



# Tools for Schools™

Helping children with cochlear implants  
succeed in the classroom

Fall 2006 Issue 3

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## Feature Article The Buzz on Bilateral

It's that time of year again—time to go back to school! The start of a new school year can be exciting and overwhelming. For school professionals who work with children who use hearing aids, cochlear implants, or other assistive hearing technology, the first days of school can be especially challenging. These school professionals must learn how to use, troubleshoot, and manage new technology, train general education professionals, and stay up to date on the latest trends in the field of hearing health.

One growing trend school professionals will observe this school year is students who use two cochlear implants rather than just one. Now that the safety and efficacy of unilateral cochlear implantation is well established, there is a growing trend to provide patients with a cochlear implant in each ear. Research clearly demonstrates that people with normal hearing and individuals who use two hearing aids show significant benefit when listening with two ears.

The benefits of hearing with two ears include:

- Better speech understanding in noise
- Improved localization of sound sources
- Improved sound quality and clarity
- Improved ease and confidence in communication situations

This issue of the *Tools For Schools (TFS) E-Newsletter* reviews the terminology associated with bilateral cochlear implantation, discusses the benefits of binaural hearing, reviews research on the benefits of bilateral cochlear implantation, and provides tips from aural rehabilitation specialists who have experience working with children who have two cochlear implants.

### Terminology

There are several terms used to describe hearing with one versus two ears. These terms are often used interchangeably and can cause confusion.

**Unilateral hearing loss or monaural hearing loss:**

Normal hearing in one ear and the presence of hearing loss in the other ear.

**Bilateral hearing loss or binaural hearing loss:** The presence of hearing loss in each ear.

**Unilateral hearing or monaural hearing:** Hearing with one ear.

**Bilateral hearing or binaural hearing:** Hearing with

Feature Story	1
Resource Corner	3
Technology Corner	7
Upcoming Education and Training Events	8

two ears; describes any condition where both ears are involved in listening (hearing with a cochlear implant in one ear and a hearing aid in the other ear, hearing with a cochlear implant in each ear, hearing with a hearing aid in each ear, normal hearing).

**Unilateral implantation or monaural implantation:** Use of a cochlear implant in only one ear.

**Bilateral implantation or binaural implantation:** Use of a cochlear implant in each ear.

**Unilateral amplification or monaural amplification:** Use of a hearing aid in only one ear.

**Bilateral amplification or binaural amplification:** Use of a hearing aid in each ear.

**Contralateral ear:** Opposite ear.

**Bimodal hearing:** Use of a cochlear implant in one ear and a hearing aid in the other ear.

**Simultaneous cochlear implantation:** Both cochlear implants are placed during one operation.

**Sequential cochlear implantation:** Each cochlear implant is placed during a separate operation.

## Benefits of Bilateral Hearing

Normal hearing listeners gain two important everyday advantages from having two ears: bilateral benefit and bilateral advantage.

**1. Bilateral benefit** is the ability to listen with the ear that has a better signal to noise ratio. The bilateral benefit comes into play when speech and noise come from different directions and is primarily the result of the head shadow effect.

- **Head shadow effect:** When listening to the primary signal (typically speech) in noise, the head acts as a sound barrier that causes a reduction in the loudness of noise at the far ear.



**2. Bilateral advantage** is the ability to combine sounds from the two ears to hear better than with one ear alone. The bilateral advantage enables sound localization, binaural loudness summation, and binaural squelch.

- **Localization (directional hearing):** The brain's use of differences in the timing and loudness cues of a signal between the two ears to determine the location of a sound source.
- **Binaural loudness summation:** When identical signals are presented to both ears, the signal may be perceived as louder than if the signal was presented to just one ear.
- **Binaural squelch:** The ability of the brain to separate the primary signal (typically speech) from background noise by comparing the time, loudness, and frequency differences of sounds coming from different directions to each ear.

**[Click here to learn more about the benefits of Bilateral Hearing in Advanced Bionics' White Paper "Hearing with Two Ears."](#)**

**[Click here to take Advanced Bionics' FREE Web courses: Hearing with 2 Ears: Terminology, Considerations and Outcomes" and "Bilateral Cochlear Implants."](#)**

## Bilateral Cochlear Implantation: Research Results

Several research studies indicate that most bilateral implantees have dramatic improvements in head shadow effects and sound localization. Some bilateral implant users show binaural summation and binaural squelch effects.<sup>2,3,5,6,7,8,9,10</sup>

One 2004 analysis reviewed the benefits of two implants for everyday listening and quality of life. When everyday listening benefits were assessed, patients with bilateral implants reported better speech understanding in noise, improved clarity and quality of sound, and better localization of sound in everyday situations than patients with unilateral implants. Moreover, when asked what they preferred, all bilateral implant users strongly preferred two implants to using one implant with the better ear alone.<sup>2,3,5,6,7,10</sup>

