

# eAudiology Lecture Series - An Introduction to Tele-Audiology

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**Western**  
National Centre  
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# Common Terms and Definitions

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DISCUSSION OF THE EVOLVING  
TERMINOLOGY AND CURRENT  
DEFINITIONS



A word cloud of telehealth-related terms in various colors and orientations. The terms include: e-Audiology (yellow), e-Health (blue), Connected-Health (teal), Telepractice (yellow), Telerehabilitation (yellow), Tele-Audiology (pink), Telemedicine (black), and Telehealth (teal).

# Evolving Terminology

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Health care providers are faced with a plethora of terms/definitions describing the use of information and communication technology to deliver health services, mainly due to:

**Rapid innovation/growth in telecommunication technology**

**Response to changing health needs and contexts in society**

**A dynamic model of service provision**

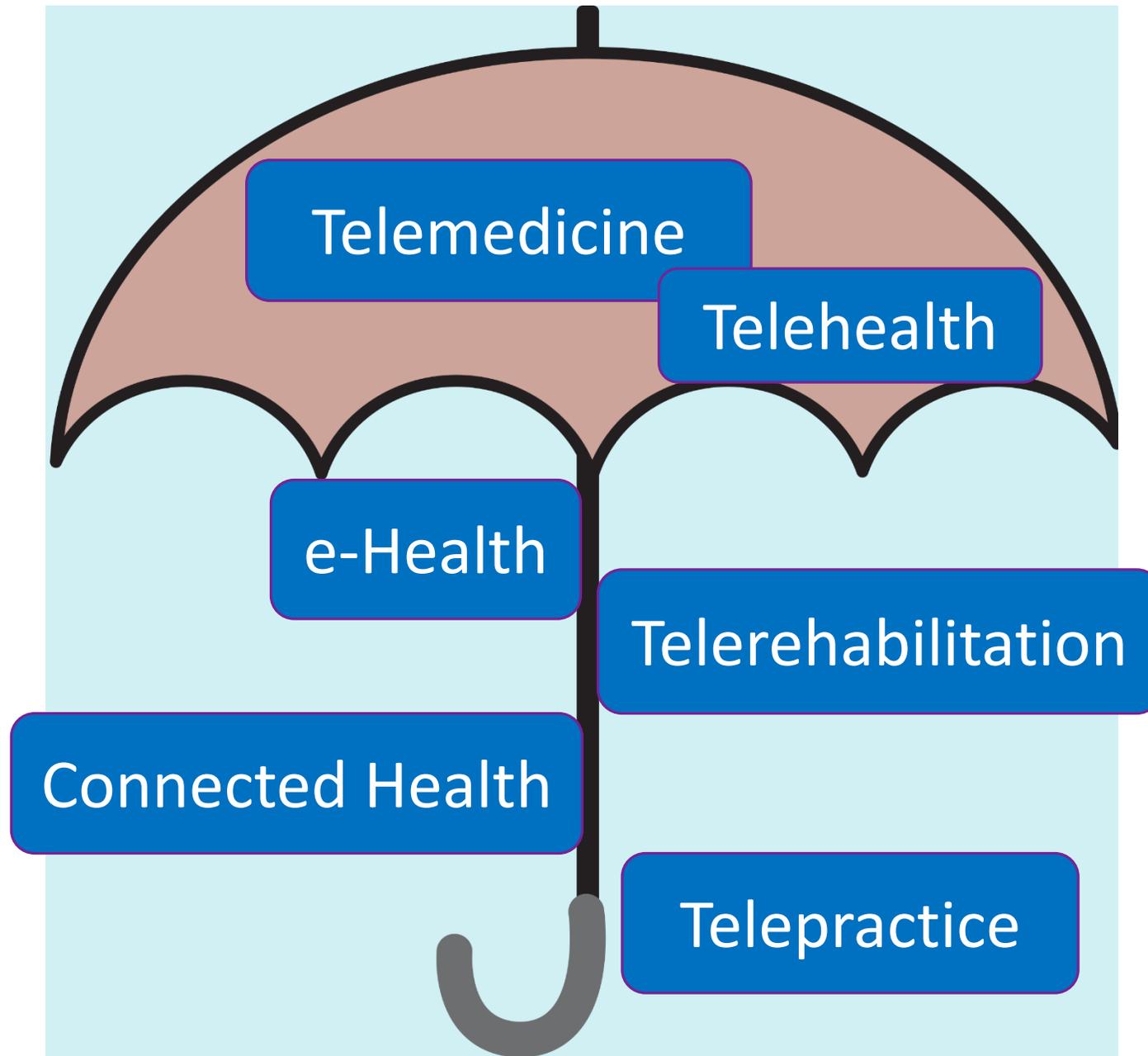
The evolution of terms may help distinguish emerging applications from historical ones.

However, the use of differing terminology to describe services may be confusing to:

**People accessing the services**

**Policy makers**

**Other stakeholders**



# Common terms in Audiology

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ASHA has adopted the term telepractice:

**Telepractice:** The application of telecommunication technology to the delivery of audiology professional services at a distance (<https://www.asha.org/Practice-Portal/Professional-Issues/Telepractice/>).

