CHAPTER

16 Telehealth in Paediatric Audiology

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'Digital technologies are now integral to daily life, and the world's population has never been more interconnected. Even so, its application to improve the health of populations remain largely untapped, and there is an immense scope for use of digital health solutions.'

~World Health Organisation, 2025

Summary

This chapter provides an overview of the application of telehealth for the assessment and intervention of paediatric hearing loss. It explores the benefits of implementing telehealth for families of children with hearing loss, identifies the different models and types of telehealth service delivery and reflects on some of the challenges to implementation. In addition, this chapter provides a summary of best practice principles for the successful implementation and delivery of family-centred telehealth services for young children with hearing loss from birth to thirteen years. Furthermore, the chapter highlights the importance of training hearing care professionals and therapists in telehealth practices to ensure effective telehealth delivery and client engagement.

Learning objectives

From this chapter, the reader will be able to:

1. Define the role and primary benefits of telehealth in paediatric audiology.
2. Identify different models and types of telehealth services in audiology, including tele-assessment and tele-intervention.
3. Discuss the essential technology setup and clinician training required for effective remote delivery.
4. Analyse the challenges of implementing telehealth in paediatric audiology and propose strategies to address these challenges.
5. Evaluate best practices and guidelines for successful implementation of telehealth in paediatric audiology.

Introduction

Telehealth, the provision of specialised services at a distance using information and communication technology, has become an important aspect of modern healthcare delivery worldwide. Telehealth reduces the geographical and logistical barriers that frequently limit access to timely diagnosis and intervention, especially for families in remote or underserved regions, and aligns closely with global priorities of equitable healthcare and person/family-centred care (P/FCC). In audiology, telehealth (also referred to as teleaudiology, tele-therapy and telepractice) has been adopted in a variety of hearing care services, including screening, diagnostic assessment, hearing aid (HA) fitting, cochlear implant (CI) mapping and auditory-verbal therapy (AVT). For children with hearing loss (HL), telehealth services are delivered through synchronous video consultations and asynchronous data exchange. The feasibility and effectiveness of telehealth in the identification and management of HL have been demonstrated across different contexts (including remote and resource-constrained environments), and its use has been recommended by the latest World Health Organisation's World Report on Hearing (World Health Organisation 2021).

Benefits of Telehealth in Paediatric Audiology

Telehealth addresses longstanding challenges related to access, continuity of care and equity of service provision. It offers families more flexible and responsive care options and aligns closely with P/FCC. The following section explores the key benefits of telehealth in paediatric audiology.

Efficacy

Studies have shown no significant differences between telehealth and in-person hearing screening methods, including the use of distortion product otoacoustic emissions (DPOAE) (Ameyaw et al. 2019) and automated auditory brainstem response (AABR) (Hatton et al. 2019; Sithi, Govender and Ntuli 2024). Oremule et al. (2024) reported that mobile audiometry closely aligns with conventional audiometry in measuring hearing thresholds. Similarly, other studies have demonstrated the effectiveness of telehealth in diagnosing otitis media (OM) (Habib et al. 2023). In intervention, telehealth can be effective for delivering listening, spoken language and speech intervention, with outcomes comparable to traditional in-person therapy (Constantinescu et al. 2014). However, other authors have recommended that telehealth be used as a second option due to yielding better results in-person (Ebrahimi et al. 2024). Remote CI programming and HA monitoring have also shown positive outcomes (Muñoz et al. 2021; Schepers et al. 2019).

Cost effectiveness

For families, telehealth reduces costs associated with travel, childcare and time away from work, alleviating common financial barriers to accessing care. Providers similarly benefit from decreased expenses related to travel for outreach services, clinic space, utilities and administrative overhead, while the flexibility of telehealth scheduling reduces missed appointments (McCarthy et al. 2019). Research has demonstrated the cost reduction for patients and providers associated with reduced travel-related expenses, with these savings rising with increased service intensity (for example, Hatton et al. 2019).

Improved accessibility and convenience

A major benefit of telehealth is improving accessibility and convenience in paediatric hearing services. In rural and remote areas, access to hearing healthcare is often limited due to a shortage of qualified hearing healthcare professionals (HHPs) and the high costs associated

with establishing local services or travelling to urban centres (Swanepoel et al. 2010). Through telehealth, families in these areas can access services without the burden of long-distance travel. Telehealth may also be used to provide better access for Indigenous populations (for example, Habib et al. 2023). Similarly, in low-resource settings like Sub-Saharan Africa, telehealth can be a feasible method of providing access to screening and diagnostic assessment (for example, Sithi, Govender and Ntuli 2024).

Telehealth also enhances access for families in metropolitan regions by overcoming barriers such as traffic congestion, limited public transport and long waiting lists. It allows flexibility in scheduling appointments around school, work, care of children with additional needs and other commitments (McCarthy et al. 2019). Beyond benefiting families, telehealth also enables HHPs to manage their caseloads more flexibly, increasing service efficiency and reducing travel demands.

Enhanced continuity of care

Telehealth also plays an important role in reducing loss to follow-up and enhancing continuity of care. By enabling ongoing remote monitoring and check-ins, telehealth minimises the risk of families disengaging from care pathways (Ameyaw et al. 2019). Furthermore, telehealth supports continuity when families travel or relocate, or when HHPs move practices. During the COVID-19 pandemic, telehealth proved invaluable in maintaining care continuity despite restrictions (for example, Mardinli et al. 2023).

Increased caregiver involvement

As HHPs are not physically present to be 'hands-on' during sessions, caregivers naturally assume greater responsibilities, such as assisting with assessments and implementing intervention strategies. For instance, in assessment, studies have explored the feasibility of parents performing otoscopy using smartphones (Shah et al. 2018; Erkkola-Anttinen et al. 2019). In intervention, telehealth could facilitate a coaching environment where professionals guide parents in mastering skills, promoting FCC (McCarthy et al. 2019). This engagement also extends to other family members, with siblings often participating in telehealth sessions, further strengthening the support system around the child with HL (McCarthy et al. 2019).

