# Survey of Canadian Paediatric Cochlear Implant Centres

# *Enquête auprès des centres canadiens d'implants cochléaires chez les enfants*

*Lynne C. Brewster, MS*
Saskatchewan Preschool Auditory Rehab. Centre
Saskatoon, Saskatchewan

*Elizabeth Fitzpatrick, MSc*
Department of Communication Disorders
Children's Hospital of Eastern Ontario, Ottawa

**Key words:** cochlear implants, habilitation, profound hearing loss

## Abstract

This article provides a review of cochlear implant services for children in Canada. Currently there are nine paediatric cochlear implant centres, seven of which provide cochlear implant surgery. The results of a survey completed in December, 1994 are presented. Information related to candidacy, number of children implanted, expectations, and habilitation services are reported.

Cochlear implants have become accepted as a viable option for children who have profound hearing loss and who derive little benefit from conventional amplification (Canadian Association of Speech-Language Pathologists and Audiologists Position Paper, 1995). In June 1990, the United States Food and Drug Administration approved the use of the Nucleus-22 channel cochlear implant device with children. Since then, the number of children implanted worldwide has increased dramatically.

In Canada, cochlear implants have been used in adults and children since the 1980s. The availability of implants and program funding have varied widely from province to province. Currently, the majority of cochlear implant programs are funded entirely or partially by provincial governments. There are currently seven hospitals performing cochlear implant surgery in children in Canada. Two other implant programs carry out pre- and post-implant intervention, but do not include a surgery component. The purpose of this article is to describe some of the services offered by these programs and to provide some of the demographics for children in Canada who have received cochlear implants.

## *Abrégé*

*Cet article porte sur les services d'implants cochléaires pour enfants au Canada. Il y a actuellement neuf centres d'implants cochléaires pour enfants, dont sept pratiquent la chirurgie d'implantation cochléaire. L'article présente les résultats d'une étude, qui a pris fin en décembre 1994, et des renseignements sur les candidatures, le nombre d'enfants qui ont reçu des implants, les attentes et les services de réadaptation.*

*Les implants cochléaires sont maintenant acceptés en tant qu'option efficace pour les enfants atteints de déficience auditive profonde et pour lesquels l'amplification classique présente peu d'avantantages (document de principe de l'Association canadienne des orthophonistes et audiologistes, 1995). En juin 1990, la* ***Food and Drug Administration*** *des États Unis a approuvé l'utilisation du dispositif cochléaire multicanaux Nucleus 22 chez les enfants. Depuis, le nombre d'enfants qui ont reçu des implants a augmenté de façon spectaculaire à travers le monde.*

*Au Canada, on utilise les implants cochléaires, chez les adultes et les enfants, depuis les années 1980. La disponibilité des implants et le financement des programmes varient beaucoup d'une province à l'autre. La majorité des programmes d'implants cochléaires actuels sont financées en tout ou en partie, par les gouvernements provinciaux. La chirurgie d'implantation cochléaire chez les enfants est actuellement pratiquée dans quatre hôpitaux canadiens. Deux autres programmes d'implants réalisent des interventions avant et après l'implantation, mais ils ne comprennent aucune composante chirurgicale. Cet article vise à décrire certains services offerts par ces programmes et à transmettre certaines données démographiques sur les enfants canadiens qui ont reçu des implants cochléaires.*

## Method

A survey of Canadian paediatric cochlear implant centres was undertaken in 1993 as part of the activities of the Canadian Association of Speech-Language Pathologists and Audiologists (CASLPA) Working Group on Cochlear Implants in Children. This working group was assembled to develop a position paper on cochlear implants in children. A questionnaire* was developed and mailed to all of the paediatric cochlear implant centres in Canada in 1993. This questionnaire requested information about each centre from the time the cochlear implant program was established. The questionnaire was again sent out in December of 1994 requesting information for that year. For the purpose of this survey, a cochlear implant centre was defined as a centre offering pre-implant assessment, follow-up speech processor programming, and habilitation services. Cochlear implant surgery is performed in seven of the nine centres identified.

The nine centres participating in the survey were: L'Hotel Dieu de Québec, Québec; Children's Hospital of Eastern Ontario, Ottawa; Hospital for Sick Children, Toronto; University Hospital, London; Central Speech and Hearing Clinic, Winnipeg; Saskatchewan Cochlear Implant Program, Saskatoon; Glenrose Rehabilitation Hospital, Edmonton; Alberta Children's Hospital, Calgary; and, The British Columbia Children's Hospital, Vancouver.

All nine questionnaires were completed and returned, giving an overall return rate of 100%. The results of the questionnaire are summarized and reported below under key headings.

## Results

### Patient Selection Criteria

All centres determine candidacy based on criteria commonly found in the literature on cochlear implants in children (Mecklenburg et al., 1991; Beiter et al., 1991). These include: profound bilateral sensorineural hearing loss, little or no benefit from amplification, no medical contraindications, good motivation, and appropriate expectations.