It is common for health care disciplines to use the prefix tele-:

**Tele-audiology:** The utilization of telepractice to deliver audiological diagnostic treatment and management services (Rushbrooke and Houston, 2016). Will be used primarily in this presentation.

This World Health Organization (WHO) has started using the term “electronic” to replace “tele” and the prefix e- (as in e-health):

**eAudiology:** A more general term that describes the the application of information, computer or communication technology to audiological practices.

# What do these terms have in common?

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Tele-audiology

eAudiology

telepractice

An important common thread between terms is **the use of technology to break down barriers of geography and access to health care and/or education.**

They all describe care provided by a non-traditional modality (i.e., does not use face-to-face services).

They do not describe a separate hearing care field, but instead, **a specific delivery model of care within the field of audiology.**

**Have the capability of providing services across all age groups and with continuity of care.**

Includes the use of information and communication technologies in the delivery of remote services or services at a distance.

# The growing interest in tele-audiology...

An increasingly important service delivery medium due to many factors:

Improved equity of access to care

Reduced travel time/cost

Improved flexibility around the delivery of care

Greater choices in the format of the services/applications

More effective/efficient communication

Generalization of skills/troubleshooting in home/preferred environment

Close to 80% of people with hearing loss do not have access to hearing health care services because they live in developing countries where audiologists/hearing health care professionals are unavailable.

(Fagan & Jacobs, 2009; Goulios & Patuzzi, 2008; Swanepoel & Hall, 2010; Swanepoel, Hall & Biagio, 2011)

This is certainly true for people needing to travel outside of a remote area to reach a provider; however, it is also true that access can be difficult in more urban areas and tele-audiology has the potential to improve efficiency in the health care system.

(Nemes, 2010; Swanepoel, 2013)

# Practice Standards and Practice Considerations

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THIS SECTION WILL SERVE AS AN INTRODUCTION TO KEY TOPICS DISCUSSED IN CURRENT PRACTICE GUIDELINES SPECIFIC TO THE USE OF TELE-AUDIOLOGY AND THE KEY PRACTICE CONSIDERATION

# Understand the Rules and Regulations...

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Clinicians providing services via tele-audiology are bound by federal and state/provincial regulations as they would be when providing in-person services. The use of tele-audiology does not remove any existing responsibilities in delivering services. Most regulatory bodies provide position statements that cover:

**Roles and responsibilities**

**ethical guidelines**

**licensure needs, etc.**

Here are some examples:

American Speech-Language-Hearing Association (ASHA):

<https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589934956&section=Overview>

ASHA state-by-state: <https://www.asha.org/Advocacy/state/default/>

College of Audiologists and Speech Language Pathologists of Ontario (CASLPO):

[http://www.caslpo.com/sites/default/uploads/files/PS\\_EN\\_Use\\_of\\_Telepractice\\_Approaches\\_in\\_Providing\\_Services\\_to\\_Patients\\_or\\_Clients.pdf](http://www.caslpo.com/sites/default/uploads/files/PS_EN_Use_of_Telepractice_Approaches_in_Providing_Services_to_Patients_or_Clients.pdf)