Implementation of Telehealth Services in Paediatric Audiology

Models of telehealth

Telehealth in audiology (that is, teleaudiology) includes various models designed to deliver comprehensive hearing care to families of children with HL aged zero to thirteen years. These models can be used flexibly, taking advantage of digital technologies to provide a range of hearing-healthcare services, ensuring that children receive timely and effective hearing care regardless of their geographical location. Four main models of telehealth in audiology are described in the next section.

a) Synchronous teleaudiology

Synchronous teleaudiology involves real-time interactions between HHPs and clients through video conferencing platforms. This synchronous model (Figure 16.1) allows professionals to conduct live assessments, provide immediate feedback and engage in interactive consultations and interventions with both children and caregivers. For example, procedures like remote video-otoscopy, pure-tone audiometry, speech-in-noise tests and immittance audiometry have been found reliable when performed remotely, with the audiologist guiding an on-site facilitator (for example, a community healthcare worker [CHW] or parent/caregiver) on how to position the child, use the equipment and complete the procedure (Rushbrooke, Waite and Huston 2020). The synchronous model of teleaudiology care is beneficial for conducting not only screening and assessment procedures but is also optimal for follow-up appointments, intervention and counselling sessions where children and families are supported throughout the hearing care continuum (Rushbrooke, Waite and Huston 2020).



Treasures of Wisdom

Benefits of Telehealth

- Telehealth significantly improves accessibility, especially in rural, remote, and low-resource settings, by eliminating geographical and logistical barriers to care.
- Telehealth enhances continuity of care and family engagement, enabling ongoing support, reducing loss to follow-up, and empowering caregivers to play an active role in their child's care.

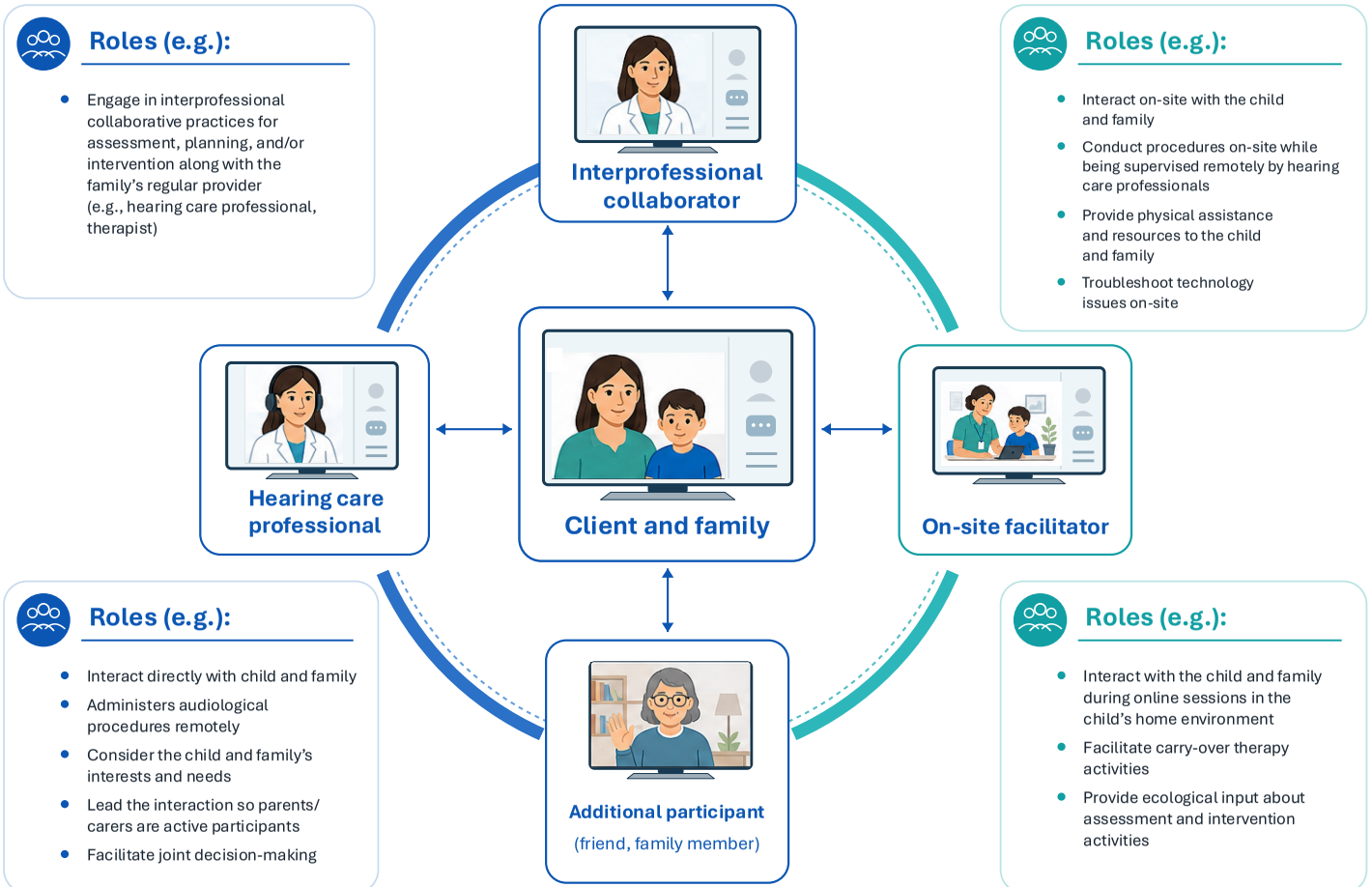


Figure 16.1: Synchronous paediatric teleaudiology model with a description of potential roles of each participant

b) Asynchronous teleaudiology

Asynchronous teleaudiology, also known as 'store-and-forward', involves the collection and transmission of audiological data to be reviewed by the HHP at a later time. The asynchronous model (see Figure 16.2) is useful for initial screenings and diagnostic evaluations where immediate interaction may not be needed or be possible. For example, on-site facilitators (CHWs, allied-health assistants) can use portable devices such as smartphones, tablets or iPads to conduct hearing screening tests at home or in primary care settings, and the results are uploaded to a secure cloud-based platform for the HHP to review later. Altamimi et al. (2024) used a store-and-forward approach to improve access to hearing care services for children with OM in Perth, Australia. Children with OM were assessed by audiologists and the data reviewed later by a multidisciplinary team (MDT; that is, otolaryngologist registrar, clinical nurse specialist, audiologist) which then provided individualised care plans to caregivers via phone calls. The asynchronous approach enabled early access to hearing care and reduced the cost associated with initial and follow up appointments (Altamimi et al., 2024)

