [the] position of audiology to that of a technician.”

Audiologist with 15 years of experience
“I think that the whole concept of teleaudiology is horrible! Why not just invent robots to take over the profession???”

Audiologist with 7 years of experience
Why study teleaudiology?
Telehealth: Possible Benefits

- Increasing access to healthcare
- Reducing wait times
- Reducing medical travel
- Minimizing caregiver stress/time off paid work
- Facilitating rapid response
- Reducing CO₂ emissions
- Reducing costs of delivering healthcare
- More comfort when discussing stigmatizing issues
- Improved clinical outcomes
- Improved adherence to treatment

Clark et al., 2007; Darkins & Carey, 2000; DelliFraine & Dansky, 2008; Jennett et al., 2003; Wantland et al., 2004; Watanabe et al., 1999
Ratio of Audiologists to General Population: Developed World

= 1000 people
Ratio of Audiologists to General Population: 
**Developing World**

= 1000 people

Swanepoel et al., 2010
Ratio of Audiologists to General Population: Developing World (optimistic estimate)

= 1000 people

Swanepoel et al., 2010
Ratio of Audiologists to General Population: 
**Developing World (pessimistic estimate)**

Swanepoel et al., 2010
Global Telemedicine Market: Strong Growth Expected

BCC Research, 2012
Projected average global residential download speed (Mbps) 2009-2014

Source: Hyperconnectivity and the Approaching Zettabyte Era, June 2, 2010, Cisco
The number of broadband wireless subscriptions in the US has exceeded the number of people in the US.
Models of Telehealth Delivery

Real Time: Synchronous, interactive, and live:

- Users on both ends are communicating with real-time feedback
  - Telephone
  - Skype

Cloud-based: Asynchronous & off-line:

- Information is stored and reviewed at a later time (also known as “store-and forward”)
  - Answering machine
  - E-mail
Telehealth – Direct connection

- “Self-administered”
- Administered by clinician
Telehealth – Connection via a facilitator

- Central Office
  - Clinician
  - Facilitator: Less training/education than the clinician
  - Located in a regional clinic

- Remote Site
  - Secure Internet Connection
  - Phone / Video Conferencing

- Patient
- Facilitator

<table>
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<th>Categories</th>
<th>No. of Reports</th>
<th>Study Populations</th>
<th>Procedures/Techniques</th>
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<td>Children and adults</td>
<td>Video-otoscopy, audiometry (AC and BC), HINT, ABR, intraoperative monitoring, balance testing</td>
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<td>Adults</td>
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<td>Patient perceptions</td>
<td>2(3)</td>
<td>Adult clinic patients, tinnitus patients, cochlear implant mapping patients</td>
<td>Questionnaires</td>
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Supplementary notes:
- Reports of audiological intervention also including patient perceptions.
- AABR, automated auditory brainstem response; ABR, auditory brainstem response; AC, air conduction; BC, bone conduction; CI, cochlear Hearing-in-Noise-Test; OAE, oto-acoustic emissions.
• Most studies involved a facilitator with the patient
• Study designs mostly compared the results of face-to-face evaluations and remote evaluations
• Results: Good agreement between face-to-face appointments and teleaudiology appointments
• Caveat: Thus far, few studies per topic
Today’s research: Attitudes toward teleaudiology
Berg (1999) found that 75% of telemedicine interventions ultimately fail.

To understand why, Broens et al. (2007) and Hailey & Crowe (2000) conducted meta-analyses of telemedicine interventions:

- Reliable technological systems that support the intervention
- *They also found that it is critical to understand attitudes of key stakeholders toward the intervention*
I initially assumed that the attitudes of patients toward teleaudiology mattered most.
I initially assumed that the attitudes of patients toward teleaudiology mattered most.
Acceptance by clinicians is a key factor in determining success with telemedicine interventions

(Al-Qirim, 2007; May, 2006; Wootton & Herbert, 2001).

The practitioner is described as:

“the most important initial gatekeeper for success with telemedicine interventions”...