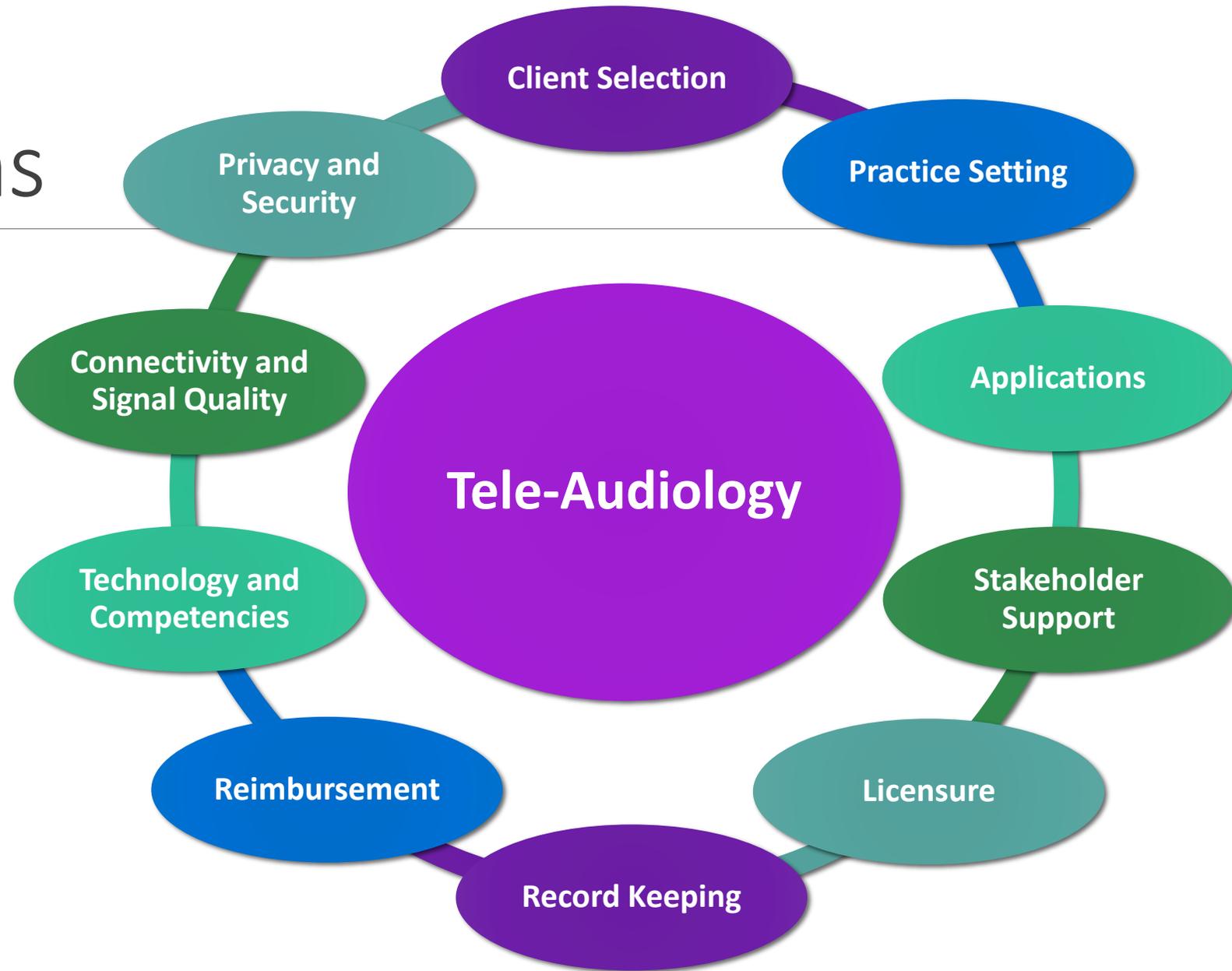
# General Practice Standards Checklist

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- My regulatory body endorses the use of tele-audiology
- I have reviewed all applicable position statements and will continue to adhere to the Code of Ethics and requirements that apply to my membership/certification
- The provision of tele-audiology services is in the best interest of my patient/client
- I will deliver tele-audiology services with the same standard of care used in traditional delivery models (i.e., face-to-face)

# Key Practice Considerations

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# Tele-audiology Practice Considerations

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- ❑ **Client Selection:** Understand service preferences and select patients/clients that are appropriate for tele-audiology services. Consider comfort level with technology, age (manual dexterity, parental/caregiver support), technology needs, ability to follow instructions, etc.
- ❑ **Practice Setting:** Tele-audiology can be delivered in a variety of settings including schools, hospitals, clinics, universities, homes, care facilities, etc. Each will present unique set-up needs. Services in each must comply with regulations and policies.
- ❑ **Applications:** Understand and apply applications (e.g., remote assessment, interventions) that align with the technology being used and with your practice standards. Procedures requiring hands-on contact (e.g., ear mold impressions) should still be conducted in person, with the patient/client physically present.
- ❑ **Stakeholder Support:** Successful implementation requires support at all levels including the clinicians, administrators/organizational leaders, payers/sponsors, support staff, patients/clients and their family members and caregivers, etc. This often involves planning, advocacy, education and training efforts.

# Tele-audiology Practice Considerations

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- ❑ **Licensure:** Check your professional liability status and licensure needs in the location that the patient/client is located. When providing services outside of your regulatory body, consult with the regulatory body in which the patient/client is located.
- ❑ **Record Keeping:** Understand your obligations around record keeping for tele-audiology services, including informed consent (benefits, risks, side-effects, alternatives) and documentation of services. These are likely similar to your current practices for face-to-face.
- ❑ **Reimbursement:** Be knowledgeable about/compliant with rules and regulations regarding reimbursement for services – this may vary from payer to payer and may influence billing structures and required documentation.

# Tele-audiology Practice Considerations

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- ❑ **Technology and Competencies:** Ensure that you have the necessary competencies, knowledge and skills to provide appropriate tele-audiology services or that the appropriate technological assistance is available to you. Ensure that all equipment is calibrated and maintained.
- ❑ **Connectivity and Signal Quality:** An important factor due to the transition of information across telecommunications connections (e.g., internet connection speech, bandwidth during video/web conferencing). Ensure that the quality of audio and video signals is appropriate for the services being provided (this may vary according to the application of interest and/or the patient/client's communication disorder).
- ❑ **Privacy and Security:** Ensure maintenance of patient/client confidentiality including both electronically transmitted information and records in audio and video format. You might choose to encrypt your data, use a private network, unique passwords, etc. Ensure the technology and services are compliant with the necessary regulations (e.g., HIPAA).