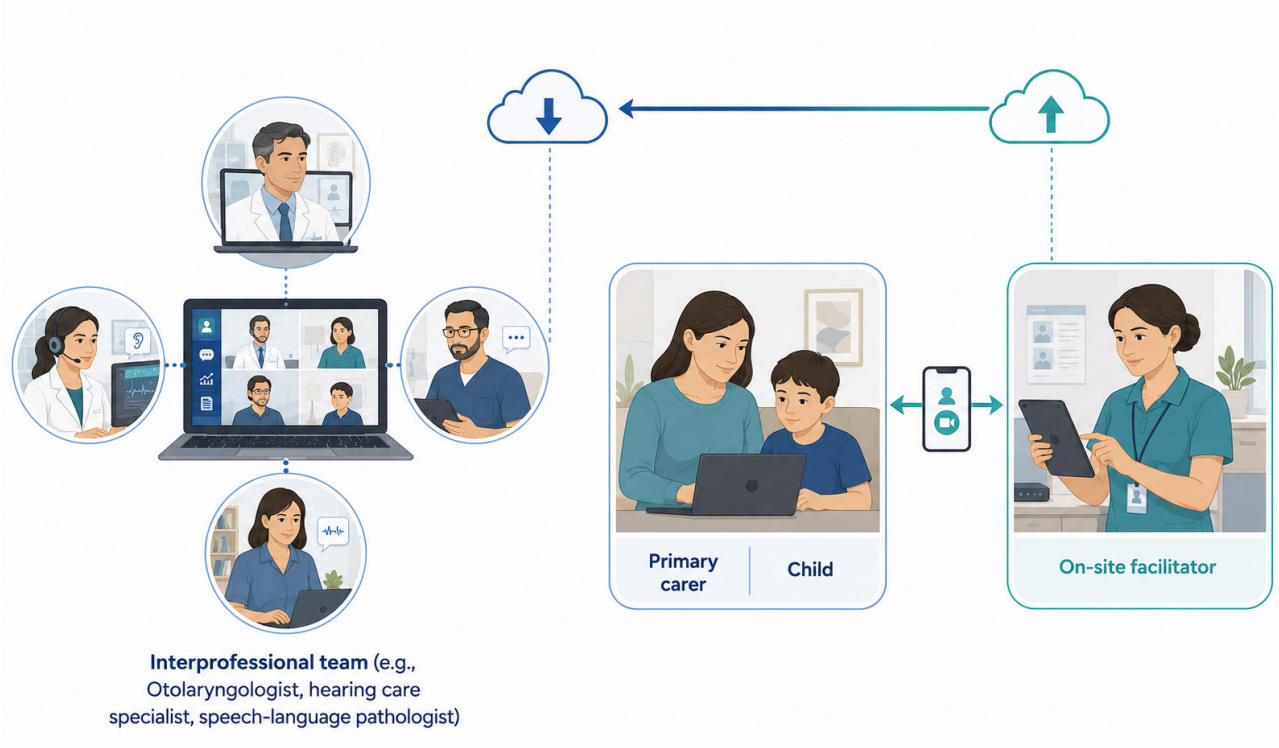


Figure 16.2: Asynchronous model of paediatric teleaudiology assessment

c) Hybrid teleaudiology

As the name suggests, hybrid teleaudiology combines elements of synchronous, asynchronous and in-person models to provide a comprehensive and holistic approach to hearing care. This model allows for initial data collection and preliminary assessments to be conducted asynchronously, followed by synchronous consultations for detailed assessment and intervention, or an initial synchronous audiological intervention followed by in-person sessions. For example, a child's hearing test results are uploaded to a cloud-based platform, and the audiologist reviews the data before a scheduled synchronous video consultation to discuss the findings and plan further interventions (Rushbrooke, Waite and Huston 2020). Another example is a telehealth consultation combined with an in-person assessment, which then includes intervention provided via in-person and telehealth sessions. This integrated approach ensures thorough, tailored, and person-centred hearing care while maximising the efficiency of telehealth services (see example in Chapter 15).

d) Mobile Health (m-Health) applications

m-Health applications (herein m-Health apps) have increasingly been used in teleaudiology to facilitate remote hearing assessments and interventions. These apps can be installed on smartphones and/or tablets/iPads, allowing HHPs and trained workers to conduct hearing screenings and monitor children's hearing health across different contexts and clinical settings. Schools can partner with audiologists to conduct remote hearing screenings and follow-up assessments using portable audiometers and video conferencing tools (see example in Chapter 4).

The four models of teleaudiology described in this section provide flexible and effective solutions for delivering



Treasures of Wisdom

Models of telehealth

- Synchronous teleaudiology involves real-time interaction between providers and families, making it effective for assessments, counselling, and intervention supported by on-site facilitators.
- Asynchronous teleaudiology allows data collection and delayed review by specialists, reducing the need for immediate interaction and enabling cost-effective early access to care.
- Hybrid and m-Health models combine digital tools and in-person care or mobile applications to deliver tailored, scalable hearing services across diverse clinical and community settings.

hearing care to children with HL and families. It is important for the HHP to consider which model(s) of telehealth are the best fit for the clinical services they wish to undertake and will best meet the needs of their clients. Some practical insights into the technology and set-up for telehealth assessment and intervention, including best practice principles are provided later in the chapter.

Integration of telehealth into hearing care systems

Integrating telehealth into existing service delivery systems in paediatric audiology is essential for creating a seamless care pathway. This may involve the consideration of how telehealth could be used to complement existing in-person services in a hybrid model of service delivery. Audiology clinics could adopt a hub-and-spoke model where more specialised services such as diagnostic testing are provided in-person from a central location (the 'hub'), and satellite sites (the 'spokes') are used to provide basic or intermediate care services, with telehealth used to connect back to specialists at the hub as needed. Integrating telehealth into existing systems would have the benefit of leveraging established healthcare infrastructure, such as electronic health records and information technology systems. This approach enables HHPs to maintain continuity of care and collaborate remotely with the MDT to develop comprehensive care plans (Al-Worafi 2024).

Telehealth Assessment in Paediatric Audiology

For assessment, telehealth allows HHPs to conduct hearing screenings, diagnostic evaluations and follow-ups remotely. Based on the purpose of the assessment, HHPs will need to determine the technological requirements to successfully complete each procedure.

As discussed in Chapter 4, remote hearing screening can be conducted using portable audiometers connected to smartphones or tablets based on the available resources at each site. These smart devices are particularly effective in community-based settings such as daycares or schools, allowing for the early identification of HL.

