

# Quick Practice Guideline

May 2018

## Tools and considerations for assessing and managing unilateral hearing loss in children

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### Introduction

Unilateral hearing loss (UHL), once considered to be a nuisance and not taken seriously by hearing professionals, has been shown in recent decades to be associated with academic, speech and language, and social/behavioral deficits in children (Bess & Tharpe, 1986; Lieu, 2004; Lieu, 2013). Despite increased understanding of these problems, there exists little evidence of effective interventions that can ameliorate these deficits.

The following summary of tools available to audiologists for the assessment and management of children with UHL is based on a review of the extant literature and, when evidence was not available, on expert opinion.<sup>1</sup>

### Principles of identification and assessment

Numerous published guidelines by various national organizations have outlined recommendations for newborn hearing screening and assessment of hearing loss in children (American Academy of Pediatrics (AAP), 2007; American Academy of Audiology, 2012; American Speech-Language-Hearing Association [ASHA], 2004; AAP, 2003; Ontario Infant Hearing Program Audiologic Assessment Protocol, 2008). These guidelines, as well as additional guidance in the provision of family-centered early intervention should be considered by audiologists who provide services to children. Specifically, the authors of this Quick Practice Guideline support the recommendation that hearing be screened by 1 month of age, hearing loss identified by 3 months of age, and intervention provided by 6 months of age. These recommendations hold true for all forms of permanent hearing loss, including those that are unilateral.

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A unique and immediate consequence of UHL is loss of binaural function that has a negative impact on localization, which has implications for child safety as well as listening ability (Humes, Allen & Bess, 1980; Johnstone, Nabelek & Robertson, 2010), and speech perception in noise (Bess, Tarpe & Gibler, 1986; Ruscetta, Arjmand, & Pratt, 2005). There is also evidence suggesting that UHL negatively impacts balance (Wolter et al., 2016), early auditory behavior and preverbal vocalization (Kishon-Rabin et al., 2015), speech and language development (Ead et al., 2013; Lieu, 2013), academic attainment (Lieu, 2004; Lieu, 2013), and even cognition (Ead et al., 2013; Lieu, 2013). Therefore, children

with UHL can benefit from a number of non-standard screenings including balance function, speech and language skills, and academic ability.

#### **Audiologic monitoring/follow-up schedule**

The table below provides a sample of available instruments beyond standard audiometry for monitoring auditory behaviors, identifying children who are at risk for hearing-related difficulties, and monitoring performance with hearing technology.

Measure	Purpose of instrument	Target population/ degree of HL	Respondent	Age range	Authors
<b>Auditory Behavior in Everyday Life (ABEL)</b>	Evaluate auditory behavior in everyday life (auditory awareness, aural/oral and social skills)	Mild to profound hearing loss	Parent	4 to 14 years	Purdy et al., 2002
<b>Children's Home Inventory for Listening Difficulties (C.H.I.L.D.)</b>	Monitor listening skills within the home environment	All	Parent and child, versions	Parent 3 to 12 years Child 7+ years	Anderson & Smaldino, 2000, 2012
<b>Early Listening Function (ELF)</b>	Obtain indication of functional use of hearing	Infants and toddlers with hearing impairment	Parent and audiologist	5 months to 3 years	Anderson, 2000
<b>Hearing Environments and Reflection on Quality of Life (HEAR-QL-26)</b>	Determine how a child perceives the effects of their hearing loss	All	Child	7 to 12 years	Urmansky, Jeffe & Liu, 2011
<b>Listening Inventory for Education (LIFE-R)</b>	Identify classroom situations that provide listening challenges	All	Child and teacher versions	6+ years	Anderson, & Spangler, 2011
<b>Listening Situations Questionnaire (LSQ)</b>	Identify benefit of amplification, difficulty in understanding, and satisfaction of amplification		Parent and child versions	7+ years	Grimshaw, 1996, 2004
<b>LITTLEARS Auditory Questionnaire (LEAQ)</b>	Assess auditory behaviors	All	Parent interview	≤ 2 years	Kühn-Inacker, Weichbold, Tsiakpini, Coninx, & D'Haese, 2004
<b>Parents' Evaluation of Aural/oral Performance of Children (PEACH)</b>	Evaluate effectiveness of amplification	Infants and children with mild to profound hearing loss	Parent interview	Preschool to 7 years	Ching & Hill, 2007

Measure	Purpose of instrument	Target population/ degree of HL	Respondent	Age range	Authors
<b>Screening Instrument for Targeting Educational Risk (PRESCHOOL SIFTER)</b>	Identify children at risk for educational delays and determine need for further evaluation	All	Teacher	3 to 5 years	Anderson & Matkin, 1996
<b>Screening Instrument for Targeting Educational Risk (SIFTER)</b>	Identify risk for educational delay and further evaluation	All	Teacher	Children in grades 1 to 6	Anderson, 1989
<b>Teachers' Evaluation of Aural/oral Performance of Children (TEACH)</b>	Record functional hearing and communication ability with hearing aid technology	All	Teacher interview	Preschool to 7 years	Ching & Hill, 2005

### Developmental screening

Some challenges identified in children with UHL are insidious and require non-audiologic screenings for detection and ultimate intervention. The American Academy of Pediatrics has recommended ongoing developmental and behavioral screenings for children at their well-child visits (Hagan, Shaw, & Duncan, 2017).