# Overall...

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**It is your job to be knowledgeable about and compliant with existing rules, regulations and guidelines regarding tele-audiology including:**

Security

Privacy protections

Reimbursement for services

Licensure

Liability

# Other Resources

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The American Academy of Audiology (AAA) has a tele-audiology toolkit:

[https://www.audiology.org/practice\\_management/resources/resources-and-tools](https://www.audiology.org/practice_management/resources/resources-and-tools)

ASHA practice portal on telepractice:

<https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589934956&section=Overview>

A list of audiology associations outside of the USA:

[https://www.asha.org/members/international/intl\\_assoc/](https://www.asha.org/members/international/intl_assoc/)

# Methods and Modalities of Service Delivery

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DIFFERENT METHODS OF DELIVERY WILL BE DISCUSSED AND  
COMPARED AND CORRESPONDING TECHNOLOGY OPTIONS  
PRESENTED

# Asynchronous (store and forward)

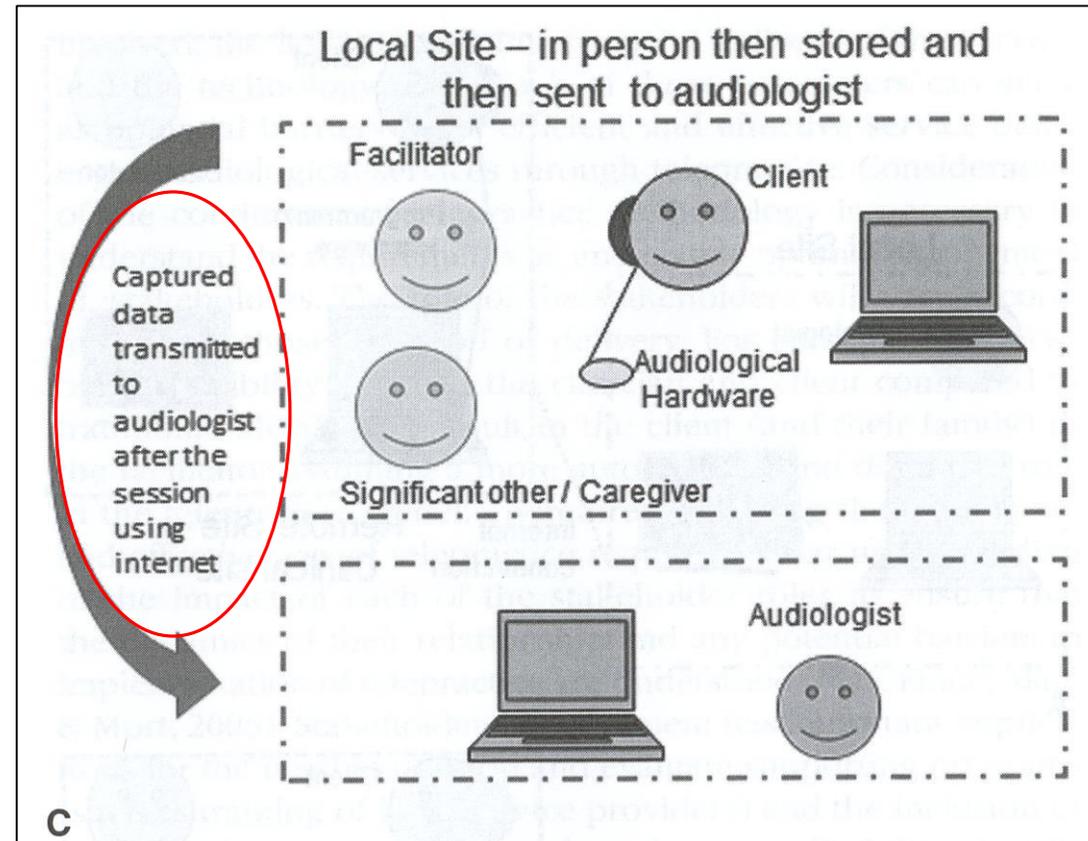


Illustration from Rushbrooke and Houston, 2016

# Examples of asynchronous delivery of information

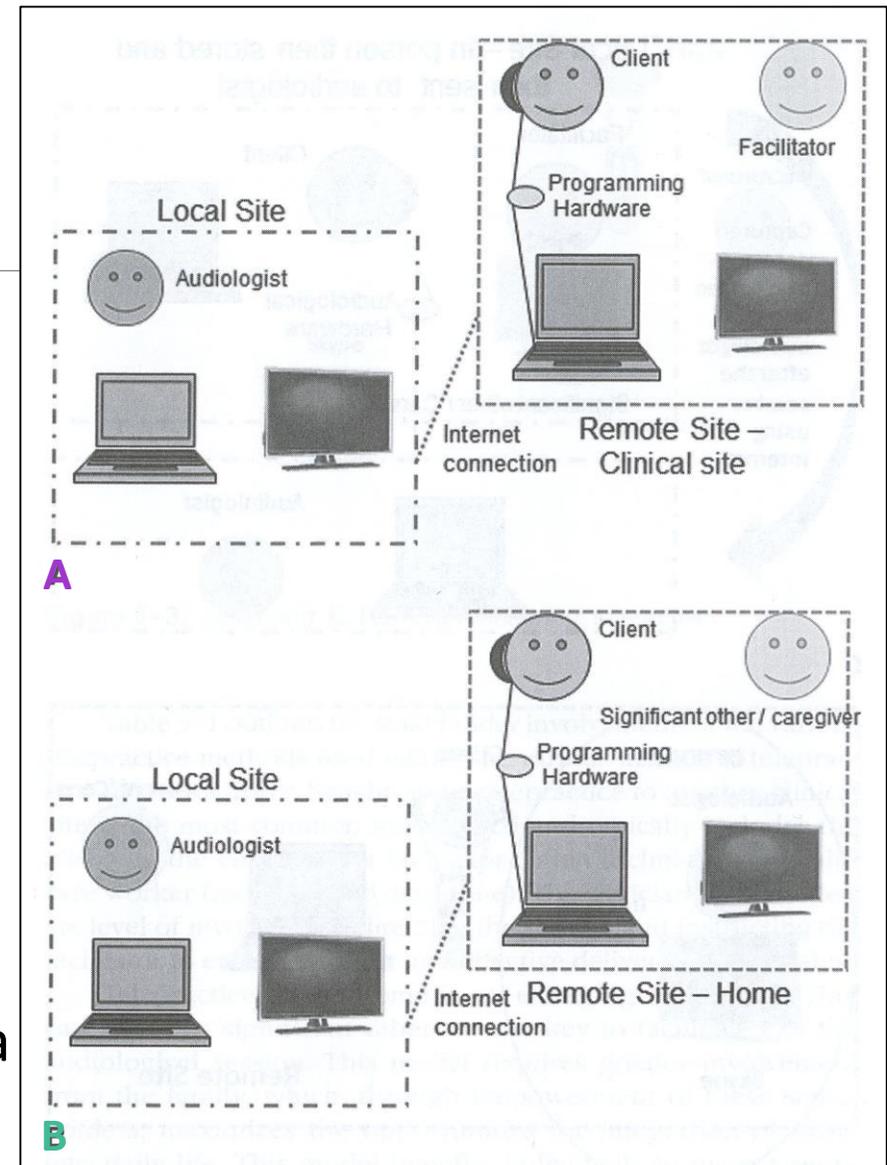
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- ✓ Email transmission of data such as voice clips, video-otoscopy images, scanned tympanograms, audiograms, auditory brainstem response recordings, etc.
- ✓ Transmission of audiological testing results which may include automated audiometry data such as self-screening or self-assessment of hearing sensitivity
- ✓ Transmission of outcomes data specific to individual listeners (e.g., survey data collected on a smartphone or tablet (EMA))

# Synchronous (real-time and interactive)

**Example A:** Synchronous transfer of information from the clinician to a remote clinical site to supervise a technician during testing/programming (use of facilitator)

**Example B:** Synchronous transfer of information from the clinician to a client/patient in their home to facilitate direct testing/programming by the clinician (without a facilitator)



# Examples of synchronous delivery of information

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- ✓ Interactive video
- ✓ Web-based systems to facilitate real-time analysis and/or troubleshooting of devices (often include custom applications and Bluetooth/telecoil)
- ✓ Online/telephone live communication
- ✓ Remote computing technology (e.g., desk-top sharing)

These are often paired together to facilitate specific applications.

Comparison of Delivery Models	Facilitators	Barriers
<b>Asynchronous</b>	<p>Lower internet requirement.</p> <p>Can be completed with a facilitator (clinician may not be present).</p> <p>An alternate connection option when connectivity challenges arise.</p>	<p>Store-and-forward.</p> <p>Not an interactive process.</p> <p>Services cannot be time sensitive.</p>