## **Advanced Bionics' HiResolution® Bionic Ear System and Bilateral Cochlear Implantation**

Preliminary clinical results from patients who have been implanted with two Bionic Ears at a United States research center indicate that HiResolution Sound Processing provides bilateral benefit that is superior to bilateral benefit from conventional sound processing. The results showed that subjects were able to tolerate a more difficult signal-to-noise listening ratio with HiResolution than with conventional sound processing.<sup>1</sup>

**[Click here to learn more about how the HiResolution Bionic Ear System captures, composes, details, and delivers sound.](#)**

**[Click here to learn more about the clinical results from patients who have been fit with two Bionic ears in the article "Effects of Converting Bilateral Cochlear Implant Subjects to a Strategy With Increased Rate and Number of Channels" by Dunn et al.](#)**

## **RESOURCE CORNER**

### **A Tale of Two Ears: Tips From the Team at the Hearing Enrichment Language Program (HELP) of INTEGRIS Health**

One of the most popular presentations at this year's AG Bell convention in Pittsburgh was "A Tale of Two Ears" by the Hearing Enrichment Language Program (HELP)/CI of INTEGRIS Health at the Hough Ear Institute. During this presentation, the program's Auditory-Verbal therapists shared their knowledge about working with children who use two cochlear implants. The Tools For Schools (TFS) program recently had the opportunity to interview the HELP team to learn more about how to approach aural rehabilitation with children who have two cochlear implants.

#### **TFS: How many children with bilateral cochlear implants has HELP/CI worked with?**

**HELP/CI INTEGRIS:** We currently have 24 children and three adults with bilateral implants, all of whom have been implanted since August 2004. Many of our families returned from the AG Bell Convention in July 2004 requesting second implants based on the information presented at the meeting.

#### **TFS: How do you approach aural rehabilitation with a child who has bilateral cochlear implants?**

**HELP/CI INTEGRIS:** As an Auditory-Verbal program, our approach is based on the hierarchy of listening skills with heavy emphasis on the parents' role. The specific goals for each child are very individualized depending on several key factors. From our work, the HELP team has found three trends that impact outcomes and should be considered when designing treatment goals.

1. The chronological age of the child at the time of the second implant.
2. The period of time between implants (all of our bilateral cochlear implants in children have been performed sequentially).
3. The duration of deafness of the second ear.

General patterns from our practice that we have observed are:

- The younger the child and the shorter the duration of deafness, the less need for new-ear-only therapy.
- Typically, when a child between the ages of 12 months and three years of age receives his or her second implant, Auditory-Verbal therapy continues in the same manner as it did with one implant only. From the point of activation of the second device, the counsel is most often to put both implants on in the morning and continue wearing both throughout the day.
- The older the child, especially if he or she is a good user of the first cochlear implant, typically requires some time with new-ear-only therapy.

#### **TFS: In cases of sequential cochlear implantation, do you recommend that children take off their first cochlear implant so you can provide therapy to the newly implanted ear in isolation?**

**HELP/CI INTEGRIS:** Our experience has been that older children (above the age of 5 or 6) who perform well with their first implant often require a period of new-ear-only therapy. Frequently, the sessions will begin with both implants as the instructions and expectations are explained. For a designated period of every session, which increases as the child is

able to tolerate the use of his or her second implant only, the first implant is removed and auditory skills are addressed in the hierarchy of auditory skill development building from very simple tasks that the child is familiar with to more difficult “open-set” tasks.

### **TFS: How do older children usually respond to new-ear-only therapy?**

**HELP/CI INTEGRIS:** Children who perform well with their first implant often become frustrated or frightened that something is wrong or that they are not performing in a way that they had previously. This transition is often the most difficult for parents when they attempt to do new-ear-only practice at home.

### **TFS: What are some recommendations for therapy activities for new-ear-only therapy with older children?**

**HELP/CI INTEGRIS:** It is important for the therapist to sit on the side of the new ear during therapy. Recommendations for therapy ideas often include familiar songs and easy games. With older children “popcorn” reading or reading aloud while they follow along with the printed words is also recommended. Families are very creative when it comes to designing new-ear-only practice at home. For example, families may have their children use the new-ear-only while watching television or after bath time. Some families do not replace the battery in the first implant once it is depleted to encourage new-ear-only practice.

### **TFS: Do you approach therapy in the newly implanted ear in the same sequence one would normally approach auditory therapy?**

**HELP/CI INTEGRIS:** Yes, absolutely. The progression through the auditory skill hierarchy is the guiding factor in determining treatment goals and as a way to monitor progress. It is important to note, that some of the children who have had the greatest time lapse between the first and second implants, continue to demonstrate improvement in their auditory skills with new implant only and certainly with both implants as far out as two years from the activation of the second implant. This has been very encouraging to parents, audiologists, and therapists. Many of these children have far exceeded our expectations based on the duration of deafness in the second ear and because many of the children who now have bilateral cochlear implants did not wear amplification for more than a few months prior to receiving a second implant.