It is recommended that audiologists and speech-language pathologists ensure that these screenings are implemented and, if not, consider the use of such measures to determine if additional referrals are needed.

This table provides information on screening tools that can be valuable in the identification of developmental and behavioral difficulties in children, including those with UHL.

Screener	Developmental domains covered	Age range	Languages of materials	Technical background needed?
<b>Ages and Stages Questionnaire</b>	Communication Gross motor Fine motor Problem solving Personal-social	1 to 66 months	English, Spanish, French	No
<b>Ages and Stages Questionnaire: Social-Emotional</b>	Self-regulation Compliance Communication Adaptive functioning Autonomy Affect Interaction with people	6 to 60 months	English Spanish	No
<b>Communication &amp; Symbolic Behavior Scales (CSBS Checklist)</b>	Communication assessment	6 to 24 months	English	No
<b>Early Language Milestone Scale (ELM Scale-2)</b>	Identifies language delays	0-36 months	English	No

### Early intervention

Although many children with permanent bilateral hearing loss are enrolled in early intervention programs and receive a variety of specialized services and regular surveillance, there is more variability in the provision of early intervention services for children with UHL. Many of these children receive no intervention services and minimal follow-up after diagnosis despite evidence indicating their risk for delays in speech, language, and academic achievement.

Part of early intervention is the consideration of a variety of technologies for children with UHL.

Currently, there are no published guidelines stating which children with UHL should receive hearing technology, what type of technology should be used, or what type is most efficacious.

The following table briefly summarizes these available technologies and provides consideration of their relative advantages and limitations.

Device	Benefit	Disadvantage	Considerations
<b>Conventional</b>	Improved detection of sound on the affected side	Might not provide benefit for profound SNHL	Supports fitting on affected side if degree is mild to severe  Environmental sound awareness might be the goal for more severe degrees of loss
<b>Bone conduction</b>	Suitable for unilateral microtia/atresia. Might be considered in lieu of a conventional CROS	No fitting protocols  Sound quality for profound UHL is inferior to routed signal in CROS	Surgical option not available for children under the age of 5 years in many areas
<b>Contralateral Routing of Signal (CROS)</b>	Improved detection of speech on the side with UHL in quiet  Improved speech understanding in noise when speech is the dominant signal on the side with hearing loss	Reduced speech understanding when noise is the dominant signal on the side with hearing loss  Unlikely to help localization	Ability to manage device and listening environment – especially for young children  Need to avoid occluding normal hearing ear – use large vent or open fitting  No data available regarding outcomes of non-implanted bone conduction devices for children with profound UHL Transcranial CROS requires custom earmold that sits in bony portion of canal
<b>Cochlear Implant (CI)</b>	Improved speech recognition on affected side  Improved overall speech recognition in noise  Improved localization (adults and children)	Surgical intervention  Might prevent candidacy from future advancements in hearing restoration	Must have compelling audiologic data showing that the ear to be implanted will not benefit from other non-surgical forms of technology Subject to medical and regulatory candidacy criteria
<b>Personal Remote Microphone System (RMS)</b>	Improved access to primary auditory signal  Addresses effects of noise, and reverberation	For each transmitter/microphone, system is beneficial for hearing a single talker only. Multiple microphones are needed for multiple talkers  Requires talker's cooperation  Use of a personal receiver might affect compliance for some users	Deciding which ear to fit depends on multiple factors, including degree of hearing loss in poorer ear and ability to ensure an open fitting in the better ear

Device	Benefit	Disadvantage	Considerations
<b>Classroom Audio Distribution System</b>	<p>Improved access to primary auditory signal</p> <p>Delivers primary talker's voice evenly throughout the learning space through one or more loudspeakers</p> <p>Benefits all listeners in the learning space</p>	<p>Each transmitter/microphone system is beneficial for hearing a single talker only. Multiple microphones are needed for multiple talkers</p> <p>Requires the talker's cooperation</p> <p>Limited portability and flexibility for use across a range of environments</p> <p>Might not provide the same degree of benefit as personal or desktop RMS</p>	<p>Improved signal-to-noise ratio, but dependent upon classroom acoustics</p> <p>Systems are more effective when classroom acoustics have been optimized</p>
<b>Desktop RMS</b>	<p>Improved access to primary auditory signal</p> <p>Addresses effects of noise, distance, and reverberation on speech understanding</p>	<p>Each transmitter/microphone system is beneficial for hearing a single talker only. Multiple microphones needed for multiple talkers</p> <p>Requires the talker's cooperation</p> <p>Limited flexibility for use across a range of environments</p> <p>Use of a desktop receiver might affect compliance for some users</p>	

### Information to be conveyed to families

Despite technological progress and enhanced professional understanding of UHL in children and its implications, there remain numerous challenges to effective communication between audiologists and families of these children. This is in large part the result of a lack of management standards for UHL, and reflective of the challenges many audiologists face in their own counseling skills and strategies in communicating with families. Audiologists have an important role in providing support, information, and resources to parents throughout their journey with their child. To meet the needs of individual families, services need to be family focused, and the process should be modified based on unique

family circumstances, dynamics, and desires (ASHA, 2008; Larsen et al., 2012).

### Final comments

Unilateral hearing loss poses a complex management challenge for audiologists given its wide and diverse range of impact on child development. This Quick Practice Guideline attempts to summarize key considerations for managing UHL in children but is by no means exhaustive. Care providers for these children are encouraged to seek additional information via the references that follow.

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