<b>Synchronous</b>	<p>Real-time .</p> <p>Client interactive.</p> <p>Observable response (for many applications).</p> <p>Timely response.</p>	<p>Greater internet requirements.</p> <p>Usually requires the clinician to be present.</p>

Note: the clinician should verify licensure requirements and payer definitions that may vary across tele-audiology delivery types.

# Hybrid models

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Refers to the **combination of services and/or support** delivered by:

A combination of tele-audiology and face-to-face methods

A combination of services delivered through asynchronous and synchronous delivery models

Examples:

- Face-to-face services followed by synchronous distance support could be used to enhance the follow-up care required after initial consultation.
- Screening could be completed using an asynchronous model, followed by synchronous services to complete diagnostic services

May be the most **efficient model** as it can maximize on the facilitators from each individual delivery model.

# Current Applications/ Practice Areas

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INTRODUCTION TO THE DIFFERENT TECHNOLOGY OPTIONS AND  
CORRESPONDING APPLICATIONS OF TELE-AUDIOLOGY SERVICES

# Examples of Tele-Audiology in Practice

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Remote cochlear implant/  
hearing aid programming

Aural habilitation/rehabilitation

Counselling

Infant hearing screening

Diagnostic hearing assessments

Pure-tone audiometry

Outcome measurement

Teleotoscopy

Tele-audiology in school settings

Internet-based treatment for  
tinnitus

A general overview of the potential for some of these applications in practice will be given, with the understanding that this topic is fast evolving. Only a selection of references are provided – this is not a comprehensive list.

# A systematic review of telehealth applications in audiology (Swanepoel and Hall, 2010)

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Available reports spanned audiological services such as screening, diagnosis, and intervention.

- Screening applications for all populations have demonstrated the feasibility and reliability of telehealth using both synchronous and asynchronous models.
- Diagnostic procedures included audiometry, video-otoscopy, oto-acoustic emissions, and auditory brainstem response, confirm clinically equivalent results for remote telehealth-enabled tests and conventional face-to-face versions.
- Intervention studies, including hearing aid verification, counseling, and Internet-based treatment for tinnitus, demonstrate reliability and effectiveness of telehealth applications compared to conventional methods.
- More research is needed related to tele-audiology including patient perceptions including the use of surveys of patient experiences.