All but one program listed as a criteria an appropriate education program with a strong auditory component. Two centres reported a lower age limit of three years, others reported a two year age limit and some centres did not specify age in the list of criteria. One centre reported an upper age limit of 9 years, 11 months. Four centres specified psychological suitability as a criteria for candidacy.

### Team Approach

All centres report the use of a team approach for assessment and follow-up of children with cochlear implants. Teams varied in composition and number of members/professional areas represented from as small as two members to six different professionals. All teams included an audiologist and all except the two centres where cochlear implant surgery is not completed on site, included a surgeon. All teams include at least one therapist which may be a speech-language pathologist, auditory-verbal therapist, or educator of the hearing-impaired. All but one team include a psychologist and five of the nine centres include a social worker on the team. A detailed composition of cochlear implant teams across Canada is presented in Table 1.

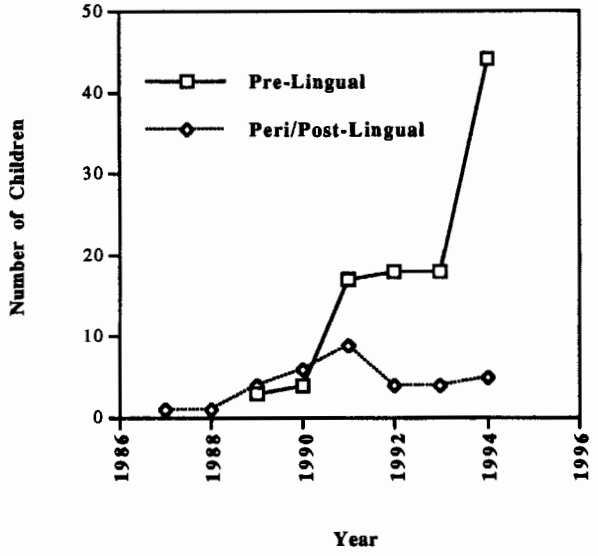
**Table 1. Composition of Cochlear Implant Teams Across Canada**

| | Surgeon | Audiologist | Social Worker | Psychologist | Speech-Language Pathologist | Auditory-Verbal Therapist | Educator of the hearing-impaired | Other |
|---|---|---|---|---|---|---|---|---|
| B.C.'s Children's Hospital | x | x | | x | x | | | Clinical Nurse Specialist Pediatrician |
| Glenrose Rehabilitation Hospital | x | x | x | x on consult | x | | x | |
| Alberta Children's Hospital | x | x | x | x | x | | | |
| Saskatchewan Cochlear Implant Program | x not on site | x | | x | x | | x | Psycho/Social Consultant Administrative Co-ordinator |
| Central Speech and Hearing Clinic Inc. | | x | | | | x | | |
| University Hospital London | x | x | x | x | | x | | Child-life Specialist |
| The Hospital for Sick Children | x | x | x | x | x | | | Aural (Re)habilitationist |
| Children's Hospital of Eastern Ontario | x | x | x | x | | x | | |
| L'Hotel-Dieu de Quebec | x | x | | x | x | | | |

## Number of Children Receiving Implants

As depicted in Figure 1, the number of children receiving implants in Canada grew slowly from 1987 to 1990, with the majority of these children being post-lingually deaf. Significant growth in the number of children receiving implants occurred from 1991 with the majority of these children being pre-lingually deaf. For the years between 1991 and 1993, the number of implants per year ranged between 22 and 27. This increased to approximately 50 children in 1994 and reflects the new funding program in the three Ontario centres.

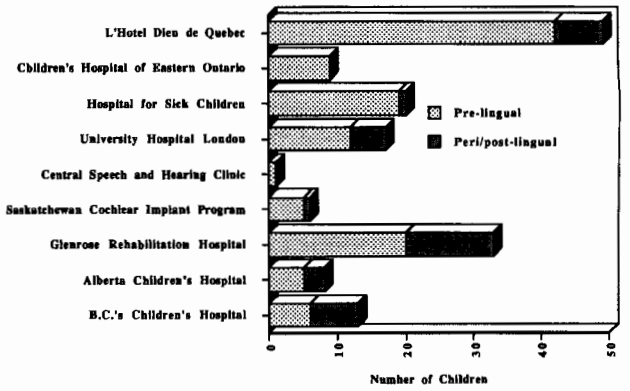
**Figure 1. Number of Children Receiving Cochlear Implants in Canada by Year of Implantation**




A breakdown of the number of pre-, peri- and post-lingually deaf children receiving implants at each centre is provided in Figure 2. In addition, 24 children have been implanted in centres other than those where they are currently followed. Twelve of these children were implanted in the United States, 11 represent children implanted through the Glenrose Rehabilitation Hospital in Edmonton, and one child was implanted through the Hospital for Sick Children in Toronto. Therefore, it is estimated that as of December, 1994 approximately 168 children had received cochlear implants.

