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Early activation in cochlear implantation: the patient's perspective

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Objectives: Early cochlear implant activation has been established as safe and effective. The purpose of this study is to assess the patient's perspective on their early activation experience.
Methods: A custom, 6-item questionnaire was administered to both adults and parents of pediatric patients who were activated within seven days of their surgery as part of their standard cochlear implant care. The questionnaire included four quantitative, Likert-style and two qualitative, open-ended questions about their activation experience.
Results: The study included 30 adult and three pediatric participants. Quantitative results showed that all participants (100%) found next-day activation convenient, with 94% preferring it over the traditional two-week wait. Most (79%) were surprised by the possibility of early activation, and nearly all (97%) would recommend it to others. Parents of pediatric patients echoed these sentiments, with all finding next-day activation convenient and preferable. Qualitative analysis revealed six themes: reduced travel burden, benefit of hearing sooner, general positive comments, recovery, support, and positive psychological impact. Suggested improvements are detailed.
Conclusion: This study establishes that adult and pediatric patients who underwent early activation demonstrate benefit from and preference for early activation. Patients benefitted from reduced travel burden, earlier access to hearing in the implanted ear, and positive psychological impacts, pointing to the need to consider broad application of early activation, tailored to individual patient preferences and circumstances.

Keywords: cochlear implant, early activation, activation, satisfaction, travel burden

Introduction

Cochlear implants (CI) are the standard of care for patients with moderate to profound sensorineural hearing loss who experience limited benefit from traditional hearing aids. The cochlear implant system is comprised of two parts – a surgically placed internal component and an externally worn sound processor. After the internal device is placed, the external sound processor is turned on at the recipient's first follow up appointment, known as an activation (Carlson, 2020). Traditionally, a 3–6 week-recovery period between surgery and sound processor activation has been recommended, which delays the hearing benefits the cochlear implant provides (Alahmadi et al., 2023; Coelho et al., 2023; Günther et al., 2018; Wolf-Magele et al., 2015).

Internal devices have become smaller, requiring less invasive surgical approaches and shorter operating times (Batuk et al., 2019; Bruschke et al., 2021; Majdani et al., 2010). As a result, the need to maintain the extended recovery time between surgery and activation is unclear. Numerous studies summarized by four recent systematic reviews and meta-analyses have demonstrated the safety and efficacy of activations as early as the day of surgery or the day after (Alahmadi et al., 2023; Alshalan et al., 2023, Coelho et al., 2023); Parker et al., 2024). Alshalan et al. (2023) aggregated safety and effectiveness data from 857 patients across 19 studies, establishing that early activation is both safe and effective. A more recent study by Patro et al. (2024) reported that patients who were activated earlier demonstrated increased wear time and higher speech perception scores, highlighting the potential hearing outcome benefits with early activation. Though limited instances are reported in the literature, potential disadvantages of early activation include site

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management (e.g. pain and swelling), potential compromised activation readiness secondary to anesthesia, or post-surgical dizziness (Coelho et al., 2023).

Historically, activation appointments were extended and often spanned several days (Vaerenberg et al., 2014). Traditional programming methodologies involved significant contribution from the patient to provide psychoacoustic loudness ratings of every single channel in the device. With modern monopolar stimulation strategies, the patient burden of initial activation has been significantly reduced (Botros et al., 2013). In addition, recent template-based programming workflows have further reduced the effort required, and consequentially, time needed, to program the sound processor at the first visit (Maruthurkkara & Bennett, 2024).

Activation appointments also include counseling and device orientation which extends the session (Vasil et al., 2021). This time intensive process may reduce both patient and provider appetite to pursue activation swiftly after surgery. This barrier can be offset by counseling prior to surgery, streamlining the equipment kit, and leveraging a manufacturer service for patient device familiarization. With the implementation of a clinically efficient activation process that is straightforward for both the patient and clinician, early activations are not only possible, but much more manageable.

With early activation being established as safe and effective, modern programming techniques which lessen programming demand at activation, and streamlined counseling practices which open the door to early activation, the question that follows is 'are patients interested?' In a review, Coelho et al., 2023 postulated that the motivation for exploring early activation was to focus on patient-centered care practices and discussed other potential benefits to the recipient. These benefits include reduced travel burden, reduced visits, positive psychological benefits (e.g. reassuring the patient that the device functions), and improved hearing sooner, enabling a quicker return to daily life. The authors comment how these benefits are 'intuitive' but 'have not been properly studied' (p. 9).

