

# **Rehabilitative Decisions with the Deafened Child A Case Study**

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This case study chronicles the rehabilitative decisions and intervention strategies and their outcomes on communication skill development of a child deafened by meningitis at age 2 years, 9 months. The decisions had an impact on receptive and expressive language, articulation, and voice as evidenced in language samples collected at one month prior to and 9-12 and 22 months after meningitis. The lack of one professional serving as a case manager resulted in fragmented services and intervention that was less than optimally effective. The documentation in this case study indicates the need for audiologists to serve in the role of case managers in assessing and prioritizing the needs of both child and family, referring to appropriate sources to meet those needs, and regularly re-evaluating these decisions.

Audiologists are often the first professionals to have contact with a hearing-impaired child and his or her family. Their role is not only to confirm the diagnosis of hearing impairment but also to advise parents and initiate the rehabilitative process. "They advise parents as to the remedial steps necessary for the child, often making recommendations about school placement, advocating certain educational methodologies, or referring children and parents to specific educational programs" (Davis & Hardick, 1981, p. 309). Presenting information, designing intervention programs, and guiding parents through the decision-making process are integral parts of an audiologist's work.

When a normally-hearing child is deafened, the audiologist may also need to aid parents in adjusting to their child's hearing loss. The case manager must be particularly sensitive to the effects of sudden loss of hearing. Parents may have difficulty accepting a diagnosis of hearing impairment if there has been no deterioration of the child's communication skills at the time of diagnosis

and initiation of programming intervention. They may be searching for something or someone who will restore the functioning of their child (Luterman, 1979). Case management with deafened children and their parents is a challenge for the professional.

The report that follows is part of a longitudinal case study that chronicles the effects of sudden onset of deafness on the speech, language, and voice of a child identified here as J.T. (Lieberth, 1985). The purpose of this paper is to evaluate the intervention decisions made for this child in terms of outcomes. Guidelines will be proposed for future case management of this child and his parents. Even though the focus of this paper is only one hearing-impaired child, application is made to case management of other hearing-impaired children.

### BACKGROUND

During the initial audiologic evaluation, J.T.'s mother reported that he was born following a full-term, uneventful pregnancy. His postnatal medical and developmental histories were unremarkable. All developmental milestones were within normal limits. J.T.'s mother did report that, because he had frequent colds and earaches during his first two years, pressure-equalizing (PE) tubes were inserted bilaterally when J.T. was 2 years, 5 months old. At 2 years, 9 months of age, J.T. contracted bacterial meningitis which left him with a profound bilateral sensori-neural hearing loss.

One month prior to his illness (chronological age [CA] = 2 years, 8 months), J.T.'s mother had made an audiotape recording of him to send to relatives in another state. This tape and subsequent taping provided the author with samples of speech, language, and voice for analysis. In addition, the author had access to J.T.'s records. The author was not directly involved in providing services to the child or his family.

Analysis of the tape recording made prior to J.T.'s illness indicated a mean length of utterance (MLU) of 3.9 words. Spoken utterances were nearly completely intelligible. Articulation errors that were present in this sample were normal developmental errors (Prather, Hedrick, & Kern, 1975). Speech and language skills were at or above norms for J.T.'s age. Spectrographic analysis revealed normal vowel length and formant frequencies within the range of normal (Peterson & Barney, 1954).

J.T.'s cognitive skills were evaluated 2 months after his illness. The evaluator used the results of this testing as an index of the child's pre-meningitis status. Results indicated performance in all areas was in the above average range.

Spontaneous language samples were recorded at 3, 6, 9, and 12 months after J.T.'s illness. A report of the changes in J.T.'s voice, articulation, and language over this period appears in Lieberth (1985). One year after his illness, J.T.'s communication skills had deteriorated. There was no growth in MLU since

the sample recorded prior to his illness. Spoken utterances were unintelligible. Articulation errors increased in number and type. Spectrographic analysis revealed that J.T. was using a slower rate and prolonging vowels. The range of the formants had narrowed. His voice was characterized by excessive pharyngeal resonance and prosody and rhythm were abnormal. J.T.'s spoken language was judged to be like that of a congenitally deaf child by three listeners familiar with the speech and voice characteristics of deaf children.

