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Cochlear Implants in the Pediatric Population: A Scan of Canadian Provinces

Environmental Scan

Context

A cochlear implant is a device which is surgically implanted to "improve hearing in children and adults with severe to profound hearing impairments."[1] A cochlear implant provides a "sensation of hearing;"[2]
it does not guarantee that the recipient will hear as well as a person with normal hearing. The cochlear implant operates electronically. A receiver/stimulator is embedded in the bone of the skull, and an electrode array is inserted into the cochlea.[3] A speech processor is worn behind the ear and a microphone is worn on the head next to or above the ear.

Not every child is an appropriate candidate for a cochlear implant and the decision to use an implant is dependent on many factors.[4] Eligibility is determined on a case-by-case basis, and includes an assessment of the benefits of proceeding with the surgery and an evaluation of the rehabilitation services that will be required for the child to interpret sounds received and adjust to the cochlear implant. As well, the motivation of the child and family, and the ability of the family to provide support for the child emotionally and otherwise, are important considerations.

Health Canada approved cochlear implants for use in children in 1990. In 2006, the Canadian Association of Speech-Language Pathologists and Audiologists released a position paper on the use of cochlear implants in children. The Association supports the use of the devices in pediatric patients with bilateral severe to profound sensorineural hearing loss. The position paper advocates considering implantation following a " comprehensive audiological, speech-language and medical evaluation of the child, a complete exploration of parental expectations, and commitment to implantation and (re)habilitation." [5]

Concern has been raised about the use of cochlear implants in children. In particular, the Canadian Association of the Deaf has stated that cochlear implants may be inappropriate for some young deaf children, and may compromise linguistic and social development.[6] Cochlear implants have also been seen as posing a threat to the distinct social and cultural values of the hearing-impaired community, as they are the main reason for the decline in sign language.

Objectives

The purpose of this report is to provide information on the status of programs providing cochlear implants in children (defined as the population between the ages of zero to 18 years) across Canadian provinces. The following questions will be addressed:

1) What is the population of Canadian children who have cochlear implants?
2) What is the most common age that these devices are surgically implanted?
3) Which provinces fund cochlear implants and speech processor upgrades?

Findings

The findings of this environmental scan are not intended to provide a comprehensive review of the topic. Results are based on a limited literature search and communication with key informants. This report is based on information gathered as of May 2011.

Since the approval of these devices by Health Canada in 1990, there has been a steady increase in the number of implantations across all age groups in Canada. Up until 2007, 4,244 Canadians had received implants; 2,534 adults and 1,710 children.[7] Our scan found that as of May 2011, approximately 2,100 to 2,350 children between the ages of zero and 18 years have received cochlear implant surgery in Canada.

These devices are implanted most frequently in children under the age of eight. Several jurisdictions indicated the age ranges of 12 to 18 months and 12 to 24 months as the most common ages for surgical implantation.

The cochlear implant programs identified through this scan are located either in hospitals which have rehabilitation services or are associated with rehabilitation centres. Children in Prince Edward Island and New Brunswick must travel out-of-province for surgery. Manitoba has announced that the surgery for cochlear implants will be provided as of the summer 2011. Information provided by provincial cochlear implant programs in Canada is summarized in Table 1.

Generally, proceeding with an implant is a team or program decision in some provincial centres; namely in Newfoundland and Labrador, Ottawa, Toronto, Saskatchewan, Edmonton, and British Columbia. Nova Scotia reported that the final decision is made by the surgeon. Prince Edward Island and New Brunswick, neither province of which provides the implantation surgery, indicated the decision is that of the medical consultant at the receiving hospital.

Each jurisdiction has outlined criteria to determine a child's eligibility for the cochlear implant surgery, except Manitoba where the program has yet to be operationalized. These criteria appear to be consistent with those outlined in the position statement of the Canadian Association of Speech- Language Pathologists and Audiologists. Jurisdictions made reference to assessment tools such as the Children's Implant Profile (ChIP) at The Hospital for Sick Children in Toronto, the Multisyllabic Lexical Neighbourhood Test (MLNT) or Lexical Neighbourhood Test (LNT) at London Health Sciences Centre, and the Canadian Consensus statement on bi-lateral implants at the Children's Hospital of Eastern Ontario.

While the assessment of eligibility for a cochlear implant, surgery, post-surgery follow-up, and rehabilitation is covered under jurisdictional health care systems, there are other financial costs associated with the cochlear implantation. These out-of-pocket costs include travel expenses, replacement batteries for speech processors, and insurance in the event of loss, damage, or theft of the speech processor.

Some provincial health ministries provide funding for upgrades to speech processors. Newfoundland and Labrador fund one upgrade up until the age of 18. Ontario makes a contribution to an upgrade within a specific period of time. Speech processor upgrades are not funded in British Columbia. In Saskatchewan, the Ministry of Education and the School Districts fund the cost of speech processor upgrades.