Diagnostic assessment using telehealth

Diagnostic assessments, including pure-tone audiometry and tympanometry, can also be conducted remotely with trained facilitators supporting on-site equipment use and using

asynchronous or hybrid methods. Ramkumar and Krumm (2023) established a viable telehealth model for remote diagnostic testing, involving remote control and access of audiology equipment and videoconferencing software. Their diagnostic test battery included video-otoscopy, tympanometry, DPOAE and AABR tests. Using a mobile telehealth van with satellite connectivity, an HHP conducted the diagnostic assessment synchronously via telehealth. Despite some challenges related to ABR assessment accuracy, the telehealth model was associated with higher follow-up rates suggesting the potential for enhancing patient adherence and continuity of care in contexts where resources are limited and HHPs unavailable (Ramkumar and Krumm 2023).

As mobile technology continues to evolve rapidly, the integration of this technology presents a promising and cost-effective approach for detecting middle ear conditions, particularly in low-resourced regions where the availability of specialised professionals remains scarce.

Teletherapy for Children with Hearing Loss

The delivery of telehealth intervention (that is, teletherapy) services for children with HL has gained popularity in recent years. Teletherapy can provide access to specialised AVT and (re)habilitation services to support listening, speech and language development while adhering to the principles of FCC. Teletherapy leverages digital technologies to deliver high-quality, personalised care, overcoming geographical and logistical barriers that often prevent access to traditional in-person (re)habilitation services. By using telehealth, HHPs can offer timely and effective support to children and their families, while ensuring that critical developmental milestones are met, and children are able to reach their full potential.

Principles and outcomes of AVT in teletherapy

AVT focuses on developing listening and spoken language skills in children with HL through active participation by caregivers (Chapter 12). In teletherapy, auditory-verbal therapists (for example, certified listening and spoken language therapists and educators) guide families to implement strategies that maximise auditory input and encourage their child's spoken language and communication. There is growing research that describes the effectiveness of telehealth (re)habilitation services for children with HL after they have received appropriate hearing amplification (that is, HAs and/or CIs) across diverse contexts and age groups (for example, Grigsby et al. 2024). Recent studies have demonstrated that telehealth

interventions are not inferior to traditional in-person rehabilitation when measured by intervention outcomes, such as language outcome measures (Grigsby et al. 2024).

Best practice principles for telehealth delivery for children with HL

Telehealth continues to have huge potential to bridge gaps in service delivery, yet it is still underused and underexplored in paediatric audiology care. As such, delivering hearing care services remotely requires some adjustments to traditional approaches that suit the telehealth model of service delivery. Table 16.1 below presents key considerations for HHPs interested in setting up a successful telehealth service for children with HL. These considerations include a series of best practice principles for telehealth delivery, including assessment and intervention sessions, and cover the technology setup, environment and telehealth approaches.

Table 16.1: Best practice principles for telehealth assessment and intervention

Physical Setup
Location and Environment (for example, participants, furniture, lighting, sound, background) • Choose the most appropriate location for telehealth sessions. This entails setting up a quiet, well-lit space free from distractions, with the camera positioned to capture every session participant (for example, the child, parents/caregivers, HHPs, siblings, pets). • Determine how many people will participate in each session and define their role. • Consider whether the room environment will be appropriate for the equipment needed (for example, furniture on wheels, soft surface tabletops). • Ensure that the room is away from high-traffic areas with excess environmental noise. • Check the flooring, wall covering, lighting and room dimensions. All these will impact the environment for telehealth sessions. • Make sure both the HHP and client(s) have an appropriate background so people and objects can be clearly seen on the screen. The HHP can ask clients to remove any visual/auditory distractions. • Include aural variety (for example, voice pitch and tone, videos, music) so clients can access diverse sources of auditory stimuli. **Professionalism** • Dress professionally to present a clear image to clients and avoid distracting accessories or clothing items. • Look and sound professional on the screen. Telehealth is as good as in-person services, so the HHP must maintain the same high-quality standards.

Resources (hardware and software)

Hardware

- Where possible, use high-definition cameras (preferably external webcams with high definition, wide viewing angle and auto-focus). Image quality needs to be clear for clients to see objects, images, facial expressions and body language clearly.
- Use high-quality microphones , as crisp and clear audio is more important for client engagement than a high-definition image. Clients need to hear conversation and stimuli without any interference or noise.
- Use dedicated headphones (for example, with active noise-cancelling) and a microphone (for example, headset, lapel mic, desktop mic) to ensure clear audio transmission.
- Optimise the audio settings by reducing background noise and adjusting microphone sensitivity to ensure clear, effective communication.

Videoconferencing software

- Ensure that clients' data is safeguarded from any breaches. Although the Health Insurance Portability and Accountability Act (HIPAA) regulations apply to providers in the United States, it is highly recommended that videoconferencing software is HIPAA compliant.
- Always choose a secure software that suits both the HHP and the client, considering pricing options, features and internet bandwidth.
- Keep children engaged during sessions by using videoconferencing platforms that include screen-sharing tools supporting interactive activities, such as storybooks, digital flashcards, visual promptsand rewards.

Planning and preparation

Preparing the client and setting expectations

- Always prepare clients ahead of the first session. Provide basic information about the telehealth appointment and discuss logistical practicalities to ensure a successful first experience.
- Conduct technical tests to troubleshoot connectivity or audio issues before the first formal session.
- Familiarise parents/caregivers and clients with platform features to ensure a smooth experience (for example, mute/unmute, turn camara on/off, screen sharing).
- Take some time to warm up the session, as there is no 'catch-up' time while walking to the room.
- Set clear expectations for the first session. This includes meeting time, date, duration of the appointment and platform to be used; resources needed for the first session and an agenda of topics to be covered; participants who will join the session; and troubleshooting procedures if needed.
- Talk clients through the first telehealth session as 'seeing the HHP' online may still be foreign to the clients. Only if they understand why and how a telehealth session is to take place, will they be at ease and engaged during the interaction.

Shared decision making and collaborative practice

- Ask for the client's input to make them feel part of the interaction, as their personal values, wishes and expectations for the intervention will be integrated into decision making and goal setting processes, enhancing their engagement.
- Consider each family's strengths and needs and discuss their short- and long-term goals as a result of the intervention process. The delivery of child- and FCC via telehealth has reported increased client engagement and outcome achievement for families of children with communication difficulties (for example, HL, speech and language disorders, autism) among others.