### INTERVENTION DECISIONS

The narrative that follows summarizes the goals, outcomes, and recommendations of intervention decisions made by J.T.'s parents and professionals. All time periods are referred to onset of illness. Chronological age is also given.

#### **1 month (CA = 2 years, 10 months)**

Profound bilateral sensori-neural hearing loss was confirmed by ABR testing. J.T. was fit with high gain ear level hearing aids 2 weeks following the ABR testing.

#### **2 to 2½ months (CA = 2 years, 11 months)**

J.T.'s cognitive, motor, social, and communication skills were evaluated by a parent-infant educator from the local school district. Parent education was initiated. After two sessions, the educator recommended that J.T. be enrolled in a total communication self-contained preschool classroom in the local school district.

#### **4 months (CA = 3 years, 1 month)**

The academic year in the school system was nearly over. For this reason, J.T. was re-enrolled in the Montessori pre-school program he attended prior to his illness. His teachers there observed that his social, emotional, coordination, and communication skills had been negatively affected by the hearing loss. They recommended J.T. be placed in a pre-academic program that would meet his needs as a hearing-impaired child.

During this same time, J.T.'s aided thresholds were determined in an audiological evaluation. The results indicated J.T.'s aided hearing was in the severe loss range. The audiologist noted that J.T.'s responses were inconsistent. She recommended that a re-evaluation of aided responses be completed after formal auditory training.

#### **5 months (CA = 3 years, 2 months)**

J.T. was evaluated by a speech-language pathologist/audiologist who had experience working with deaf children and their parents. After nine one-hour sessions of diagnostic therapy, she recommended that cued speech may be an

effective supplement to receptive communication for J.T. because of the advanced development of his language skills prior to his illness. Also, the parents expressed a desire that J.T. not sign.

Following this recommendation, the parents and the child's Montessori teacher attended classes to learn cued speech for 6 weeks. During this time, J.T. received 10 one-hour sessions of tutoring from a teacher of the deaf, proficient in the use of cued speech. She noted at the beginning of her contact with J.T. that his speech was "characteristic of a profoundly deaf three year old." After 10 sessions, she reported that, although J.T.'s visual attention to the speaker was longer when he was spoken and cued to than when he was spoken to, he was not showing any evidence of learning new vocabulary or language when it was cued and spoken to him. Despite these observations, she recommended that cued speech continue to be used with J.T.

#### **9 to 12 months (CA = 3 years, 6 months to 4 years)**

The parents felt that the educational options available to hearing-impaired children in their local school district did not meet their perceptions of J.T.'s needs. The school district program offered a total communication program which did not include the use of cued speech. The parents re-enrolled J.T. in the Montessori school until an appropriate program could be found. A traditional Montessori curriculum was followed. J.T.'s teachers noted at the end of a three month time period that his attention span and socialization skills had increased, but no change was observed in the reception or expression of spoken language. In light of this progress and given the lack of a program the parents felt was appropriate, the school recommended continued placement in their program until a program that met J.T.'s needs could be found.

During this same time period, J.T. also received individual speech, language, and auditory training for three 45-minute periods per week. Goals included conservation and development of phonemes and the establishment of a consistent aided auditory response to sound. After 27 hours of therapy, the speech-language pathologist reported that correct production of phonemes targeted during therapy was established. Intelligibility of spontaneous utterances remained poor and aided responses to sound were still inconsistent. The speech-language pathologist recommended a continuation of individual therapy with emphasis on Ling's (1976) phonologic and phonetic speech training and continued evaluation and training of aided auditory responses.

#### **17 months (CA = 4 years, 2 months)**

J.T.'s aided auditory responses were re-evaluated. The results confirmed aided thresholds in the severe range. The audiologist recommended that vibrotactile stimulation be used on a trial basis during individual speech training to supplement the limited aided auditory input J.T. was receiving. Vibrotactile stimulation from a single channel unit was used during all individual speech training sessions. These sessions were audiotape recorded for the next 7

months so that the effects of vibrotactile stimulation on speech, language, and voice could be assessed. Results of analyses of these tapes indicated a lowering of the  $F_0$  of J.T.'s voice, less vocal tension/intensity used to produce voice, greater articulatory accuracy during imitative tasks, and increased self-monitoring. Based on these positive results, the speech-language pathologist and the audiologist recommended continued use of vibrotactile stimulation during training. Procedures for obtaining wearable vibrotactile units for evaluation were initiated.

