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A position paper represents the direction SAC has taken on a particular topic or provides guidelines for particular areas of practice. These positions are time-bound, representing the thinking at a particular point in time.
Position

It is the position of Speech-Language & Audiology Canada (SAC) that unilateral hearing loss (UHL) in childhood has important consequences for development in areas such as auditory communication, academic and social functioning. Newborn hearing screening and early hearing loss detection is an essential step to ensure that children with UHL are identified and can access appropriate and timely intervention. This includes parent support and coaching, consideration of hearing technology options, monitoring and direct therapy services when required. These services should be provided within the context of an Early Hearing Detection and Intervention (EHDI) program.

Background

Definitions: Unilateral hearing loss (UHL) refers to any degree or type of hearing loss in one ear with normal hearing sensitivity in the other ear. Typically, normal hearing sensitivity in children is defined as thresholds better than or equal to 15 dB HL. Profound unilateral sensorineural hearing loss has frequently been described using the term single-sided deafness both clinically and in the literature. In this document, the audiologic term profound unilateral sensorineural hearing loss is used rather than single-sided deafness. Unilateral permanent conductive hearing loss (e.g. due to atresia) and auditory neuropathy spectrum disorder are also considered within the broad category of UHL within this document.

Prevalence: UHL estimates vary depending on the population sampled, definitions and methods utilized to determine hearing thresholds. Estimates from newborn hearing screening programs suggest approximately one in 1000 infants will have UHL (Lieu, 2018). These numbers increase with age due to later onset and acquired hearing loss with estimates ranging from 3 to 14% in the 3- to 19-year-old age range (Lieu, 2018; Shargorodsky, Curchan, Curchan, & Eavey, 2010). Data from population-level newborn hearing screening cohorts in Canada indicate that one in five to one in seven children who are identified with permanent hearing loss have UHL (Bagatto et al., 2016; Fitzpatrick, Al-Essa, Whittingham, & Fitzpatrick, 2017). Research has shown that 30-40% of children with UHL show deterioration in hearing over time and 10-20% eventually develop bilateral hearing loss (Fitzpatrick et al., 2017).

Developmental Outcomes: UHL results in a loss of binaural function which negatively impacts sound localization and speech perception abilities in noise. Sound localization is the ability to determine the location of sound sources in the environment and is important for both communication and safety. Listening in noise requires the ability to segregate or separate important sounds, like speech, from other less important sounds or background noise (Steckler & Gallun, 2012). Both of these skills involve spatial listening that is, comparing acoustic information perceived at one ear to that at the other. This requires the use of interaural cues (the difference between arrival time and between the level of the signal at the two different ears). Children with UHL have impaired spatial listening abilities (Gordon, Henkin, & Krai, 2015). There is some evidence that with UHL, the auditory system reorganizes itself to strengthen input from the ear with normal hearing and weaken pathways from the impaired ear. Consequently, the child has a reduced ability to utilize spatial sound cues. These skills are very important in children as they enhance incidental learning and decrease fatigue and cognitive load (Litovsky & Gordon, 2016).

Recent studies have examined the impact of increased listening effort on learning and behaviour in children with normal hearing sensitivity and those with hearing loss (McGarrigle, Gustafson, Hornsby, & Bess, 2019). While all children are challenged by unfavourable acoustic conditions, the effects are more pronounced for children with hearing loss, including UHL. Without efficient binaural processing skills, early auditory behaviour, preverbal vocalizations, speech-language development and academic outcomes may be impacted in children with UHL.

Children with UHL are also at risk for difficulties related to vestibular function. A high prevalence of vestibular impairment has been documented in children with sensorineural hearing loss (Cushing, Gordon, Rutka, James, & Papsin, 2013). Precise prevalence data related to vestibular difficulties for children with UHL is limited, but is believed to be higher than in individuals with normal hearing sensitivity.
Rationale

In the context of EHDI, children with UHL are now identified in infancy and early childhood. However, UHL specifically is not part of the target disorders for EHDI programs in all jurisdictions, largely due to the limited research about the benefit of intervention. For many clinicians there is uncertainty around the need for and the most appropriate intervention for children with UHL. Consequently, treatment approaches range from watchful waiting to the use of hearing technology such as hearing aids or cochlear implants as well as speech and language intervention. The consequences of UHL are not well understood, especially when hearing loss is identified in infancy. Given the increasing number of children identified with UHL at a younger age and the lack of clear evidence regarding intervention, it is important for audiologists, speech-language pathologists and other professionals interacting with these children and their families to stay current with emerging research.

The provision of information to families regarding the potential impacts of UHL, including speech, language, academic, and social issues, is an important component of the care process. Families need an understanding of how auditory deprivation and binaural advantages can impact their child’s development.


**Recommendations**

When a child is diagnosed with a UHL, it can be a very confusing and overwhelming time for families. Families are faced with an inordinate amount of information about their child’s hearing loss, technology and other intervention options. Parents have expressed concerns regarding time needed for audiology and medical appointments, their child’s communication development and the impacts on educational achievements. Research shows that professional attitudes, communication and manner are important contributors to parents’ perceptions and can greatly impact their decision-making process (Fitzpatrick et al., 2016).