### **TFS: What advice would you like to share with other professionals who are working with children who use bilateral cochlear implants?**

**HELP/CI INTEGRIS:** The top three are:

1. Recognize the need to treat each child and family individually. What works with one child may not work with another. Be flexible. All of our bilaterally implanted children have demonstrated benefit with the second implant, but the structure of therapy has been different for each child. The amount of new-ear-only practice and the wear-time schedule has varied based on the child’s tolerance, the therapist’s recommendations, and the family’s lifestyle. Practice with new-ear-only at home and highly structured therapy has been beneficial for some and unnecessary for others. Some of the younger children appear to be performing more like a child might perform with simultaneous implants.
2. Troubleshoot each device separately, i.e., perform the Ling 6 Sound Test with each implant alone and perhaps alternating ears every other day. Many of our children have been unable to report which device may not be working. Our families have found that marking each device as either left ear or right ear has been very helpful. Checking the equipment and making sure that the controls are set properly is even more important with activation of a second device. It definitely places more responsibility on both the parents and therapist in the early stages of adjustment, but our experience has taught us that with time, the children are able to reliably report difficulty.
3. Prepare the older children who are good users of their first implant by talking about what they might hear and that it will take time to adjust to the new signal. Explain that it will be harder to listen in the booth, but that is not because they are doing anything wrong or there is a problem with the device. Always preview the information and the required listening tasks while the child is wearing both implants.
4. We’ve even found that going back over the very simple tasks such as familiar phrase cards and easy games with the first implant prior to the activation of the second implant creates more success and therefore more confidence in the new ear. For older children, consider scheduling surgery so that activation takes place during the summer vacation so

that the child never has to worry about going to school with only his or her new implant. We strongly believe that a child should have access to all auditory information while at school and would never recommend new-ear-only at school.

Remember that therapy should be fun and developmentally appropriate. The challenge is to make the tasks appropriate in terms of auditory skill development but age-appropriate in terms of interest. We have frequently used a child's curriculum at school (States and capitols, or presidents etc.) or names of baseball and football teams to practice closed set discrimination, identification and comprehension tasks.

## A Tale of Two Ears: Suggestions for Success HELP/CI of INTEGRIS Health

	<b>Second implant &lt; Less than 3 years of age</b>	<b>Second implant 3 years to 5 years of age</b>	<b>Second implant &gt; Greater than 5 years of age</b>
<b>CI Wear-time</b>	Child wears both implants all waking hours.	Child wears the new implant alone for part of therapy session and during optimal quiet times at home.	Child wears both implants at school and in challenging listening environments.  The child wears the new implant alone in therapy and for home practice.
<b>Therapy targets and activities</b>	Continue early listening play routines with two implants.  Teach conditioned response with each implant individually.	Continue focus on speech-language targets.  Address targets in the auditory skills hierarchy with new implant alone.  Perform the Ling 6 Sound Test with each implant individually.	Older children can benefit from therapy sessions with the new implant alone.  Work through the auditory skills hierarchy with the new implant alone.  Perform the Ling 6 Sound Test with each implant individually.
<b>Home Practice</b>	Continue home practice in daily routines by making listening a part of every experience.	Practice listening with the new implant after bath or nap time when the new implant could be put on alone.  Read familiar books, play familiar therapy games or toys, and sing familiar songs.	Practice at home with the new implant alone using familiar phrases, card games with predictable items, conversation with a known topic, and reading aloud familiar books.

<p><b>Parent coaching/ guidance</b></p>	<p>Continue daily listening checks and maintenance of equipment.</p> <p>Keep adequate supplies of batteries and cords for both implants. Supplies should be accessible wherever the child goes including school and extra curricular activities.</p> <p>Expect that both implants should be worn all waking hours except during specified new ear alone activities.</p> <p>Expect that both implants should be worn in all classroom settings.</p> <p>Remember that two devices means more regularly scheduled appointments for mapping and audiological services.</p> <p>Consider the listening age of the child when determining expectations with both devices.</p>
<p><b>Teacher Coaching/guidance</b></p>	<p>Children should have adequate supplies of batteries and troubleshooting equipment at school.</p> <p>Children who receive a second implant will have more regularly scheduled appointments for mapping, therefore may miss more school.</p> <p>Initially, the child's newer implanted ear will not function at the same level as the first. The chronological age of the child, the period of time between implants, and the duration of deafness of the second ear appear to impact the performance of the new ear.</p> <p>The use of FM equipment will still be best practice even with two cochlear implants. The decision to use an FM system in the first implanted ear, the second implanted ear, or both ears should be determined individually on a case by case basis.</p> <p>Noise in the environment will still be a factor for optimal listening.</p> <p>Any changes in speech and vocal quality or behavior should be reported to the parent and school support team. Additionally, any regression of previously learned skills should be reported to the parents, the school team and the cochlear implant team. A mapping session may be warranted.</p>

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# TECHNOLOGY CORNER

## TFS Classroom Equipment Kits

Advanced Bionics introduces equipment troubleshooting kits for the classroom

### Four Options to Meet Your Needs!

#### BASIC

Accommodates basic troubleshooting of the PSP.  
Includes the System Sensor, which can be used with all of our sound processors and provides visual confirmation that the processors are communicating with the Internal device and that sufficient power is being provided.