In addition to those children receiving implants, the survey revealed that approximately 92 children have been assessed but have not been considered cochlear implant candidates. The primary reasons reported related to medical contraindications such as cochlear malformations and/or ossification.

**Figure 2. Number of Pre-, Peri- and Post-Linguistically Deaf Children Receiving Cochlear Implants in Canadian Centres**




Other reasons included "too much benefit" from hearing aids, lack of motivation on the part of parent or child, issues of family support and/or expectations, duration of deafness, and communication mode.

## Expectations

All centres reported that outcome measures had been established and continued to be developed as the program grew. The questionnaire attempted to address the issue of expectations for children with implants and changes in expectations with program growth. Expectations varied from awareness of sound and assistance in speechreading to using the implant to develop verbal communication.

Implant centres did not necessarily have the same initial expectations. The expectations of each centre seemed to be related to the time the program was established. Programs which were established early seemed to be more conservative in their initial expectations, while programs which were established later seemed to have higher expectations. This is reasonable in light of the advances which have been made in signal processing for cochlear implants in the past five years. Expectations may also be related to the selection process defined by each cochlear implant program. It is important to note, however, that all centres indicated that their expectations had either remained the same or risen. Typically, centres which had relatively low expectations initially had raised their expectations with experience.

## Habilitation Services

Centres provide a range of habilitation services for children with cochlear implants. All centres provide consultation to the child's education program, in service training for

**Table 2. Type of Post-Implant Rehabilitation Provided by Canadian Programs**

| | Individual therapy | Consultation to child's education program | In-service training for educators, speech language pathologists,audiologists and support personnel | Regular evaluation of child's progress | Other |
|---|---|---|---|---|---|
| B.C.'s Children's Hospital | | x | x | x | loaner equipment and everyday replacement parts |
| Glenrose Rehabilitation Hospital | Auditory-Verbal<br>Auditory-Oral<br>Total Communication | x | x | x | x |
| Alberta Children's Hospital | Auditory-Oral<br>Total communication | x | x | x | |
| Saskatchewan Cochlear Implant Program | Auditory-Oral<br>Total Communication | x | x | x | |
| Central Speech and Hearing Clinic Inc. | Auditory-Verbal | x | x | x | |
| University Hospital London | Auditory-Verbal | x | x | x | |
| The Hospital for Sick Children | Auditory-Oral<br>Auditory-Verbal<br>Total Communication | x | x | x | |
| Children's Hospital of Eastern Ontario | Auditory-Verbal | x | x | x | |
| L'Hotel-Dieu de Quebec | Auditory-Verbal<br>Total Communication | x | x | x | |

professionals involved with the child and regular evaluation of the child's progress. All but one centre provides individual therapy for children with cochlear implants. Four centres reported that they provide a total communication program as well as one or more programs with an auditory emphasis. Three programs reported that an auditory-verbal program is provided. Specific information is provided for each program in Table 2.

## Summary

A survey of paediatric cochlear implant centres in Canada was completed in December, 1994. Currently cochlear implant surgery is available for children in seven Canadian hospitals and two other centres provide pre and post implant services. Approximately 168 children in Canada have received cochlear implants, with approximately 156 implant surgeries having been performed in Canada and the remaining 12 in the United States. The numbers have grown significantly over the past two years as more Canadian programs have received funding from their provincial governments. The survey suggests that the emphasis has shifted from post-lingual deaf children to pre-lingual deaf children.

As studies on the efficacy of multichannel cochlear implants in children have reported improvement in performance in auditory perception skills and in speech production (Moog & Geers, 1994; Miyamoto et al., 1994; Waltzman et al., 1994), it is anticipated that cochlear implants will remain an important option for children in Canada.

**Acknowledgements**

The authors wish to thank the Canadian Association of Speech-Language Pathologists and Audiologists for making this project possible through the Working Group on Cochlear Implants in Children. We would also like to acknowledge the nine implant programs who completed the survey. We acknowledge the Saskatchewan Preschool Auditory Rehabilitation Centre and the Children's Hospital of Eastern Ontario for supporting our efforts.

*Readers who wish to receive a copy of the Cochlear Implants in Children Questionnaire may do so by contacting National Office at:

**1(800) 259-8519**

*Les lecteurs intéressés à consulter la version anglaise du questionnaire sur les implants cochléaires peuvent en faire la demande auprès au Bureau national.

***Please address all correspondence to:*** Lynne Brewster, Saskatchewan Preschool Auditory Rehabilitation Centre, University of Saskatchewan, Room 21, Ellis Hall, Royal University Hospital, Saskatoon, Saskatchewan, S7N OW8 or Elizabeth Fitzpatrick, Dept. of Communication Disorders, Children's Hospital of Eastern Ontario, 401 Smyth Rd., Ottawa, Ontario, K1H 8L1.

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