Evidence-based counseling is a key component during the diagnosis, intervention and ongoing audiologic care of a child with UHL (Munoz, Price, Nelson, & Twohig, 2019) and family-centred support improves communication between families and the audiologist (Bagatto et al., 2019). Shared decision-making is an important element of family-centred care where the audiologist supports the family in making a decision that is consistent with their values and considers their expectations. In light of continued clinical uncertainty about technology and intervention options for children with UHL, parents need to receive adequate information from the audiologist and other care providers to make an informed choice. Using support tools such as visual aids and decision aids may help parents in their decision making (Porter, Creed, Hood, & Ching, 2018).

**Technology: Personal Hearing Aid:** The provision of a hearing aid is recommended for children with UHL if the degree of hearing loss on the affected side permits the child to receive appropriate speech audibility from either an air or bone conduction hearing aid (McCreery, Bentler, & Roush, 2013; Moodie, Scollie, Bagatto, & Keene, 2017). Typically, mild to severe degrees of hearing loss receive appropriate audibility through a hearing aid, depending on the frequencies affected. A remote microphone system is also recommended in combination with a hearing aid, especially for classroom settings. For children with profound unilateral sensorineural hearing loss, contralateral routing of sound (CROS) devices may be considered if the child can orient their head to avoid noise sources. This applies to both air conduction and bone conduction devices that contralaterally route sound. Consistent with any hearing aid fitting, appropriate gain, output, frequency bandwidth and sound quality should be considered.

Children with profound unilateral sensorineural hearing loss may also be considered candidates for a cochlear implant. The use of a cochlear implant for UHL began as a treatment for tinnitus in adults with UHL (Van de Heyning et al., 2008) and has expanded to both adults and children with profound UHL. Abnormal cortical function is seen in individuals with profound unilateral sensorineural hearing loss and preliminary evidence suggests that implantation reverses this, such that normal hemispheric representation of sound in the brain is restored (Arndt et al., 2015). For children with profound UHL, research suggests that to be effective, cochlear implantation should occur as soon as possible after onset and within the first four years of deafness (Gordon & Kral, 2019). Intervention is required post-implantation to help the child with UHL learn to integrate the acoustic and electric signals.

**Functional Outcomes:** Hearing technology in children requires careful monitoring and evaluation of benefits. In recent years, functional outcome measures have been widely adopted to identify areas of concern and to validate the benefits of hearing devices. Several functional outcome questionnaires have been developed for these purposes and are recommended for children with UHL in a recent consensus statement (Bagatto et al., 2019). These include parent and child questionnaires that assess areas such as localization abilities (e.g., Speech Spatial and Qualities of Hearing Questionnaire) (Gatehouse & Noble, 2004) and listening behaviours (e.g., Early Listening Function, LittleEARS Auditory Questionnaire, Parents Evaluation of Aural/Oral Performance of Children) (Anderson, 2000; Ching & Hill, 2007; Tsikpini et al., 2004). There are also questionnaires to be completed by teachers in order to document functioning in school, such as the Screening Instrument for Targeting Educational Risk (Anderson, 1989) and the Teachers’ Evaluation of Aural/Oral Performance of Children (Ching & Hill, 2005). When choosing outcome measures, consideration of chronological as well as developmental age of the child is critical.

Given that children with UHL are at risk for further deterioration in hearing in one or both ears, it is important to continue to monitor their auditory abilities through audiologic and functional assessments.

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Speech-language Intervention: As noted previously, some children with UHL will develop spoken communication following typical developmental trajectories. However, given that these children are at risk for auditory and communication development delays as compared to their peers, intervention for children and their families that extends beyond hearing technology should be considered for children with UHL. While these children, especially with the benefit of early hearing loss detection and intervention, may not require the intensity of therapy typically required for children with bilateral hearing loss, their development in auditory, language, and related skills must be carefully assessed and monitored using conventional standardized speech-language measures, parent questionnaires, and functional outcome measures (Bagatto et al., 2018). Additional intervention and parent coaching should be provided if needed to facilitate auditory, linguistic and cognitive development. Furthermore, intervention and support for families can lead to increased duration/frequency of hearing technology use which can be monitored with daily use logs within hearing aids (Ganek, Cushing, Papsin, & Gordon, 2020). There is some evidence that intervention can be beneficial for children with UHL in improving speech recognition abilities in noise (Tavora-Vieira & Rajan, 2015; Hassepass et al., 2013), sound localization and spatial hearing (Ganek et al., 2020; Hassepass et al., 2013; Tavora-Vieira & Rajan, 2015).

Conclusions

The majority of children with UHL are identified in infancy and early childhood in regions with EHDI programs. There is evidence that UHL may affect children in multiple developmental domains. Technology and other interventions can reduce the negative consequences associated with UHL. However, best practices in intervention for these children are still relatively new and continue to develop. Audiologists must continue to apply current evidence to support families in decision-making. Ongoing research is needed to better understand the impact of UHL for different children and how to provide optimal interventions.

References


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