**“Tele-audiology holds significant promise in extending services to the underserved communities but require considerable empirical research to inform future implementation.”**

# Summary of Remote Diagnostic Audiometry

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- Includes all aspects related to hearing screening/assessment and all types of delivery models (interactive/non-interactive)
- Technology needs depend on delivery model
- Recent efforts have focused on evaluating automated systems using asynchronous delivery methods and in the support of EHDI using synchronous delivery methods support EHDI (greater technology needs)
- Various projects/initiatives are underway that include synchronous assessment – example: Remote diagnostic ABR in Ontario, Canada (Bill Campbell) with central sites as the host and facilitators in sites across Ontario.

# Selected References – Remote Diagnostic Audiometry

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**Swanepoel et al., 2010:** Automated audiometry is a reliable, accurate, and time-efficient hearing assessment for normal and hearing –impaired adults. Potential to reach underserviced areas.

**Eikelboom et al., 2013:** Validation of air- and bone-conduction assessment with automated system (AMTAS).

**Stuart, 2016:** NCHAM report: Infant diagnostic evaluations in rural settings to development of a coordinated system for the delivery of audiological evaluations for infants.

# Summary of Remote Cochlear Implant (CI) Programming

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- May improve access to specialist cochlear implant (CI) services/flexibility of services;
- Computer-based CI programming is well suited to tele-audiology and may be suitable to CI recipients of all ages;
- Future directions include home-based CI programming and wireless mapping (Psarros and Wanrooy, 2016)

# Selected References - Remote CI Programming

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**Hughes et al., 2012:** A validation study – suggests telehealth as a viable option for research and clinical measures in adult and child CI recipients. Included a remote-site assistant, videoconferencing, computer-based programming capabilities, for example.

**Wasowski et al., 2012:** A national network of tele-audiology provided a reliable platform for tele-fitting. Concluded improved quality of services and cost effectiveness with tele-fitting procedures compared to standard.

**Eikelbook et al., 2014:** Developed a PC-based system for remote mapping, employing voice, video and text communication. Outcome measures were used and an assistant was needed for some parts.

# Summary of Remote Hearing Aid (HA) Programming/Monitoring

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- Computer-based hearing aid analysis, monitoring and programming may be well suited to tele-audiology
- Has the potential to improve access and efficiency of services in both rural and urban settings, especially when considering follow-up remote support
- Currently the technology needs include the transmission of voice + audio data (e.g. videoconferencing) or voice data via the telephone and fitting data (retrieved from a hearing device via Bluetooth or telecoil and an application specific control) via the internet.

# Selected References - Remote HA programming

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**Angley et al., 2017:** Provided remote hearing-aid follow up support to adult listeners in the home and in the clinic. Procedures were feasible and the participants preferred remote over face-to-face.

**Campos & Ferrari, 2012:** Compared of in-person to remote hearing aid fitting, verification and counselling.

**Penteado, de Lima Ramos, Battistella, Marone, & Bento, 2012:** A description of successful cases of remote hearing aid fitting between urban and rural providers in Brazil

**Munoz et al., 2017:** Explored the use of virtual visits to monitor pediatric hearing aid use and support parental management. Virtual visits facilitated parent learning, in addition to increasing the consistency of auditory access to the child. Provides an audiologist management checklist for tele-support in the Appendix.

# Summary of Aural Habilitation/Rehabilitation

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- Distance communication may allow for greater equity of access and a more flexible range of service options across all ages;
- Initial research into the satisfaction and outcomes suggests tele-audiology as a viable and equitable service compared to face-to-face intervention options (von Muralt, Farwell and Houston, 2016)
- May include: teleconsultation (interactive videoconferencing such as verbal therapy sessions), tele-homecare (coordination of services from various providers to the home), tele-therapy (therapy protocol is managed remotely and carried out in the home), tele-monitoring (Breinza & McCue, 2013)

# Selected References - Aural Habilitation/Rehabilitation

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**Saunders and Chisolm, 2015:** Describes the current state of tele-audiological rehabilitation interventions including the some barriers (e.g., need for education).

**Brännström et al., 2016:** Evaluated an internet-based support system for audiologists and first time hearing aid clients. Reported positive experiences and overall satisfaction but audiologists reported that the support system did not address the needs of all clients.

# Technology check-list

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- What type of technology is needed for the chosen application and environment?
  
- What training/information is needed prior to beginning service delivery?
  - Technology set-up maintenance
  - Procedures and protocols
  
- Has the technology changed over time – opportunity for re-training?

Overall, the clinician should feel confident in their ability for use the technology or have access to a support person who can offer assistance with the technology.

# The Potential for Tele- Audiology

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DISCUSSION AROUND THE BARRIERS AND FACILITATORS TO CLINICAL  
IMPLEMENTATION OF TELE-AUDIOLOGY SERVICES

# Is Tele-Audiology Being Practiced?

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2002 survey on the use of tele-audiology among ASHA members (ASHA, 2002):

- 12% of audiologists were engaged in tele-audiology services.
- 40% (of those not already providing services) expressed an interest in incorporating such services into their practice.