Planning and preparation

Setting roles and expectations

- Set out the roles and expectations for all participants early on and revise them as the nature of the appointment changes. This is important because of the lack of physical contact during telehealth, so that parents/caregivers are expected to have a more hands-on role during telehealth sessions.
- Slowly build on the parents'/caregivers' confidence and skills so that they can take a more active role as the telehealth intervention progress.
- Adopt the role of a parent/caregiver coach during telehealth intervention sessions for young children with HL and other communication difficulties, guiding families on how to best support their children. .
- Ask the family who they would like to involve during telehealth appointments (especially for intervention sessions). One of the advantages of telehealth is the ease with which additional family members and other persons besides primary caregivers can be involved.
- Remember that the success of teletherapy depends on strong and effective collaborative partnerships with families. Parents and caregivers are coached to use intervention strategies and techniques during daily activities, so it is the HHP's responsibility to actively involve them in sessions.

Materials and activities

- Planning therapy activities with clients and families via telephone, email, or videocall ahead of telehealth sessions will help both HHP and families to gather and prepare appropriate resources and materials.
- Although specific equipment and devices are needed for telehealth assessment (for example, remote control of devices), telehealth intervention typically requires less expensive and specific resources and more creativity from both professionals and clients.
- Using telehealth for intervention does not mean that all resources must be digital, complex and sophisticated (for example, videos, websites, Apps, online resources). Simple, tangible and concrete materials can also be used effectively and may even be better for younger clients with HL.
- Although not entirely unique for children with HL, embedding therapy goals into family routines enables natural opportunities for language development and practice. Storytelling and shared book reading also strengthen listening comprehension and narrative skills.
- For children with HL, auditory information is particularly important, so both input and output must be clear for children and families for them to access to and practice listening and communication skills.
- Clients may benefit from having the same materials as the HHP (for example, duplicate objects), including technology, information, and resources.
- Resources and materials should be clearly seen on the screen. Always consider the complexity, colour/contrast, size, handling and meaning of these resources to increase their effectiveness.

Communication and Interaction

Communication skills

- The most important skill during telehealth interaction is effective and clear communication. Clarity of speech, eye contact, turn-taking and listening skills must be mastered to compensate for the lack of physical contact and cue reading.
- Clear, specific, open and honest communication will facilitate and support effective interaction with clients and other participants during telehealth.
- Use modelling and imitation and then observe. First, HHPs must think about the concept they want to introduce and create a way of demonstrating it through the screen. Once they have shown the client/family this concept, the HHP can ask them to imitate and replicate it immediately so they know that clients/families have fully understood this new concept/skill. Once they have understood and demonstrate this new learning, the HHP can sit back and observe a family's interaction while providing timely support and guidance.

Client and family engagement

- Many engagement-building strategies used in in-person settings can also be used in telehealth interactions. However, there are several unique features of engagement that the HHP may need to deliberately demonstrate while interacting with children and families during telehealth sessions. For example, the way in which therapeutic relationships are built remotely, the communication style used during the interaction, the telehealth environment and the use of resources available from the family's home are all aspects relevant to telehealth engagement (see Retamal-Walter, Waite and Scarinci 2023a, 2023b).
- Telehealth sessions with children often require creative problem solving to maintain their engagement. Strategies to keep children engaged include:
  - Incorporating movement-based activities, such as dancing to music, to balance sitting and active time.
  - Scheduling breaks or using shorter session durations for children with limited attention spans.
  - Using visual supports, such as visual schedules, pictures and/or props, to capture their interest and assist their understanding.

Flexibility

- HHPs must be prepared to adjust intervention goals dynamically based on session flow, child and family feedback and outcome achievement. This flexibility ensures that therapy remains effective and family centred.

Telehealth etiquette

- Maintain privacy and confidentiality as in any other appointment. HHPs must introduce themselves and the other people present 'in the telehealth room', set clear expectations for the assessment/intervention process and set boundaries for the therapeutic relationship to grow and remain professional.
- Adjust interactions to suit the individual cultural and personal characteristics of the client and family.
- Follow up on pending items from previous interactions and outline an agenda for each session, so all participants are aware of the topics to be covered.
- End each session formally, making sure that enough time is allocated to review and plan for the next session. The end of a telehealth session includes asking for feedback, answering questions, reviewing key points, discussing follow-up plans, setting goals and confirming appointment details, including referrals and action items.

Staffing and training

Personnel training

- HHPs will need to be upskilled in using the equipment and procedures effectively via telehealth. This may be in the form of self-paced and/or specific courses delivered by telehealth experts. Many organisations include telehealth training during onboarding processes and continuing professional development.
- Skills needed for telehealth include research and implementation, and effective communication.

Troubleshoot and support

- HHPs must remain calm when things do not go as planned. Ensure there are support mechanisms available to troubleshoot technology issues that will inevitably arise during telehealth sessions.
- Best telehealth practices include discussing internet breakdowns and backup plans before starting any audiological procedure via telehealth.
- Clients continue to see telehealth as a 'second best option' after in-person services. Therefore, customer experience is essential in keeping clients accountable for, motivated by and engaged in telehealth services.

Reflective practice and creativity

- HHPs should regularly review telehealth sessions and reflect on how sessions go. When reviewing sessions, HHPs must see them through a provider and client lens to identify areas for improvement during future interactions.
- Advice from more experienced professionals in telehealth delivery allow HHPs to refine telehealth skills and service delivery.
- HHPs should remain flexible and creative while delivering assessment and intervention via telehealth. HHPs must be able to transfer knowledge, expertise and skills from previous in-person interactions into a different model of service delivery.

Overcoming Challenges of Telehealth in Paediatric Audiology

Implementing telehealth services in paediatric audiology presents multifaceted challenges, particularly in resource-constrained settings where systemic barriers can impede service delivery.

Limited technology access and digital literacy

Access to technology remains a significant barrier to the implementation of telehealth in paediatric audiology, particularly in resource-constrained settings where reliable internet connectivity and access to devices such as smartphones, tablets and computers are often unavailable. This challenge is particularly prevalent in rural and underserved areas where digital infrastructure is underdeveloped or prohibitively expensive, limiting families' ability to engage with telehealth services and exacerbating disparities in healthcare access (Al-Worafi 2024; Swanepoel, Olusanya and Mars 2010). Studies have highlighted the lack of high-speed broadband networks, unreliable internet connections, and limited information technology support as key barriers to telehealth implementation in such regions (McCarthy et al. 2019). Limited digital literacy among families poses additional challenges (Alami, Gagnon and Fortin 2019). Families who are unfamiliar with digital tools or virtual communication platforms will potentially struggle to navigate telehealth systems, reducing their ability to access care effectively.