Patient perspectives on early activation were nicely summarized in the systematic review by Alshalan et al. (2023) and are briefly discussed here. Wolf-Magele et al. (2015) commented: 'All of our patients were satisfied with the reduction in the amount of time they had to wait until their implant was activated' (p. 533). This study compared their traditional activation timeline of six weeks to an earlier timeline of two weeks, and so these patient perspectives are not reflective of switch-on on the same or next day after surgery.

Günther et al. (2018) formally surveyed their patients about their satisfaction with both their early fitting procedure and their hearing experience. At activation, 84.2% of their patients were either highly satisfied or satisfied with the early fitting procedure. When reassessed at their three-month post activation appointment, 100% of patients reported being satisfied or highly satisfied. Regarding their hearing experience with their cochlear implant, 66.6% reported being satisfied or highly satisfied at activation. This improved to 70% at the three-month reassessment. These patients were fitted, on average, two days after surgery.

Roux-Vaillard et al. (2020) did not report a formal survey of patient satisfaction but commented that none of their patients reported regretting early activation and all patients would recommend it to future cochlear implant candidates. These patients were activated the day after surgery.

These reports indicate that patients are generally satisfied with early activation, though patient satisfaction was not the primary purpose of any of these studies. The present work addresses this gap in the literature by formally assessing the satisfaction of patients with cochlear implants and parents of pediatric patients with early activation.

Materials and methods

This study was a single center, cross-sectional study of patients' perspectives on early cochlear implant activation at The Rocky Mountain Ear Center. All patients signed an informed consent form prior to participation in the study. This center adhered to the principles of the Declaration of Helsinki. The survey received exemption from our local Institutional Review Board, approval number: 70788.

Study participants

The participants in this study were offered early activation either due to distance from the clinic, unique hearing circumstances, or a combination of both. Participants were offered early activation at the time of evaluation or, in revision cases, at the point of surgical scheduling. Our center provides cochlear implant services to a large geographic region, and early activation was offered to patients with significant travel requirements to reach the clinic. Early activation was also routinely offered to patients who were undergoing revision surgery, receiving a cochlear implant in their only hearing ear, were single-sided deafened or were receiving a sequential implant in the contralateral ear. Sequential bilateral recipients were often interested in early activation to reduce their time without stimulation in the implanted ear or were familiar with the cochlear implant activation and rehabilitation processes and therefore eager to

be activated earlier. Regardless of the reason for early activation, the patient required one fewer trip to the clinic during their first year of aftercare.

Over the duration of the study period, 37 subjects elected to pursue early activation rather than a traditional activation timeline. All subjects received a formal satisfaction survey; 33 subjects completed and returned the survey. The completed surveys included responses from three parents of pediatric patients. Administration of the survey was completed in person, via mail, or via electronic mail. Survey completion varied between the day of activation to eight months post activation.

Our center provides all patients with two sound processors at activation and counsels them on off-the-ear and behind-the-ear options. Among the 30 adult participants, one chose two behind-the-ear processors, one chose two off-the-ear processors, and the remaining 28 chose one of each type. The three pediatric patients each selected one behind-the-ear and one off-the-ear processor.

Clinical considerations

Detailed audiologic and surgical considerations are out of scope for this paper and are described elsewhere by our group (Biever et al., 2024). The post-surgical pressure dressing was maintained until the point of activation and removed by the audiologist at that time. The medical team was available for consultation as needed. The sound processor type was configured in the usual fashion, with instruction to the patient to maintain a clean sound processor. Counseling covered essential information, including general device use and magnet site monitoring. Recipients were provided with two magnet strengths, the clinician-selected strength and a less strong magnet should irritation occur. Though not a main outcome of this paper, no magnet site issues were observed.

Study instruments

A custom, 6-question, written survey was created to assess the patient's experience with early activation. The survey was comprised of two question types. The first section used multiple choice questions where responses included a 5-point Likert scale ranging from Strongly Agree to Strongly Disagree. Question 2 is reverse-worded where a disagreement with the statement reflects positively on their preference for early activation, purposed to bolster survey validity. The second section used open-ended questions for the patient to provide comments and potential improvements. See complete survey in Table 1.