Recent surveys suggest that most audiologists possess a **positive attitude towards tele-audiology**, especially when considering adult-focused services related to follow-up clinical services (Eikelboom & Swanepoel, 2016; Singh et al., 2014).

- Results suggest a low level of overall experience (15.5%) with tele-audiology

# Transends both Rural and Urban applications

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**Rural application:** Traditional application aimed at rural settings and the ability to better service clients/patients located at a great geographical distance from the closest clinic/health care facility. It has grown to include the potential for assessment, treatment, follow-up and educational services in need.

**Urban application:** Increasing interest due to potential to improve efficiency in service delivery and/or tailor services to meet the needs of patients/clients. Remote services could improve care for those that are unable to travel due to mobility issues, child care issues, or an inability to involve the entire family, etc.

# Evaluation of a Telepractice Model

(Modified table from Rushbrooke and Houston, 2016)

Cost/Benefit	Client	Clinician/Organization
<b>Potential Costs</b>	Equipment and technology needs (e.g., computer, internet) – home based	Equipment and technology needs (e.g., computer internet, agency IT)
		Room hire – if to other site
		Training time
		Lack of reimbursement (private fee)
<b>Potential Benefits</b>	Access to service	No outreach travel costs
	Reduced travel time	Utilization of existing resources
	Reduced costs for travel	Integration of existing technology
	Reduced impact on work/education/family	Quicker delivery of troubleshooting
	Reduced stress	Facilitate generalization of skills into the home environment
	Quicker access to troubleshooting	Flexibility of service provision
	Generalization of skills learnt in local environment	Ease of Scheduling
		Professional development

# Clinical Uptake Considerations (Telehealth)

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Full integration of telehealth services into clinical workflow requires training and protocol development to demonstrate:

**Clinical utility**

**Assess clinician readiness**

**Understand change management strategies**

**Ensure the provision of quality services**

**Align with current professional policies and standards**

(Jarvis-Selinger, Chan, Payne, Plohman, & Ho, 2008)

# Current Research at Western University (Glista, Moodie and Scollie)

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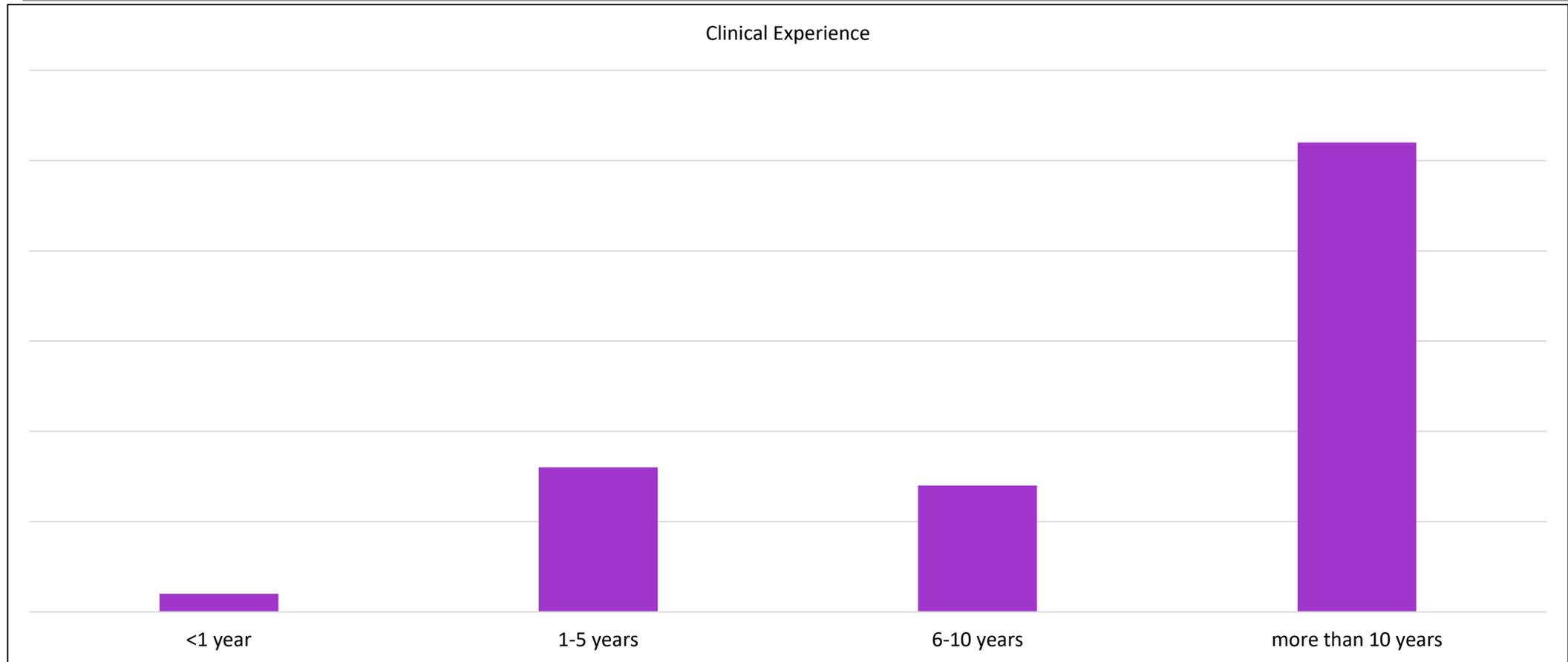
We used Concept Mapping research methods