Targeted and practical solutions should be considered to address the issues of reduced technology access and digital literacy. For example, community resources, such



Treasures of Wisdom

Take advantage of technology

- There is an old saying, 'A prepared clinician is worth two.' In the world of telehealth, preparation is not just helpful, it is essential. It is important to anticipate challenges, plan for disruptions and take time to reflect, so that better services to families can be delivered, and HHPs can grow in confidence and competence. Tips for telehealth interactions:
  - Have a backup plan in place for internet disruptions, whether it is switching to a phone call, rescheduling quickly or using asynchronous activities with families.
  - Record sessions (with consent) to revisit key moments with families or to reflect on the session. These recordings can also be viewed with mentors or colleagues for valuable feedback and support.
- By preparing well and making space for self-reflection, a resilient and responsive practice can be built.

as public libraries, schools and health centres, can serve as hubs for families to access the internet and telecommunications technology in secure and supportive environments. Such hubs could include staff or volunteers trained to assist families in navigating telehealth platforms, ensuring that technology use becomes less intimidating. Mobile health units equipped with telehealth technology offer another practical solution, bringing services directly to remote and underserved populations. Finally, asynchronous telehealth methods could also be used. For example, preloaded instructional videos, USB drives and other offline resources can support families who are without reliable internet connections, thereby ensuring continuity of care.

Financial constraints

Financial constraints may also significantly impact the implementation and accessibility of telehealth services in paediatric hearing care, particularly in resource-constrained settings. Families may face prohibitive costs associated with purchasing devices, maintaining internet connectivity or traveling to community-based telehealth hubs. In low-income contexts, even minor expenses such as transportation or data costs can limit access to services (Bhamjee et al. 2022). Additionally, resource-limited healthcare systems encounter challenges in funding the infrastructure, equipment and training required for telehealth implementation, with high initial setup costs for items such as video conferencing systems, further exacerbating the issue (Bennett et al. 2023). While some countries have established structured reimbursement models, inconsistencies and gaps in reimbursement often hinder equitable access and long-term sustainability (McCarthy et al. 2019). Without clear legislation and regulations to support sustainable funding, financial barriers continue to restrict access to telehealth for both families and healthcare systems (Bennett et al. 2023).

Workforce limitations

Workforce limitations, including shortages of skilled HHPs, present significant challenges to the consistent delivery of telehealth in paediatric hearing care, particularly in rural and underserved areas. In many countries, HHPs are concentrated in urban centres, with retention in rural areas remaining a persistent issue (Al-Worafi 2024). Furthermore, HHPs in rural settings often lack specialised expertise in paediatric audiological practice, exacerbating gaps in care. These limitations are particularly pronounced in resource-constrained settings,

where insufficient healthcare workforce capacity and inadequate training further hinder the implementation of telehealth services (Bhamjee et al. 2022).

Building engagement and relationships

A key challenge in implementing telehealth for paediatric audiology is fostering engagement and the therapeutic relationships necessary for effective care. The virtual nature of telehealth can make it more difficult for professionals to build rapport with families (Retamal-Walter, Waite and Scarinci 2023a), particularly when non-verbal cues are limited or when technical issues, such as audio or video lag, disrupt the natural flow of communication. Furthermore, young children may demonstrate variability in engagement in telepractice sessions (Retamal-Walter, Waite and Scarinci 2023b). Additionally, support for families may be difficult due to the limited ability for the HHP to provide hands-on guidance typical of traditional appointments (Retamal-Walter, Waite and Scarinci 2023a). Preferences for in-person care are often reported, as parents and caregivers value the direct, physical presence of clinicians for reassurance and troubleshooting, particularly when managing complex hearing devices or learning new intervention strategies (Mardinli et al. 2023). These challenges can lead to lower levels of engagement, reduced trust, and, ultimately, a potential impact on the effectiveness of audiological interventions delivered remotely.

To address these challenges, a family-centred and creative approach to telehealth delivery is critical. HHPs can enhance engagement by incorporating interactive, child-friendly activities that hold a child's attention and enable connection with the hearing care professional. For example, telehealth sessions can include play-based learning strategies, familiar toys or games to encourage participation and comfort (Retamal-Walter, Waite and Scarinci 2023b). Allowing additional time during interactions and enhancing verbal communication using facial expressions, vocal variations and physical cues can further increase children's engagement (Retamal-Walter, Waite and Scarinci 2023b). Within a family-centred model of care, audiologists can use telehealth to actively coach caregivers in supporting their child during assessment, device management or intervention, empowering families to take on an active role in their child's care. Clear and intentional communication is also critical, demonstrated through the setup of expectations, using warm and personable language, and maintaining consistent follow-ups to demonstrate reliability and support (Retamal-Walter, Waite and Scarinci 2023b).

Furthermore, hybrid models of care can address preferences for in-person interactions by allowing for periodic in-person sessions combined with telehealth services. Hybrid models provide opportunities for clinicians to develop rapport during in-person visits and then maintain engagement remotely (Retamal-Walter, Waite and Scarinci 2023a). Additionally, strategies such as pre-session preparation and personalised follow-up emails, videos or additional planning sessions conducted via telehealth can help families feel more connected and supported throughout the telehealth process (Retamal-Walter, Waite and Scarinci 2023b).

Ethico-legal concerns

Ethico-legal considerations are critical to the successful implementation of telehealth in paediatric hearing care. Ensuring the privacy, security and confidentiality of patient data presents unique challenges, particularly if families rely on shared devices or public internet access. Differences in legal frameworks across countries or regions further complicate service delivery and accountability, as providers may need to navigate regulatory requirements outside their own jurisdictions (Swanepoel, Olusanya and Mars 2010). Additional concerns include the absence of comprehensive policies, protocols or guidelines that govern telehealth practices (Bhamjee et al. 2022) and fears surrounding the misuse of patient data by governments or for commercial purposes (Alami, Gagnon and Fortin 2019). Insecure telehealth systems are also vulnerable to cybersecurity threats, which can lead to data breaches and legal repercussions. Addressing these challenges is essential to maintain trust, ensure ethical care and prevent inequities in telehealth delivery.

