Inter-professional collaboration to improve outpatient attendance rates on a cochlear implant aural rehabilitation programme

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Abstract

\textbf{Background:} The cochlear implant (CI) programme at Changi General Hospital started in 2010. As the number of patients gradually increased over the years, a review of attendance rates from 2010 to 2016 showed that CI patients were not compliant in attending post-surgical aural rehabilitation sessions. A significant number of no-shows or appointment cancellations without rescheduling suggest that patients may not be motivated enough to go through aural rehabilitation. Hence, it was hard to evaluate clinical outcomes, which was demoralising for both the patient and health-care professionals involved. As transdisciplinary care is often involved in the aural rehabilitation process, we reviewed the existing CI clinical pathway to identify gaps in services, and with better fostering of inter-professional collaboration (IPC) in 2017, we compared the difference in outpatient aural rehabilitation attendance rates for patients seen before and after 2017.

\textbf{Methods:} A retrospective review was undertaken of the outpatient administrative system to look at appointment cancellation rates before and after IPC for CI patients undergoing post-surgical aural rehabilitation from 2010 to 2019. A paired-sample t-test of significance was used, with the level of significance set at $p=0.05$. Problem analysis using the Problem, Intervention, Comparison, Outcomes framework helped in identifying the possible reasons for non-compliance with aural rehabilitation attendance. Inter-professional education among audiologists, otologists and speech therapists allowed for a close-knit IPC.

\textbf{Results:} There were 78 patients with CIs from 2010 to 2019. Of these, 46 patients were implanted between 2010 and 2016, and 32 were implanted after IPC was introduced in 2017. The median cancellations rates were significantly reduced from 23\% to 15\%, with a p-value of 0.00. Days to switch-on and aural rehabilitation, number of appointment cancellations and total number of individual visits were significant independent predictors of the percentage of cancellations in regression analysis.

\textbf{Conclusion:} Future studies are warranted to see if IPC can indirectly drive clinical outcomes, given that IPC encouraged better compliance with aural rehabilitation attendance post CI. It is imperative to have IPC in this dynamic health-care landscape with increasing complexities. IPC cannot be achieved without a close-knit relationship among the relevant health professionals.

Keywords

Inter-professional collaboration, cochlear implant, sharing, partnership, process, interdependency, aural rehabilitation

Introduction

Patients are always recognised as the justification for providing collaborative care, especially in the evolving health-care landscape with increasing complexity of health problems faced by health professionals.\textsuperscript{1} A call for transdisciplinary care cannot be achieved without fostering inter-professional collaboration (IPC). With greater interdependencies among health professionals, it is paramount to have good conceptual knowledge of the complexity of inter-professional relationships.\textsuperscript{2} Using the fundamental concepts of IPC – sharing,\textsuperscript{3} partnership,\textsuperscript{4} power,\textsuperscript{5} interdependency\textsuperscript{6} and process\textsuperscript{7} – the Otology, Balance and Hearing Implant (OBHI) team at Changi General Hospital (CGH) was able to identify gaps in services and to make modifications to the cochlear implant (CI) aural rehabilitation workflow. This enabled outpatient attendance rates of CI patients to improve significantly from 2017.

The CI programme started at CGH in 2010, and as of December 2019, a total of 78 patients had been implanted.

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Patients are required to be compliant with aural rehabilitation post surgery in order to optimise hearing outcomes. However, based on clinical observations and feedback gathered from colleagues, CI patients were observed to have significant no-shows or cancellation of appointments without rescheduling. This prompted the team to have an in-depth analysis to examine if there was a common occurrence over the past years and, if so, to devise strategies to improve outpatient attendance rates.

**Problem analysis**

Using the Problem, Intervention, Comparison and Outcome analysis, we identified the service gaps that may have contributed to the patients’ knowledge, attitude and beliefs of CI and hence influenced their decision to attend outpatient sessions: (a) long waiting time for the switch-on of the device after surgery and for aural rehabilitation; (b) insufficient understanding of the importance of aural rehabilitation post surgery; (c) inadequate family support to carry out home-based auditory training; (d) technical difficulties with the CI due to different expertise; (e) accessibility to home-based resources for self-training; and (f) perception of sound and expectations of hearing outcomes with the CI.

**Aim**

This study aimed to reduce the cancellation rates and hence improve the attendance of CI patients for aural rehabilitation after surgery via a revised 2017 workflow involving transdisciplinary health professional education and collaboration. IPC involves the exploration of the five fundamental concepts: sharing, partnership, power, interdependency and process to improve patients’ experience and enable continuity of care after CI. IPC also encourages partnership with industry stakeholders to facilitate the organisation of support groups and public forums to improve patients’ knowledge, attitude and beliefs.