#### **21 months (CA = 4 years, 6 months)**

J.T.'s parents enrolled him in an oral self-contained class for pre-school hearing-impaired children. The curriculum followed the Essential Elements for the State of Texas. The teacher noted at both the first and second six weeks' grading period that J.T. was making "normal" progress in all areas. She recommended enrollment in the district's program which followed a total communication philosophy in all other grade levels.

The parents also had enrolled J.T. in an intensive class for language-delayed children for two half-days per week. The goals of the program included expressive and receptive language development and recognition and production of printed vowels and consonants. The teacher used cued speech throughout the program. She noted at the end of a semester that J.T. had made progress in receptive language. There was no change in the intelligibility of his spoken utterances. She recommended continued enrollment in the class.

### **CURRENT STATUS**

The author analyzed speech, language, and voice quality in the language sample tape recorded 22 months after J.T.'s illness (CA = 4 years, 7 months). Results were compared with J.T.'s status one year after his illness (CA = 3 years, 9 months) (Lieberth, 1985). The following observations were made.

1. Vocabulary showed a growth of 1 year, 3 months as measured on the Peabody Picture Vocabulary Test. The resultant age equivalent score still revealed a delay of one year. This change can be considered positive; there had been no growth in receptive vocabulary during the first year following J.T.'s illness.
2. Receptive language measures indicated J.T. was functioning at or within a year of his chronological age. Scores also showed approximately one year's growth over scores reported one year earlier. At that time, there had been no growth in receptive language since his illness.
3. Speech intelligibility remained at the 10% level reported in the evaluation one year after his illness as rated by three listeners experienced in evaluating the speech and voice characteristics of the deaf using the NTID Intelligibility Scale (Subtelny, Orlando, & Whitehead, 1979).
4. Rate of spontaneous speech increased from 1.08 syllables per second to

- 1.77 syllables per second. This rate was still below normal limits for J.T.'s chronological age ( $M = 3.38$ ;  $SD = 0.25$ ) (Amster & Starkweather, 1985).
5. MLU of spontaneous speech increased from 3.3 words to 4.5 words. J.T. was still using simple sentence structure; no compound or complex utterances were observed.
  6. J.T. was beginning to use rising intonation to indicate question forms in structured language contexts. However, spontaneous utterances were still characterized as lacking normal prosodic features.
  7. An analysis of the segmental patterns used in the language sample revealed that 85% of consonants were in error. Half of these errors were omissions in the final position of words and nearly one-fourth were substitutions of plosive sounds for nasal consonants. In the sample made one year after J.T.'s illness, all consonant errors were substitutions or omissions and plosive errors had accounted for 36% of all errors. There was no improvement of articulation in spontaneous speech from the tapes made one year after his illness to those made 22 months after his illness.
  8. Vowels were still prolonged although their duration was shortened from the sample analyzed one year after his illness.
  9. The fundamental frequency of J.T.'s voice was lowered from 220 Hz to 210 Hz, putting it within normal limits for a child his age and sex (Peterson & Barney, 1954).
  10. The second formant remained flat, although more changes were being attempted as revealed in greater variability in utterances analyzed.
  11. Pharyngeal resonance was still a dominant characteristic of J.T.'s speech as rated by three listeners experienced in evaluating the speech and voice characteristics of the deaf on the NTID Intelligibility Scale. The listeners were more uniform in their identification of the presence of this voice quality in J.T.'s speech 22 months after his illness. Ratings of the severity of pharyngeal resonance increased over ratings made one year after meningitis.
  12. Spectrographic analysis and experienced listeners' perceptual ratings of J.T.'s overall voice quality revealed less tension was being used to produce voice. There was a reduction in spectral noise and intensity in taped samples made 22 months after J.T.'s illness.

## DISCUSSION

The results of comparison of language samples tape recorded 9 to 12 and 22 months post meningitis revealed that some positive changes in J.T.'s articulation, language, and voice quality had occurred. Throughout the intervention chronicled in this paper, the lack of a professional serving as case manager was evident.