Proactive measures are needed to address these ethico-legal concerns and ensure that telehealth practices meet global standards. Implementing secure telehealth platforms with robust encryption, firewalls and secure protocols for data storage and access is essential for protecting patient data. Further, clinicians must make sure they adhere to national and regional privacy laws that provide a framework for responsible data handling. Informed consent processes should be adapted to telehealth, using culturally relevant and simple language to explain patient rights and responsibilities. Addressing licensure barriers is equally critical. International and national agreements are needed to standardise telehealth practices across jurisdictions, and to enable providers to work effectively under differing regulatory frameworks. Training clinicians in the ethical issues and responsibilities in telehealth further supports the delivery of respectful and secure care. The checklist in Appendix 16.1 can be used to ensure that HHPs are considering ethico-legal considerations in their telehealth practice.

In addition to the checklist for ensuring compliance, Table 16.2 provides some examples of professional guidelines and regulatory frameworks for ensuring ethical, secure and effective delivery of telehealth services in audiology for various regions.

Table 16.2: Examples of telehealth guidelines and regulatory frameworks

Country	Professional Guidelines	Data Security Legislation/ Standards
Australia	Australian Teleaudiology Guidelines (Audiology Australia)	Australian Privacy Principles/ Privacy Act
Canada	SAC Position Paper on The Use of Virtual Care in Speech-Language Pathology and Audiology Services (Speech-Language and Audiology Canada)	Personal Information Protection and Electronic Documents Act (PIPEDA)
South Africa	General Ethical Guidelines for Good Practice in Telehealth (Health Professions Council of South Africa)	Protection of Personal Information Act (POPI Act)
United Kingdom	A guide to remote working in Audiology (British Academy of Audiology)	The UK General Data Protection Regulation (GDPR)
United States	Position Statement: The Use of Telehealth for the Delivery of Audiological Services (American Academy of Audiology)	Health Insurance Portability and Accountability Act (HIPAA)

Implementation Frameworks for Telehealth in Paediatric Audiology

Several frameworks can be considered in the development of telehealth services, to guide effective and sustainable implementation. These frameworks consider aspects of access, training and acceptability, and therefore can be used to mitigate the challenges to telehealth implementation discussed in this chapter. Two relevant frameworks are outlined in this section.

Access framework

While not designed for telehealth, Penchansky and Thomas' Theory of Access (1981) conceptualises access to healthcare as a multidimensional construct. The five elements of this theory could be used as a framework to guide the development of telehealth services by ensuring each dimension is addressed in the planning and implementation phases:

1. Availability: The service is available to those needing it. Assess the resources required to deliver telehealth services, such as trained HHPs, technology and infrastructure, ensuring they are sufficient to meet the demand in the target population.
2. Accessibility: The user has access to the service. Evaluate geographical and technological barriers that might prevent families from accessing services and implement solutions like internet subsidies or telehealth hubs in schools or community centres.
3. Adequacy: The service responds to the needs of the community. Design services that are flexible and user-friendly, accommodating the needs of families with varied schedules and caregiving responsibilities.
4. Affordability: The cost of the service is considered. Develop funding models to reduce cost barriers, such as partnering with government programmes or NGOs to subsidise telehealth technology and services.
5. Acceptability: The service is considerate of the community's cultural and attitudinal needs. Engage stakeholders to ensure services are culturally sensitive, trusted, and aligned with the preferences of families and HHPs.

I2I-4-Telehealth

The innovation to implementation for telehealth, or I2I-4-Telehealth (Theodoros et al., 2016), is a knowledge translation (KT) tool adapted to help start telehealth services. It begins by establishing a foundation for change, which includes clearly defining the telehealth innovation, identifying key stakeholders and developing a comprehensive plan to communicate with and engage these stakeholders. The process of implementing telehealth innovation operates alongside this foundation, requiring a coordinated change management strategy that complements the KT activities. It comprises seven steps guided by key focus points:

1. State the purpose of the KT plan: Clearly define the main goal of the KT plan, focusing on what needs to change and what success would look like. This helps establish the rationale for implementing telehealth and secures buy-in from stakeholders.
2. Select an innovation: Identify a specific, feasible telehealth innovation that addresses the purpose of the KT plan. This includes ensuring the innovation has a strong evidence base and aligns with organisational and community needs.
3. Specify key players and actions: Identify all stakeholders involved in the implementation process and outline the specific actions they need to take. This ensures clarity about roles and responsibilities.
4. Identify agents of change: Determine influential individuals or groups who can advocate for and drive the adoption of the telehealth innovation. These could be opinion leaders, champions or early adopters.
5. Design the KT Plan: Develop a comprehensive plan for implementing the innovation, including the methods, materials and strategies to engage stakeholders and encourage adoption.
6. Implement the KT plan: Put the plan into action, either at once or in phases. Use feedback from stakeholders to adjust the implementation as needed to improve acceptability and feasibility.
7. Evaluate success: Assess the impact of the telehealth innovation and the KT plan based on specific metrics such as reach, effectiveness, adoption, implementation and sustainability.

These systematic steps, together with an example relevant to paediatric audiology, are presented in Figure 16.3.

