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### What are the auditory benchmarks for average progress in children with cochlear implants (CI) during the first year of implant use?

Auditory benchmarks have been established independently for three groups of children, based upon research findings and clinical experience.<sup>1-5</sup> These groups are:

**Group 1:** Children implanted in the preschool years (age four or earlier).


**Group 2:** Children implanted at age five or later who have some residual hearing/speech perception skills, have consistently worn hearing aids, and communicate primarily through speech.

**Group 3:** Children implanted at age five or later who have little or no residual hearing/speech perception skills and are highly dependent on sign language and other visual cues for language learning.









The benchmarks shown for each of the three groups in Tables 1, 2, and 3 are based on data collected and reported by the investigators cited above.

### Tracking Auditory Progress in CI Children

**Note:** Child is credited only for skills in listening-alone conditions. "Spontaneous" means without prompting or modeling and when not in a listening set.

 Time post-implant child should demonstrate the skill

**Table 1 — Group 1 • Children implanted at age four years or earlier**

Skill	1 mo.	3 mos.	6 mos.	9 mos.	12 mos.
1. Full-time use of CI					
2. Changes in spontaneous vocalizations with CI use					
3. Spontaneously responds to name 25% of time					
4. Spontaneously responds to name 50% of time					
5. Spontaneously alerts to a few environmental sounds					
6. Performance in audio booth consistent with what is reported at home					
7. Evidence of deriving meaning from many speech and environmental sounds					
8. Major improvement in language					



**Table 2 — Group 2 • Children implanted at age five years or older**  
(Some residual hearing, consistent HA use prior to CI, primarily oral)

Skill	1 mo.	3 mos.	6 mos.	9 mos.	12 mos.
1. Full-time use of CI					
2. Understands some words or phrases, closed-set					
3. Understands many words or phrases, closed-set					
4. Spontaneously responds to name 50% of time					
5. Understands familiar phrases in everyday situations when listening, auditory alone					
6. Spontaneous recognition of own name versus names of others					
7. Knows meaning of some environmental or speech signals when heard, auditory only					
8. Major improvement in language					

**Table 3 — Group 3 • Children implanted at age five years or older**  
(Limited or no residual hearing, limited or no HA use, heavily reliant on visual cues or signs)

Skill	1 mo.	3 mos.	6 mos.	9 mos.	12 mos.
1. Full-time use of CI					
2. Begins to discriminate patterns of speech (syllable number, stress, length, etc.)					
3. Understands some words in closed-set					
4. Begins to spontaneously respond to name					
5. Reports when device is not working (e.g., dead battery)					
6. Understands many words or phrases in closed set					
7. Understands a few things, open-set					
8. Major improvement in language					

**Note:** Full-time implant use is an unconditional prerequisite to auditory development. If a child is not wearing the implant during all waking hours—at home, school, and other activities—these benchmarks are not applicable. *Children who fail to bond to their device and wear it full-time within a few weeks of initial stimulation may exhibit insufficient progress and are at high risk of becoming nonusers of their implants.*

### References

1. Robbins, A.M. (2003) Communication Intervention for Infants and Toddlers with Cochlear Implants. *Topics in Language Disorders*, Vol. 23, no. 1; 16-28.
2. Osberger MJ, Zimmerman-Phillips S, Barker MJ, Geier L. Clinical trial of the Clarion cochlear implant in children. *Annals of ORL. Suppl 177*. 1999;108(4):88–92.
3. Waltzman SB, Cohen N. Implantation of patients with prelingual long-term deafness. *Annals of ORL. Suppl 177*. 1999;108(4):84–87.
4. Robbins AM, Koch DB, Osberger MJ, Phillips SZ, Kishon-Rabin L. Effect of age at implantation on auditory skill development in infants and toddlers. *Archives of Otolaryngol Head Neck Surg*. 2004;130:570–574.
5. McClatchie A, Therres MK (2003) *AUDitory SPeech & LANguage (AuSpLan)*. Washington, DC:AG Bell.



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### Why identify Red Flags?

The acquisition of listening is a developmental process that involves a sequence of cumulative skills—each subsequent skill depends on the acquisition of earlier skills. For this reason, delays early in listening development often lead to long-term delays, and long-term delays usually lead to lifelong deficits. Clinicians should be familiar with the range of progress in typical children with implants so they are comfortable raising a Red Flag when a child’s performance lags behind that of his/her peers. However, it is important to note that what we term a Red Flag is not a diagnosis of a problem or a statement of permanent disability, but a notice to pay attention to the skill.

### What is considered a Red Flag?

Based on the auditory benchmarks provided on the front side of this card, a Red Flag is a delay in a particular skill of three months or more. It is important to remember raising a Red Flag is an expression of mild concern. The number of Red Flags raised is based on the length of the delay and the number of skills delayed. Therefore, the greater the number of skills that are delayed at an interval, the more substantial the concern.

### What do we do about Red Flags?

There is little value in raising a Red Flag for a listening skill unless we can suggest ways to monitor and improve that skill. Remember that a clinical Red Flag is not a diagnosis of a problem but an indication that increased attention needs to be given to a specific skill area. Below is a table that provides you with tips on how to respond to Red Flags.

### Responding to Red Flags

Table 4: How to respond to one Red Flag	Table 5: How to respond to two Red Flags
<input checked="" type="checkbox"/> Share ideas with child’s parent	<input checked="" type="checkbox"/> Share concern with child’s parent
<input checked="" type="checkbox"/> Confirm child wears CI during waking hours	<input checked="" type="checkbox"/> Confirm child wears CI during waking hours
<input checked="" type="checkbox"/> Contact CI center regarding possible equipment/programming changes	<input checked="" type="checkbox"/> Contact CI center regarding equipment/programming changes
<input checked="" type="checkbox"/> Assess that home/school environment creates a need for child to use the skill	<input checked="" type="checkbox"/> Utilize any one-flag response
<input checked="" type="checkbox"/> Verify that prerequisites to a skill are adequately established	<input checked="" type="checkbox"/> Change teaching methods/techniques
<input checked="" type="checkbox"/> Break down skill into smaller steps and teach those steps	<input checked="" type="checkbox"/> Add sensory modality
<input checked="" type="checkbox"/> Use different materials/teach the skill in another way	<input checked="" type="checkbox"/> Consult with a colleague for new ideas
<input checked="" type="checkbox"/> Increase the intensity of training toward the skill	<input checked="" type="checkbox"/> Refer for learning profile testing
<input checked="" type="checkbox"/> Write plan of action/check every month for three months	<input checked="" type="checkbox"/> Refer to specialists to rule out additional disabilities

Reference: Robbins AM. Clinical Red Flags for slow progress in children with cochlear implants, Loud & Clear. Valencia, Calif.: Advanced Bionics; 2005:1.

### Advanced Bionics

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