Analysis

Responses to questions 1–4 were aggregated within their Likert response category, converted to percentage, and plotted using Microsoft Excel (Microsoft, Redmond, Washington, U.S.). Responses to questions 5 and 6 were coded based on principles of Thematic Analysis as detailed by Naeem et al. (2023). Briefly, keywords were extracted from statements, aggregated into codes from which higher-level themes were identified.

Table 1. Custom survey questions and response options.

Question/statement	Response options
(1). It was convenient to have my cochlear implant activated the day after surgery.	Strongly Agree Agree Neutral Disagree Strongly Disagree
(2). I would have preferred to wait two weeks after surgery to have my implant activated.	Strongly Agree Agree Neutral Disagree Strongly Disagree
(3). I was surprised I could have my cochlear implant activated so soon after surgery.	Strongly Agree Agree Neutral Disagree Strongly Disagree
(4). I would recommend a next day activation to other patients who have a cochlear implant.	Strongly Agree Agree Neutral Disagree Strongly Disagree
(5). What other comments would you want to include about your experience with having your implant activated the day after surgery?	Free text
(6). How could your experience have been improved?	Free text

Results

Participant characteristics

The study included 30 adult and 3 pediatric participants. The average age at implantation for adults was 68.4 years (±15.0), while for pediatric participants, it was 5.3 years (±0.6). Additional patient demographic details can be found in Table 2.

Regarding the activation timeline, 3% (1 adult) had their implant activated on the same day as surgery. Most adults, 77% (23 participants), and all pediatric participants (100%, 3 participants) had their implants activated the day after surgery. Additionally, 17% (5 adults) had their implants activated between 2–7 days post-surgery.

The average distance to the clinic for adults was 244.6 miles (±280.7), with a range of 7–1170 miles. For pediatric participants, the average distance was 358.3 miles (±173.8), ranging from 160 to 484 miles.

Special patient considerations included 3% (1 adult) who were single-sided deafened, 10% (3 adults) who received a sequential implant, and 7% (2 adults) who were undergoing revision surgery. Results of these special populations are described below. All pediatric participants (100%, 3 individuals) were single-sided deafened, and therefore a sub-analysis was not possible.

Quantitative results

All patients found it convenient to have their cochlear implant activated early. Most participants preferred the early activation timeline over the traditional two-week wait, with only a small portion remaining neutral. Many participants were surprised they could have their implant turned on so quickly, with few remaining neutral or not surprised that early activation was a possibility. Nearly all participants would recommend early activation to other patients while only a small percentage remained neutral. This data is visualized in Figure 1.

Quantitative results: special populations – adult

Three patients opted for early activation due to unique hearing circumstances, generally following the same trend. Two patients who chose early activation after revision surgery found it convenient, preferred it over waiting, were surprised by the early activation possibility, and would recommend it to others. The patient with SSD also found early activation convenient, preferred it over waiting, and would recommend it to others. Departing from the trend of the group, this patient was not surprised by the possibility of early activation.

Quantitative results: parents of pediatric patients

Three parents of pediatric patients who received cochlear implant the day after surgery responded to the survey. All parents strongly agreed that it was convenient for their child to have their cochlear implant activated the day after surgery. All parents disagreed or strongly disagreed with the statement that they would have preferred a traditional activation timeline and waited two weeks. All parents were surprised the implant could be activated so quickly. All parents would recommend early activation to other patients. This data is visualized in Figure 2.

Qualitative results

Combined results from adult and pediatric patients are detailed below with special headings focusing on the pediatric responses.

Qualitative results: comments

Twenty-three respondents offered comments. Six themes emerged from patient comments: (1). Reduction in travel burden (2). Benefit of hearing sooner (3). General positive comment (4). Recovery (5). Support and (6). Positive psychological impact. These themes, details, and examples are outlined in Table 3. Ten responses (43%) included comments about how early activation reduced their travel burden. Within this theme, there were five comments specifically on the convenience of early activation and one comment on how the reduction in travel burden offered cost savings. Seven responses (30%)

Table 2. Patient demographics.

