

## Issues in Cochlear Implant Candidacy

In a recent survey by the British Cochlear Implant Group (BCIG) council, members were asked what the priority working areas for the BCIG council should be. The topic of candidacy was the emphatic winner. This is because those working in the cochlear implant (CI) field in the UK believe that the guidelines for candidacy no longer reflect the entire population of patients that the BCIG and the UK implant field consider to be potential CI candidates. There is a clear need to review these guidelines in light of new evidence, some of which is collated in this supplement.

The population of CI candidates who could potentially benefit from implantation appears to be far wider than current guidelines permit. On the upper end of the performance range individuals with greater levels of residual hearing or those where the contralateral ear has useable acoustic hearing have been shown to benefit from implantation. This change has arisen because improved surgical techniques lead to better post-operative retention of acoustic hearing. Increased audiological knowledge of fitting and technological advances also allows the amplification of residual acoustic hearing and its integration with electrical hearing to be optimized. These individuals (both children and adults) would not necessarily fall within the candidacy range with the current assessment methods and more sophisticated listening tests that are sensitive to the benefits of electro-acoustic hearing are required to establish whether they could benefit from implantation.

At the other end of the speech performance scale are adults who had pre-lingual onset of deafness and/or long duration of profound post-lingual deafness. When implanted, many of these individuals now show demonstrable improvements in outcomes and quality of life measures whereas previously it had been thought that they would not be able to benefit from implantation. For some individuals the improvements are only clearly seen using assessment methodologies that are not mentioned in the guidance such as audio-visual speech assessments.

As the population changes and people are living longer, there is an associated increase in the age at implantation. With increases in migration many adults and children (and their families) do not have good levels of spoken English. For the older adults and people who do not speak English as their first language the speech perception tests specified in the National Institute of Health and Care Excellence guidance and used in routine practice are unlikely to give a true indication of the person's access to speech sounds. Therefore, further work is required to ensure that the assessments are appropriate for the population being assessed for candidacy and sensitive to the benefits those patients report following implantation.

A score of less than 50% on the Bamford Kowal and Bench (BKB) sentences presented in quiet (at 70 dB SPL) is used as one of the candidacy criteria for assessing adults in the UK. Use of this measure alone to assess hearing function has become inappropriate as the assessment is not suitable for use with the diverse range of implant candidates today. The papers in this supplement suggest that it would be appropriate to broaden the pre-implant assessment test battery to include the Arthur Boothroyd (AB) monosyllabic speech perception task (scored by both word and phoneme) together with CUNY (City University of New York) audio-visual sentence materials in quiet for poorer performing candidates. Additionally, the papers suggest that speech-in-noise measures should be included when assessing individuals at the higher end of the performance range such as those with residual hearing. A more complex combination of measures for determining candidacy will provide a better assessment of an individual's access to speech. Other more qualitative measures to better understand an individual's everyday listening experience should also form part of the clinical evaluation assessment battery to fully understand the impact that the hearing loss has on an individual's functional hearing and everyday life.

It has been recommended that the cut-off audiometric level should be reduced to 80 dB HL at 2 and 4 kHz in the UK for all implant candidates, compared to the current threshold of 90 dB HL. However, there are concerns that even this change would not sufficiently cover all of the unusual audiometric configurations that an appropriate candidate could have. It is also recognized that pure tone audiometry has important limitations and that possibly other measures, such as the speech intelligibility index could be added to the test battery as a way to support candidacy decisions regardless of where the hearing threshold level is set.

The inherent variability of the assessments is not currently taken into account when applying them. Given that most routine clinical measures are known to have less than perfect test–retest reproducibility, it would be appropriate consider the potential effects of this variability on both threshold measurements and speech perception measures to ensure that people are not incorrectly classified as ineligible due to measurement error.

When looking at candidacy criteria across the world, it is clear that there is wide variability in practice and service delivery that is governed, at least in part, by socio-economic factors and funding models. Compared to other countries where CIs are centrally funded, the current approach used in the UK is extremely conservative. There is a general move internationally to expand the candidacy criteria for CIs, for the reasons highlighted by the authors within this supplement. When thinking about changing candidacy for CIs for both adults and children it is not only the cost of the device and intervention that should be considered but also the cost of not providing implants to the appropriate individuals and the impact that this would have on their lives and on society more generally. Poorly managed hearing losses have a huge impact on a person's life, for adults it could result for example in social isolation, reduced self-confidence and poor employability. For children it could impair their access to speech and in turn delay language acquisition, which has further implications on that child's education and employment outcomes in later life.

BCIG Working Party on Candidacy

Deborah Vickers, Padraig Kitterick, Carl Verschuur, Carolina Leal, Louise Jenkinson, Fiona Vickers and John Graham,