(Whitten & Mackert, 2005)
Study I
Study I: Qualitative Study

- Interview-based qualitative study exploring attitudes toward teleaudiology
- Potential participants were nominated by a panel of 3 experts, with the goal of inviting hearing health care professionals with varied but relevant work histories
- 60-100 minute long interviews of 11 hearing health care practitioners (data saturation was obtained) were conducted
- Interviews were transcribed and coded by 2 independent coders
A total of 97 codes emerged, clustering into core themes:

• Advantages & disadvantages of teleaudiology
Convenience
Principal disadvantage: Teleaudiology could pose a threat to patient-practitioner relationship quality
Discomfort...
...it's a gut feeling....
....the in-person experience is richer...
“You almost need to be in [the client’s] presence to understand their body language and eye contact and their tone. I’m not exactly sure what it is. It’s almost an intangible thing to me. In order to feel comfortable with someone and trust them, I would prefer to have built that in person.”

-Audiologist (public setting)  
18 years of experience
Qualitative study: Major themes revealed

Teleaudiology is well-suited for some clinical tasks & patient populations, and not others.

<table>
<thead>
<tr>
<th>Well-suited</th>
<th>Not well-suited</th>
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<tbody>
<tr>
<td>Aural Rehab</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Follow-up appointments</td>
<td>New patients</td>
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<tr>
<td>Issue of accessibility</td>
<td>Children</td>
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</table>
TECHNOLOGY

The learning curve is just too steep for some
Study II
Goal: To survey attitudes toward teleaudiology in a large sample of hearing health care practitioners.

Participants:
- Recruited through electronic mailing lists and postings at conferences.
  - 202 practitioners ($M = 39.3$ years age; $SD = 11.0$)
    - 28: Owned their own clinic(s)
    - 109: Worked in a private practice
    - 53: Worked in a non-profit environment
Perceived effect of teleaudiology on hearing health care

-3 -2 -1 0 1 2 3
Worsen
No effect
Improve

Proportion of respondents

Meet quickly  Accessibility  Relationship quality: Returning pts  Quality of care  Quality of Interaction  Ability to discuss private topics  Relationship quality: New pts

Mean

-3 -2 -1 0 1 2 3
Worsen
No effect
Improve

Perceived effect of teleaudiology on hearing health care
Willingness to use Teleaudiology: Clinical tasks

Proportion of respondents

- Answer questions
- Counseling
- HA adjustments
- Screening
- 1st fit: Returning pt
- Assessments
- 1st fit: New pt

Extremely willing
Moderately willing
Not at all willing

1
2
3
4
5

100
80
60
40
20
0
Willingness to use Teleaudiology: Patient groups

The graph shows the proportion of respondents willing to use Teleaudiology across different patient groups:

- **Tech-savvy**: Most willing, with a majority extremely willing.
- **Remote**: Moderately willing, with a significant proportion moderately willing.
- **Mobility issues**: Not at all willing, with a majority not at all willing.
- **Out of town**: Extremely willing, with a significant proportion extremely willing.
- **Busy schedules**: Not at all willing, with a majority not at all willing.
- **Returning pt.**: Not at all willing, with a majority not at all willing.
- **New pt**: Extremely willing, with a significant proportion extremely willing.

The colors represent different willingness levels:
- **Green**: Extremely willing
- **Blue**: Moderately willing
- **Red**: Not at all willing
- **Yellow**: Extremely willing

The black dots represent the mean willingness for each group.
Willingness to use Teleaudiology: Age groups

Age group (years)

- 0-2
- 3-6
- 7-12
- 13-17
- 18-30
- 31-65
- 66-79
- >80

Proportion of respondents

- Extremely willing
- Moderately willing
- Not at all willing
On average, it is believed that teleaudiology will increase accessibility, but will likely have a minimal effect on hearing health care.

However, there are significant proportions of clinicians who have opposing attitudes toward teleaudiology.

Willingness to conduct teleaudiology appointments is highly dependent on the clinical task to be performed and the patient group receiving service.
Why are there such fervent beliefs for and against the use of teleaudiology in hearing health care?

In part, practitioners may be adopting different frames of reference regarding:

• Clinical tasks to be performed
• Patient populations being served
Study III
Study 3: Pediatric vs. Non-pediatric Practitioners

Goal: To better understand the observed reluctance of using teleaudiology with pediatric populations

Original sample: Only 15 of the 202 participants indicated that pediatrics comprised their primary clientele

Collected data on 30 additional practitioners who indicated that pediatrics comprise their primary clientele
Pediatric vs. Non-pediatric Practitioners Willingness to use teleaudiology: Age groups

<table>
<thead>
<tr>
<th>Years of Age</th>
<th>Extremely willing</th>
<th>Moderately willing</th>
<th>Not at all willing</th>
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<tr>
<td>0-2</td>
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<td>3-6</td>
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<td>65-79</td>
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<td>&gt; 80</td>
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Adults