J.T.'s parents made decisions for their child after consulting a number of professionals, each providing his/her view of J.T.'s needs. Anchored in the knowledge that he had normal hearing prior to his illness, was the parents' belief that J.T.'s needs would be different than those of congenitally deaf children (i.e., he would not need to sign). This belief was reinforced by the speech-language pathologist-audiologist and the teacher of the deaf who worked with J.T. in the first six months after his illness. The parents continued using cued speech despite the results of the evaluation one year after his illness which indicated no receptive or expressive language growth and despite the recommendation that J.T. be enrolled in a total communication program.

It was noted during the evaluation 22 months after his illness that J.T.'s receptive language skills had improved to within a year of his CA. This growth may have been due in part to cued speech. Other contributing factors might have been: results of intervention or maturation. Despite improvement in receptive language, however, no improvement in intelligibility of spoken utterances has occurred. Articulation errors have not been corrected as evidenced in the analysis of spontaneous language samples. Thus, J.T. has no effective means of expressing himself. Although positive changes in spectrographic and perceptual features of J.T.'s voice have been noted, his overall voice quality is still characteristic of the voice qualities found in congenitally deaf children.

The parents' decision not to expose J.T. to sign influenced their decisions about his educational placement and the choice of cued speech. No program is available through the local school district on an on-going basis that incorporates cued speech. In each alternative placement, J.T. did make progress in receptive language but his speech remained unintelligible.

Auditory management decisions followed a similar pattern. The parents sought out no fewer than three audiologists to test J.T. The results of testing and the recommendations of each have been similar. Searching for a method of improving J.T.'s hearing, the parents' most recent action was to have J.T. evaluated by a cochlear implant team, despite the positive effects of the vibrotactile aid. They opted for an implant 2 years after his illness even given the physician's pre-operative conclusion that the cochlea was ossified. No response to sound was noted either immediately after the implant or three months after the unit was activated. A booster was added to the implant and, with this additional stimulation, J.T. began responding to sound. His responses continue to be inconsistent. There have been no changes in his speech, language, or voice in the five-month period following the implant.

To be optimally effective, a program of rehabilitation must include a case manager; that is, a person who has knowledge of (a) hearing impairment and its effects, (b) educational placement options available in the area, and (c) knowledge of the family. This person serves as a liaison between professionals and parents and a coordinator of the services the child and his family receive. A case manager is responsible for assessing the needs of the child and his

parents in all areas of development at regular intervals in the rehabilitative process (Sanders, 1982). Upon completion of the assessment, the needs of the parents and the child are identified and prioritized by the case manager in cooperation with the parents (Luterman, 1985). The case manager and the parents seek appropriate programs of intervention or professionals to meet their needs as well as the child's. The case manager also regularly re-evaluates decisions in light of the current status of the child (Davis & Hardick, 1981; Sanders, 1982). Case management is thus an on-going process for the professional and the parent. The case manager also should aid the parents in developing their skills at evaluating the progress of their child and in ensuring that needs that are identified are met (Sanders, 1982).

Problems may arise if those professionals who have roles in the rehabilitation of hearing-impaired children view their areas of specialization as exclusive of other disciplines. This can result in fragmented services and intervention that is less than optimally effective, as demonstrated in this case study (Sanders, 1982). It also adds to the confusion parents feel. They continually try to establish trust and rapport with a professional who they feel will provide them with enough support and information to make decisions on their own.

The outcomes of rehabilitative decisions in this case study clearly demonstrate to this author the need for a case manager. Until a case manager becomes involved with J.T. and his parents, the shotgun approach the parents have taken in seeking services for this child will probably lead to more conflicting outcomes in his rehabilitation. Because of their role in the identification and early management of hearing-impaired children and their families, audiologists should take the role of case manager. According to a 1981 survey, audiologists tend to spend a greater amount of time providing information to parents of hearing-impaired children than they do assisting parents in finding solutions to problems and achieving independence (Flahive & White, 1981). Unwillingness of audiologists to take the role of case manager may stem, in part, from a reported lack of course work and practicum experiences in counseling (McWilliams, 1976). Until audiologists realize the importance of their role as case managers and work toward preparing themselves for this role, services to hearing-impaired children and adults will remain fragmented and suffer from lack of effectiveness.

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