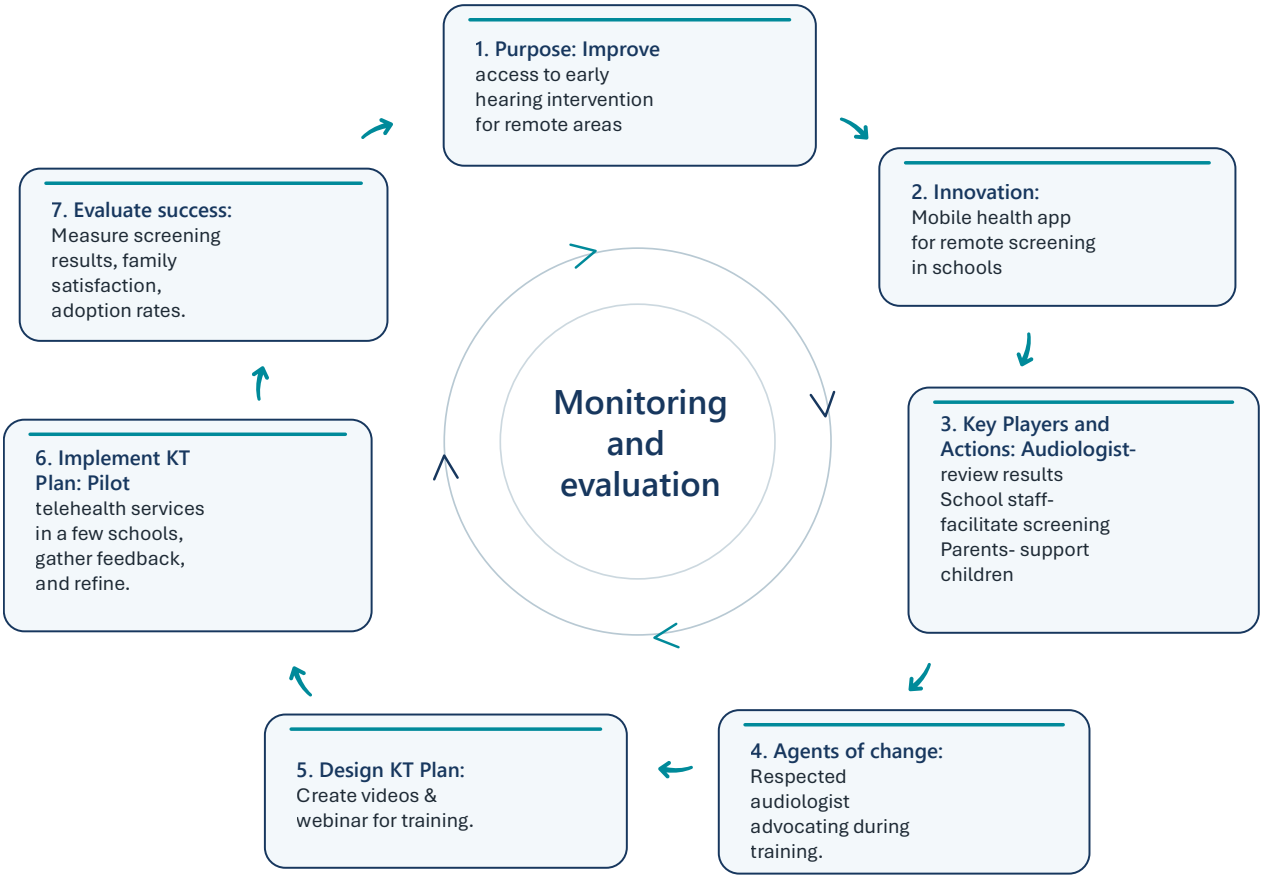


Figure 16.3: Application of the I2I-4-Telehealth in paediatric audiology

By addressing these dimensions systematically, the framework ensures telehealth services are equitable, sustainable and capable of meeting the diverse needs of the community.

Continuing professional development in telehealth audiology

Staying up to date with best practices in telehealth is essential for HHPs supporting children with HL. As service delivery models continue to evolve, so too must the skills and confidence of the HHP in using technology to engage families and deliver effective intervention. Ongoing professional development helps ensure that HHPs remain responsive to emerging evidence, with the knowledge and skills to provide high-quality, evidence-based and family-centred services across a range of settings.

Examples of reputable online platforms that offer comprehensive continuing professional development opportunities in telehealth for HHPs are listed below:

- Audiology Online (*www.audiologyonline.com*) has collated a number of professional development courses for HHPs to prepare for telehealth assessment and intervention. The course catalogue for Telehealth (*https://www.audiologyonline.com/audiology-ceus/telehealth/*) offers over 40 introductory, intermediate and advanced courses for professionals interested in offering audiology services at distance both for children and adults.
- For speech pathologists, there are over fifteen dedicated courses for professionals working via telehealth with diverse populations and communication difficulties (*https://www.*



Treasures of Wisdom

Barriers to telehealth

- Limited access to technology and digital literacy in underserved areas significantly restricts the reach of paediatric audiology telehealth services, reinforcing existing healthcare disparities.
- Financial constraints affect both families and healthcare systems, making it difficult to afford the devices, connectivity and infrastructure needed for sustained telehealth delivery.
- Workforce shortages, particularly in rural settings, hinder telehealth implementation but can be mitigated through remote supervision, upskilling and context-specific training.
- Building engagement and trust in virtual care is essential, requiring creative, family-centred strategies and hybrid models to strengthen therapeutic relationships and maintain participation.

speechpathology.com/slp-ceus/all/#/category_id:telehealth-and-telepractice).

- It is important to check what training and courses are available to you as part of your affiliation and/or membership to professional associations at the national and international levels.

Conclusion

Telehealth presents an exciting and transformative opportunity for HHPs to expand their reach and enhance service delivery in paediatric audiology. By addressing barriers such as geographic isolation, accessibility and cost, telehealth ensures equitable and timely care for children and families who might otherwise struggle to access vital hearing services. With growing evidence demonstrating comparable outcomes to in-person care, telehealth empowers the HHP to deliver high-quality, family-centred interventions. Embracing telehealth with a commitment to best practices and continuous professional development enables HHPs to overcome challenges and leverage technology to make a meaningful impact on children's auditory and communication development. The integration of telehealth into clinical practice enhances efficiency and outcomes and also highlights the profession's adaptability and innovation in meeting the diverse needs of families worldwide.



Test your knowledge:

Based on the content covered answer the following questions:

1. What are the four different models of telehealth?
2. Describe the most important considerations regarding telehealth environment, technology setup and client engagement.
3. What are the traditional challenges to telehealth regarding audiological assessment and intervention?
4. In your context of practice, what is needed to implement an effective and family-centred telehealth audiology service for children with HL?
5. Which aspects of telehealth may be easier for you to implement and why?

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Appendix 16.1: Checklist for ensuring compliance and best practices in telehealth

a) Licensure Requirements and Professional Guidelines

- ☐ Ensure licensure or certification in the jurisdiction where the client is located.
- ☐ Verify compliance with professional guidelines from relevant organisations.

☐ Follow evidence-based standards for telehealth to provide care equivalent to in-person services.

b) Patient Consent

☐ Obtain informed consent from clients before delivering any telehealth services.

☐ Clearly explain the nature of the telehealth visit, including potential benefits, risks, and deviations from in-person care.

☐ Inform client of their right to withdraw from the service at any time.

☐ Document the consent appropriately for legal and ethical compliance.

c) Privacy and Data Protection Regulations

☐ Ensure compliance with relevant regulations or legislation.

☐ Ensure the use of telecommunication tools that provide encryption and firewalls to ensure data protection.

☐ Implement access controls to ensure only authorised personnel can view client information.

☐ Conduct regular risk assessments to identify and mitigate potential vulnerabilities in data security.

☐ Train staff on relevant regulations and secure handling of client data.