**Method**

A retrospective analysis was conducted of the outpatient administrative system from 2010 to 2019. Looking at the time to CI switch-on after implantation, the lead time for aural rehabilitation and the cancellation rates of the 78 recipients from 2010 to 2019, we inferred that there may be an association between cancellation and the long wait time after surgery. Baseline data were collected from 2010 to 2016, and evidence-based modifications were applied based on the fundamental concepts of IPC in order to revise existing protocols in 2017. After implementation, we looked at the same parameters for comparison to assess whether there had been a change in the cancellation rates. Paired-sample t-tests were also carried out to see if there were any significant differences after modifications to existing protocols were made in 2017.

**OBHI team-based exploration of fundamental concepts of IPC (SIP3)**

**Sharing.** Different health professionals work with CI patients: the surgeon (otologist), audiologist and speech therapist. It is hence important to have a common goal, with shared values of teamwork, ownership and professionalism to deliver seamless patient care. In addition, the OBHI team recognises the shared responsibility for patients and ensures that all pre-implant candidates go through extensive counselling and clinical evaluation with all parties before making a decision on CI surgery. This shared decision making represents teamwork and encourages ownership among team members. The perspectives of the different professionals involved are also shared during the scheduled CI monthly meeting, with all facets of sharing done collaboratively.

**Interdependency.** Team members are interdependent rather than autonomous. Joint audiology–speech therapy sessions allow for any technical difficulties with the CI to be addressed promptly. Speech therapists are also able to acquire simple CI troubleshooting and technological skills with the CI processor and accessories. A one-stop service at the Department of Otolaryngology improves accessibility for medical, audiology and speech therapy support.

**Partnership.** Partnership can be characterised as a collegial-like relationship, with open communication, mutual trust and respect. The OBHI team is aware of the value and contributions of each individual and has worked closely with relevant stakeholders to improve the knowledge, attitude and beliefs of CI recipients. These partnerships include the inauguration of the CI recipient support group in 2016 and the organisation of regular public health forums, with the support from relevant stakeholders.

**Power.** The perceived symmetry in power relationships comes through collaborative interactions. The simultaneous empowerment of individual team members is based on experience and knowledge rather than functions or titles. This shared power allows members of the OBHI team to make strong suggestions and recommendations on CI candidacy, where decisions are made synergistically and professional boundaries are transcended.

**Process.** The dynamic and collective process of the team also encouraged evidence-based review of existing protocols to improve the patient experience. The shared planning and intervention culminated with refined work processes culminated with improved productivity and continuity of care.

**Previous method (2010–2016)**

- No dedicated surgeon–audiologist–therapist counseling for pre-implant candidates (lack of partnership and power symmetry).
- Time to switch on the CI after surgery was 4 weeks on average (process gap).
- Less frequent CI audiological mappings with mapping interval after switch-on at 1, 3, 6 and 12 months apart (process gap and lack of sharing of best practices).
- Inconsistent and long wait time for speech therapy aural rehabilitation (process gap and lack of partnership).
- Aural rehabilitation is impeded, with no immediate technical support or expertise with CI (lack of partnership, interdependency and sharing of expertise).
Independent focus on outcomes (surgical, audiological and rehabilitation) without understanding patients’ and caregivers’ knowledge, attitude and beliefs on CI (lack of partnership and interdependency).

No financial assistance for stoic patients who view cost as a significant barrier to CI.

Revised method with IPC (2017–present)

- All pre-implant candidates are extensively counselled by the surgeon, audiologist and speech therapists in a dedicated pre-implant evaluation session.
- Evidence for time to switch on CI after surgery was critically evaluated and reduced to 2 weeks on average.
- An increase in intensity of audiological CI mapping intervals: every 2 weeks for the first 2 months.
- Patients are referred to speech therapist for aural rehabilitation within 2 weeks post surgery.
- Joint audiological and aural rehabilitation session for the first 2 months in order to provide a ‘one-stop’ service with accessibility to medical, audiological and rehabilitation services.
- Inauguration of a recipient support group and regular public health forums to raise awareness and bridge gaps in knowledge and to improve patient attitude and beliefs on CI.
- Involvement of our medical social workers (MSW) to ‘ring-fence’ funds to assist patients with financial needs.

The number of cancellations without rescheduling or the number of no-shows was tabulated on a Microsoft Excel spreadsheet. Administrative data such as days to CI switch-on, days to aural rehabilitation and total number of appointments made were recorded. The time was calculated in days with an electronic web calendar that is inclusive of weekends and non-workdays. Specific dates (e.g. date of surgery and date of switch-on) were listed, and the calculator generated the time in days. The data were tested for normality in distribution, and appropriate statistical tests were performed accordingly. Paired-sample t-tests were carried out for data that were normally distributed and the non-parametric equivalent: Wilcoxon signed ranked test for skewed distribution.