Each province has established criteria to determine access, not only for eligibility for the implantation, but also for upgrades to the speech processor. A combination of demand for the procedure and continual improvements in technology has placed pressure on available health care resources.[8]

Table 1: Cochlear Implants in Canada's Pediatric Population

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
Newfoundland and Labrador					
29	Surgery can be performed at the minimal age of 12-18 months, and older	Bilateral severe to profound sensorineural hearing loss, with limited benefit from hearing aids Confirmed severe to profound hearing loss in both ears with little or no benefit from hearing aid Children less than 4 fail to reach developmentally appropriate milestones, usually in consultation with an Auditory Verbal Therapist and/or Speech Language Pathologist, and children over 4 years of age score less than 12% on a difficult open-set, word-recognition test or at less than 30% on an open-set sentence test	Final authority determined by ear, nose, and throat, and cochlear implant team	Children are granted 1 upgrade up to the age of 18	Implants and processor upgrades are funded by the Department of Health and Community Services

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
Nova Scotia					
Approximately 65	Less than 8 years of age	Bilateral severe to profound sensorineural hearing loss with limited benefit from hearing aids 6-month trial with a hearing aid is recommended as first step	Final authority determined by cochlear implant surgeon	Processor replacement, subject to availability of funding, is on the basis of medical necessity (i.e., processor is obsolete, no longer suitable, past its useful life)	Implant and processor upgrades are funded by Department of Health and Wellness
Prince Edward Island Surgery is performed out-of-province					
Approximately 7	Between 2–18 years of age	Criteria requires the implant to be medically necessary	Final authority determined by medical consultant	Speech processor upgrades are provided when needed within a 5–10 year time frame A written request from facility stating the reason for an upgrade is required	Implant and processor upgrade are funded by Health PEI

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
New Brunswick Surgery is performed out-of-province					
According to 2009-2010 data, approximately 49 children are being followed within the province It is estimated that there are approximately 20–30 additional adult/child clients with implants who are receiving follow-up in out-of-province locations for whom data is not available	Most children diagnosed through the Universal Newborn and Infant Hearing Screening Program receive implants at approximately 12 months of age	Children under the age of 19 are eligible for a second implant (bilateral) The New Brunswick Cochlear Implant Follow-up Services accepts referrals for cochlear implant candidacy evaluations to determine eligibility for implants	Final authority determined by surgeon/surgical site to which the client is referred The assessment coordinated by the New Brunswick Cochlear Implant Follow-up Services involves an audiologist, psychologist, speech-language pathologist, and social worker, as required		Implants and initial external processor are funded by New Brunswick Department of Health As of May 3, 2011, the province does not cover the cost of implant upgrades. However, there are ongoing discussions on this issue involving the Department of Health, the Department of Social Development, and the Regional Health Authorities
Quebec					
477; includes approximately 20 children who received implants out-of-province	Since 2009: • 79 implanted at age 1 • 77 implanted at age 2 • 63 implanted at age 3, etc.	For small children: Minimally confirmed as having severe hearing loss with little or no benefit from hearing aids, after significant trial The hospital lacks authority	Final authority determined by team of surgeons, audiologists, speech therapists, and psychologists who discuss candidacy in a monthly meeting	Speech processors are the property of the hospital, and the costs of repairs and replacement of processor when needed by patient are covered by the hospital Patient keeps	Implants are funded by the Ministry of Health Hospitals seek a special budget from the Ministry of Health for use in upgrading obsolete models of

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
		to provide bilateral implants. A study has recently been completed which supports the implantation of 20 patients with bilateral cochlear implants		the same model of processor until obsolescence Upgrades are covered only when processor is obsolete Processors are declared obsolete by the manufacturer	speech processors
Ontario (2 centres surveyed)					
Centre 1					
Approximately 650	Youngest age is 8 months These children are typically deaf from birth	Children's Implant Profile is used to assist in candidacy determination	Final authority determined by entire implant team and best available evidence	Upgraded speech processors are funded for patients who have not received Assistive Devices Program or other Ministry funding for implants within three years Current equipment must not be functioning for eligibility, or a new processor demonstrates additional benefits for the patient	Implants are funded by the Ministry of Health and Long-Term Care The Assistive Devices Program funds up to 75% of the cost of a new processor, to a maximum of $5,444.00

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
Centre 2					
Approximately 180 There are another 170 children who have received implants while living in other provinces There are 40 children who have received implants in their second ear	Most common age is 12 months, followed by 24 months	The criteria for candidacy are: • severe to profound sensorineural hearing loss • lack of benefit with hearing aids • willingness to participate in and availability of an auditory-based language therapy • absence of medical contraindications (e.g., radiological evidence of cochlear nerve deficiency, chronic middle ear disease) • no suggestion of prolonged periods of auditory deprivation (e.g., profound congenital hearing loss without amplification in either ear over a period of 5-6 years)	Final authority determined by hospital cochlear implant team	It is expected that an upgrade would be provided after 3-5 years of use if the device is no longer under warranty and device repair is needed but cannot be done at a reasonable cost	As above