Graph shows willingness to use teleaudiology across different age groups.
Pediatric vs. Non-pediatric Practitioners Willingness to use teleaudiology: Age groups

- Extremely willing
- Moderately willing
- Not at all willing

Years of Age:
- 0-2
- 3-6
- 7-12
- 13-17
- 18-30
- 31-64
- 65-79
- > 80

Graph showing willingness levels for adults and pediatrics across different age groups.
Study 3: Interpretation

Reluctance of practitioners to conduct teleaudiology appointments with pediatric populations may be due to a practitioner’s familiarity conducting audiology appointments with children.
What are the attitudes of patients toward teleaudiology?
Patient attitudes toward teleaudiology

- Questionnaire design
- Postings at 50+ audiology clinics (electronic or paper copies)

224 respondents
- All had experienced at least one audiology appointment
- 129 males; 95 females
- Mean age = 67.1 years ($SD = 15.3$)
Patient attitudes toward teleaudiology

Patient Willingness to use Teleaudiology

% of respondents

Not at all willing

Moderately willing

Extremely willing
Willingness to have a teleaudiology appointment: Comfort with technology

![Bar chart showing willingness to have a teleaudiology appointment by comfort with technology]

- **Low**
- **Moderate**
- **High**

The chart indicates a trend where an increase in comfort with technology is associated with a corresponding increase in willingness to have a teleaudiology appointment.
Examined 27 factors that might contribute to willingness to conduct teleaudiology appointments.

MORE likely to have a teleaudiology appointment

LESS likely to have a teleaudiology appointment
Factors MOST LIKELY to motivate a teleaudiology appointment

- Access to specialists
- Flexible appointment times
- Meeting with practitioner in emergencies
- Minimize time is waiting room
- Obtaining appointments quickly

Does not impact my decision

Much more likely
Factors LEAST LIKELY to motivate a teleaudiology appointment

- Can not examine me
- Can not examine my hearing aid
- Lack of social contact
- Being in the same room
- Change in eye-contact
- The bond I have with my practitioner

Much less likely

Does not impact my decision
Study IV
Study 4

Goal: To better understand how attitudes shift before and after experiencing a remote follow-up fine-tuning of hearing instruments (first fit was a face-to-face appointment)

Sample: 8 audiologists and 16 patients (Germany)

- 4 fine-tuning issues
- 4 handling issues
How did the attitudes shift before and after using the teleaudiology technology?

Clients:
- More positive: 66.7%
- Same: 16.7%
- More negative: 16.7%

Professionals:
- More positive: 66.7%
- Same: 16.7%
- More negative: 16.7%
The future of teleaudiology?
US Secretary of Veterans Affairs, Eric Shinseki
Public and Intergovernmental Affairs

VA Announces 2011 Industry Innovation Competition

February 15, 2011

WASHINGTON – The Department of Veterans Affairs (VA) today announced the opening of the 2011 Industry Innovation Competition to identify, fund and evaluate promising innovative technology proposals to improve the quality of health care for Veterans.

“VA has a long history of being an innovator and early adopter of health technology,” said Secretary of Veterans Affairs Eric K. Shinseki. “This competition continues that legacy and provides VA with a powerful tool to utilize the best and brightest within the industry to improve care and services for our Nation’s Veterans, their families and survivors.”

This competition is part of VA’s Innovation Initiative (VAI2), a department-wide program that solicits the most promising innovations from employees, the private sector, non-profits, and academia to increase Veterans’ access to VA services, improve the quality of services delivered, enhance the performance of VA operations, and reduce or control the cost of delivering those services. Up to $100 million in awards could be made in this innovation competition.

“VAI2 offers a unique opportunity to tap the talent and innovative power of the private sector,” said Jonah Czerwinski, Senior Advisor to the Secretary and Director of VAI2. “The 2011 Industry Innovation Competition builds on the momentum established in 2010 by challenging industry and academia in five new areas.

Public and private companies, entrepreneurs, universities and non-profits are encouraged to propose new ways to:

- Leverage telemedicine solutions to provide audiology services to Veterans who live far from medical centers
- Create and implement enhancements or novel uses of VA’s “Blue Button” personal health record
This research was made possible because of the contributions of:

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[Logos of various organizations]
Thank you!