**Purpose: Develop a conceptual framework of the factors that influence clinician adoption of tele-audiology practices related to the provision of remote follow-up hearing aid support**

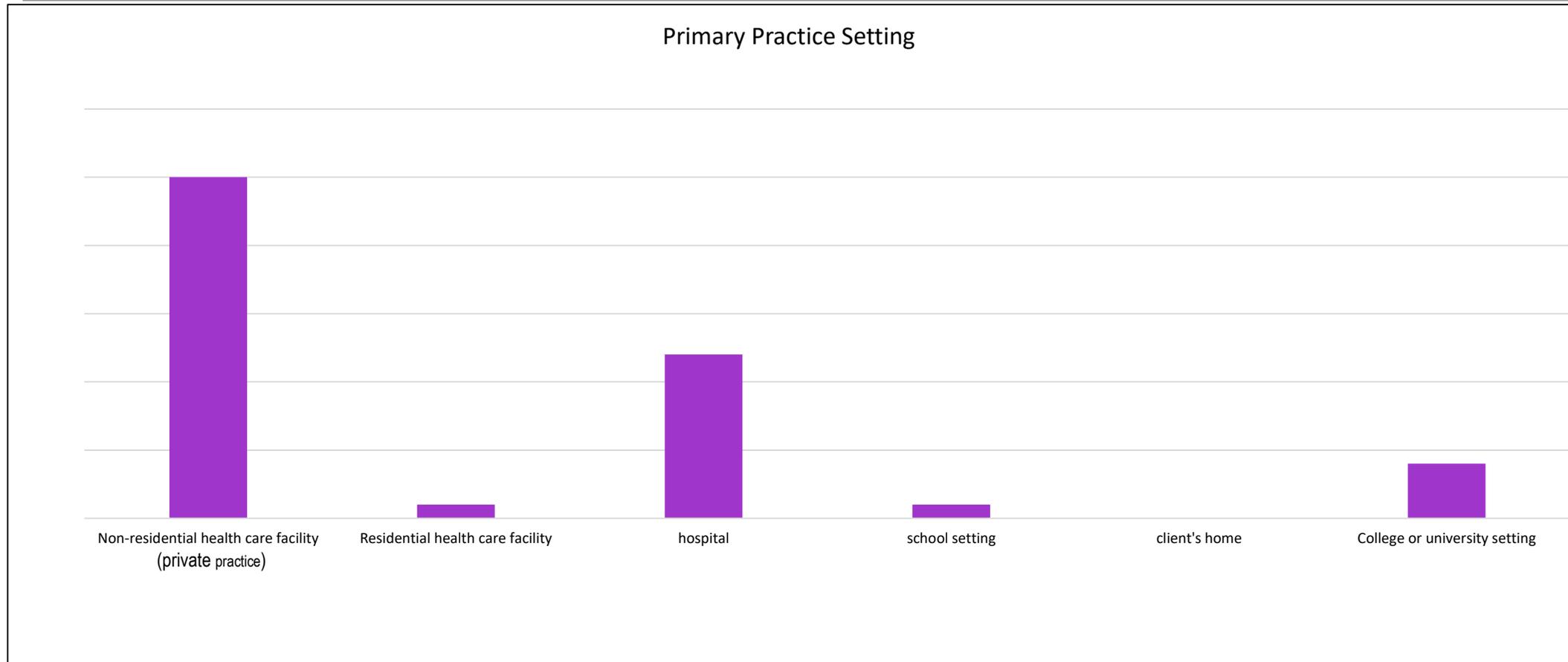
All 42 participants were registered audiologists in the province of Ontario

Several group sessions were run - included audiologists that mainly focused on the provision of either adult- or pediatric-focused services

# Our Participants



# Our Participants



# Major factors emerging:

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# Next steps...

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- Compare the factors voiced by adult- versus pediatric focused audiologists
- Learn about importance level – what factors are most important to this groups of clinicians
- Guide clinical-uptake of remote hearing aid fitting support tools
- Help with the design of future studies

# Future Directions

## Take-Away Messages

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- Tele-audiology has emerged
- It is not a new field, but a unique and potentially powerful way to deliver services in the field of audiology
- It has the potential to enhance current practices and facilitates patient centered-care
- Literature indicates that tele-audiology has the potential to improve equity of access to services for all different types of patients/clients and across all ages

- Clinical-uptake considerations are important
  
- Audiologists, with their technical knowledge, are well-positioned to be leaders in the area of tele-practice
  
- Future research efforts should include researcher-clinician collaborations to facilitate the development, synthesis, dissemination and exchange of knowledge around tele-audiology practices
  
- Tele-audiology is constantly evolving and will require us to collaboratively (research, clinicians, industry) seek ongoing education and training efforts related to:
  - Set-up, maintenance, modifications to technology
  - Procedures and protocol around clinical applications
  - Regulatory considerations
  - Best practice protocols

Thank you

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