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
Manitoba					
Approximately 51; 30 have unilateral and 21 have bilateral implants	Approximately 34 months (almost 3 years)	Province recently announced a cochlear surgery program; patients have been travelling out-of- province for the surgical component The Winnipeg Regional Health Authority will run the program All patients who have been assessed as suitable candidates for cochlear implantation are eligible for implantation; i.e., are placed on a wait list for surgery		Manitoba residents 18 years and younger on obsolete models only. These obsolete models may be body-worn processors or models that are no longer serviced (i.e., company does not cover repairs and no longer offers extended warranties; families pay for repairs)	Currently the Manitoba Health's Insured Benefits Branch has funded out-of-province implants Speech processor upgrades are funded for children, only. Manitoba Health Out-of-Province pays for upgrades
Saskatchewan					
Approximately 50	Children with severe to profound losses recieve implants as soon as possible Children with progressive losses as soon as they no longer receive benefit from hearing aids	Basic criteria are: • older than 12 months • severe to profound hearing loss • slow development of auditory skills • realistic parental expectations	Final authority determined by multidisciplinary team comprised of cochlear implant surgeon, audiologist, speech-language pathologist, and teacher of the deaf, with access to social worker and psychologist	Time frame varies depending on internally implanted device, availability of the upgrade, and the needs of the child Factors considered include: • improvement in the speech processor signal • ergonomics	Ministry of Health covers the cost of the initial implant and surgery Ministry of Education and School Division covers the cost of speech processor upgrades and FM equipment

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
				• reliability interface with personal frequency modulation • motivation of child • history of speech processor use • auditory experience of the child •psychoacoustic limitations of the speech processor map • academic placement • classroom acoustics • use of computers and other equipment requiring audio input	
Alberta (2 centres surveyed)					
Centre 1					
Approximately 133	In the past two years, the average age of a child receiving an implant was 2.4 years	Candidacy criteria are based on the manufacturer indications for device use that have been approved by both Health Canada and the US Food and Drug Administration	Final authority determined by multidisciplinary team consisting of audiologist, speech language pathologist, psychologist, social worker, teacher of the hearing impaired, and surgeon	When a device is obsolete, or is at least seven years old, the client is eligible for funding assistance	Alberta Health and Wellness provides funding to Alberta Health Services to cover the cost of the devices A portion of device upgrades is covered by Alberta Aids to Daily Living

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
Centre 2					
Approximately 91	2008-2009: • average 49 months (age range 12 months -13 years) 2009-2010: • average age 36.8 months (age range 16 months-9 years) 2010-2011: • 29.8 months (9 months-6 years) There is a bilateral program for pediatrics throughout Alberta	Candidacy criteria are based on the manufacturer indications for device use that have been approved by both Health Canada and the US Food and Drug Administration	Final authority determined by multidisciplinary team consisting of audiologist, speech-language pathologist, psychologist, social worker and surgeon	When a device is obsolete, or is at least seven years old, the client is eligible for funding assistance	Alberta Health and Wellness provides funding to Alberta Health Services to cover the cost of the devices
British Columbia					
Approximately 220; 21 of these have bilateral implants	Most common age is 12-15 months of age, with some variation The average age at implantation is complicated by individual circumstances Under ideal circumstances and when a child is identified with a hearing loss in the	Bilateral severe to profound sensorineural hearing loss with limited benefit from hearing aids 3- to 6-month trial with a hearing aid is recommended as first step Family and/or child with good motivation and realistic expectations about the cochlear implant	Final authority determined by cochlear implant team	Not known	Ministry of Health pays for the cost of surgery and equipment Speech processor upgrades are not funded

Population with Implants (0-18 Years)	Most Common Age for Implants	Eligibility Criteria	Who Decides	Upgrade Criteria	Funding of Implant and Processor Upgrades
	first few months of life, they receive implants before two years of age	Family prepared for the time and travel costs associated with cochlear implant follow-up, as well as the continuing costs of speech processor supplies and upgrades Enrollment in an appropriate educational program, with emphasis on development of auditory/oral skills			

Conclusion

Approximately 2,100 to 2,350 Canadian children have cochlear implants. The surgery and device is funded under the provincial health budget in all provinces. New Brunswick and Prince Edward Island fund the surgery out-of-province. Manitoba is currently establishing a new otological surgery program which will provide cochlear implant surgeries by the summer of 2011; until then, surgeries are being performed out-of-province. The youngest age that the surgery is performed is 12 months in most jurisdictions; one jurisdiction reported a cochlear implantation in an eight-month-old infant. The most common age for implantation seems to be within the 12- to 18-month age range.

Eligibility for the surgery is usually assessed by a team of professionals, which may include a surgeon, speech-language pathologist, audiologist, psychologist, or social worker. The team is guided by factors such as age of the child, the extent of the hearing loss, developmental factors, motivation of the child and family, and the extent of family support.

The technology is continually undergoing improvements, creating demands for upgrades. Funding for upgrades varies by province, from no funding, to some funding with various conditions.

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