Results

Days to CI switch-on and days to aural rehabilitation before and after 2017 were significantly different, with a p-value of 0.000 and a median difference of 9 and 210.5 days, respectively. Days to CI switch-on depended on the whether the site of the wound post surgery has adequately healed, which can range from weeks to a few months. Hence, the initial belief was to wait for at least a month before switching on the CI post surgery. However, with better inter-professional education through IPC, we have successfully switched on patients’ CI as early as 2 weeks after surgery. (Figure 1a, 1b) It is also not surprising that prior to IPC, introduced in 2017, the median lead time for aural rehabilitation was as long as 6–7 months (210 days), as audiologists and surgeons were unaware of the importance of prompt aural rehabilitation. This has significantly changed since better fostering of IPC as described previously. (Figure 2a, 2b) Consequently, with this decrease in lead time to switch on the CI and be referred for aural rehabilitation, there was an increase in the total number of aural rehabilitation sessions attended (p=0.001), (Figure 3a, 3b) with the number (p=0.000) and percentage (p=0.006) of cancellations significantly reduced (p=0.05). (Figure 4a–5b) Comparing the results before and after 2017, the median difference in number of aural rehabilitation sessions attended and the number and percentage of appointment cancellations were +16, −4 and −8, respectively. The team strongly believes that the lead time to switch on the CI (Figure 6a) and to start aural rehabilitation (Figure 6b) are amongst barriers to motivation to attend outpatient appointments.

The total number of individual trips made to see all three different health professionals also significantly decreased, with a median difference of −11 (p=0.000) after IPC was better fostered in 2017 to facilitate joint sessions (on the same day). Multiple regression analysis revealed that the days to switch-on, days to aural rehabilitation, number of appointment cancellations and total number of appointments were significant predictors of the overall percentage of appointment cancellations, holding all other independent variables constant. There was hence a significant decrease in appointment cancellation by 8% after enhanced IPC in 2017. (Figure 6c) For every day of delay in switch-on and referral to aural rehabilitation, there is a 0.12% and 0.01% increase in cancellation rate, respectively. The independent variables explain about 80% of the variance in data with an R of 0.9. (Table 1–3)

One of the limitations is that number of aural rehabilitation sessions will be different based on the year of CI. Recipients who were implanted earlier (2010) will naturally have more time for aural rehabilitation (2010–2019) compared to candidates who were implanted in 2019. However, what seems to be consistent is that before IPC was introduced in 2017, the number of aural rehabilitation sessions remained significantly low compared with an increase in sessions attended from 2017 to 2019. The average number of aural rehabilitation sessions in a year is also hard to specify, as every implant recipient’s progress on the listening hierarchy is different, and the number of appointments are based on each individual’s performance.

Discussion

IPC involves a multifaceted and multi-prong approach. It requires synergistic collaboration among the surgeon (otologist), audiologist, speech therapist, social worker and administrative staff to provide timely intervention and care to our patients. While the surgeons help to address any medical or surgical concerns with CI, they work closely with the audiologists who are primarily responsible for programming the CI processor to verify and validate the patients’ clinical performance with outcome measures. Concurrently, the speech therapists provide timely aural rehabilitation to the CI recipients, whose performance is monitored and discussed at monthly CI meetings. When a stoic patient is identified, extensive counselling is given by all health professionals to educate, inform and convince patients of the need to overcome social and functional
impairments of hearing loss. These efforts are further enhanced in support group meetings and public hearing awareness events, organised by the inter-professional team. Patients who have financial needs are also expeditiously referred to our MSW colleagues, who will assist them accordingly. IPC culminates with support from our administrative colleagues from outpatient operation, who source, secure and arrange available resources and rooms for our health professionals to conduct joint sessions on the same day. IPC cannot be achieved without first understanding its related concepts. IPC can help to streamline processes to improve patient satisfaction and experience and the productivity of health-care professionals, and it can enable continuity of care. IPC encourages and motivates both clinicians and patients, and may indirectly drive better clinical outcomes. It is hence crucial to have IPC in the current health-care landscape.

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Authors’ contributions
K.W.D.C. was involved in the data collection, study design, statistical analysis and first draft. H.W.Y. was involved in the study design, and edited and approved the final manuscript.

Availability of data and materials
The data sets generated and/or analysed during the current study are available from the corresponding author.

Ethical approval
Data collected were unidentifiable and hence did not require ethics board approval under category 8 of the Singhealth Centralised Institute Research Board (CIRB). Category 8 – research using unidentifiable data use of (a) previously collected anonymous data; or (b) existing data set that has been stripped of all identifying information and there is no way that it could be linked back to the individuals from whom it was originally collected (through a key to coding system or by any other means) does not constitute human biomedical research, as there is no interaction with any individual and no individually identifiable information is used.

Informed consent
Not Applicable.

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