#### STANDARD

Includes all the items in the Basic Kit plus a head-piece/cable for the Auria BTE.

#### DELUXE

Includes all the items in the Standard Kit plus a PSP headpiece, a cable for the CI/Platinum BTE, and an Auria PowerPak, which can function as an alternate power source for the Auria BTE.

#### BUILD YOUR OWN

The ideal kit for flexibility. Choose any of the equipment listed or any of the equipment from our product catalogue at <http://www.bionicear.com/support/products/catalog.asp>.

### Speech Processor



Platinum Series (PSP)

Platinum CII BTE

Auria BTE

### Equipment Kit Case



**To order, please contact our Customer Care Department at (800) 678-2575 or [customerservice@advancedbionics.com](mailto:customerservice@advancedbionics.com).**

**[Click here for a more detailed description of each option.](#)**

## Bilateral Cochlear Implantation and Safety: IntelliLink

### What is IntelliLink?

IntelliLink is a unique safety feature that links programs on an individual sound processor only to the ear (implant) to which the programs were fit.

### Why is this important?

Stimulation levels required to elicit comfortable hearing are significantly different between individuals and can even be significantly different between an individual's two ears. For these reasons, each program downloaded to a sound processor is fit to comfortably and safely stimulate only one ear. If a sound processor is mistakenly used on the wrong ear, discomfort may occur, or hearing performance may be compromised. The IntelliLink feature works by disabling sound processor function in cases where the sound processor is coupled to the incorrect ear.

### What does this mean for everyday life?

Peace of mind at home, at school, and on the playground. For example, if your student uses bilateral cochlear implants, and accidentally puts one of his sound processors on the wrong ear, the program will not stimulate. Or, if two children switch sound processors, the sound processors will not stimulate.

# Upcoming Education and Training Events

## SuperSize Your Cochlear Implant Knowledge and Skills

A two-day workshop. Day 1 covers cochlear implant candidacy, setting expectations, and hands-on troubleshooting experience. Day 2 focuses on aural rehabilitation techniques and activities.

## Rehabilitation for Children and Adults With Cochlear Implants

A two-day workshop. Day 1 focuses on auditory skill development in children. Day 2 covers adult aural rehabilitation topics and suggestions for home activities to improve listening.

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Date	Workshop	Location
Sept 28-29th	SuperSize Your Cochlear Implant Knowledge and Skills	Boston, Ma.
Oct 5-6th	SuperSize Your Cochlear Implant Knowledge and Skills	Toronto Canada
Oct 12-13th	Rehabilitation for Children and Adults With Cochlear Implants	San Francisco, Calif.
Oct 19-20th	SuperSize Your Cochlear Implant Knowledge and Skills	Atlanta, Ga.
Nov 9-10th	SuperSize Your Cochlear Implant Knowledge and Skills	Cincinnati, Ohio

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**[Click here to register or learn more about our upcoming education and training events.](#)**

## Web Courses

Did you know that Advanced Bionics offers several live Web Courses every month? A library of recorded courses on topics is also available. Web Courses are FREE and offer continuing education units (CEUs).

## Upcoming Live Web Courses

Course Series	Authors	Date of First Class
Bringing Music to Life	Chris Barton and Amy Robbins	September 19, 2006
<b>Topics:</b> The Language of Music, Music and Language; Nurturing Music Development in CI Kids; Using Music to Foster Daily Living Skills With Hearing Loss		
Course Series	Author	Date of First Class
Tuesdays With Mary	Mary Koch	September 12, 2006
<b>Topics:</b> Listening Activities for Infants and Toddlers; Listening Activities for School Children		

## Recently Recorded Web Courses

Hearing With Two Ears: Terminology, Considerations, and Outcomes. Author: Carissa Moeggenberg

Bilateral Cochlear Implants. Author: Jolie C. Fainberg

We CARE: Introducing Advanced Bionics New Aural Rehabilitation Resources. Author: Sandy Mintz

Making Therapy Fun. Author: Mary Koch

Working with ITSIs. Author: Amy Robbins.

**[Click here to register for Advanced Bionics' FREE live and/or recorded Web Courses.](#)**

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