	Adults	Pediatrics
Number	30	3
Age at Implantation (years ± SD)	68.4 ± 15.0	5.3 ± 0.6
Right Sided Implants	37% (*N* = 11)	67% (*N* = 2)
Duration of Hearing Loss (years ± SD)	25.7 ± 15.6	4.8 ± 1.0
Activation Timeline		
Same day as surgery	3% (*N* = 1)	–
Next day after surgery	77% (*N* = 23)	100% (*N* = 3)
Between 2–7 days after surgery	17% (*N* = 5)	–
Distance to Clinic (miles ± SD)	244.6 ± 280.7 (Range: 7–1170)	358.3 ± 173.8 (Range: 160–484)
Special Patient Considerations	• 3% (1/30) were single sided deafened • 10% (3/30) were sequentially implanted • 7% (2/30) were undergoing revision surgery	• 100% (3/3) were single sided deafened

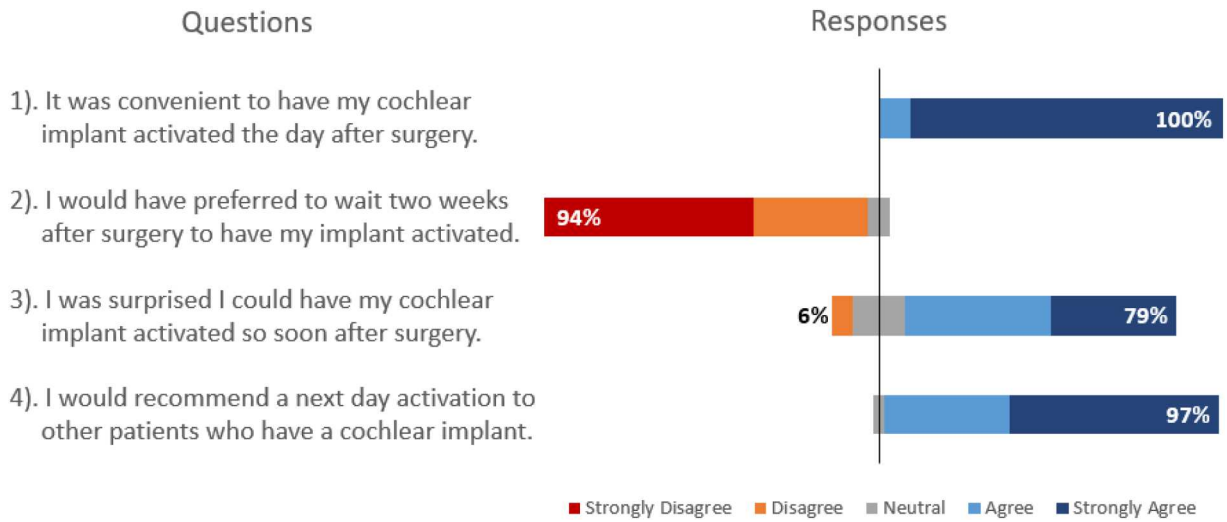

Figure 1. Questions and five-point Likert responses from 30 adult and three parents of pediatric patients. Percentages on the right-hand side of the center line represent the percent responses of 'Strongly Agree' and 'Agree.' For example, 100% of respondents answered either 'Strongly Agree' or 'Agree' to Question 1. Percentages on the left-hand side of the center line represent the percent responses of 'Strongly Disagree' and 'Disagree.' For exmple, 94% of respondents answered either 'Strongly Disagree' or 'Disagree' to Question 2.

expressed appreciation for the ability to hear sooner after surgery with early activation. Seven responses (30%) offered a general positive comment about their early activation experience. Three responses (13%) related to their recovery process. Two responses (9%) noted that it was important to have family or caregiver support. Finally, two responses (9%) described a positive psychological impact of early activation.

Qualitative results: comments – parents of pediatric patients

Two parents provided comments about their perspective on early activation for their child. One commented on the psychological impact to their child, noting that 'getting it activated sooner rather than later helps transform the scariness of surgery as well as some of the discomfort and pain into a little excitement.' Another parent noted that early activation reduced their travel burden from both a time and cost perspective.

Qualitative results: improvements

Nine respondents suggested improvements. Four themes emerged from their comments: (1). Additional Support (2). Appointment Cadence and Logistics (3). Sound processor style preference and (4). Equipment issue management. These themes, details, and examples are outlined in Table 4. Five responses (56%) suggested additional support. Within this theme, there were requests for additional support on expectations, learning to hear with the

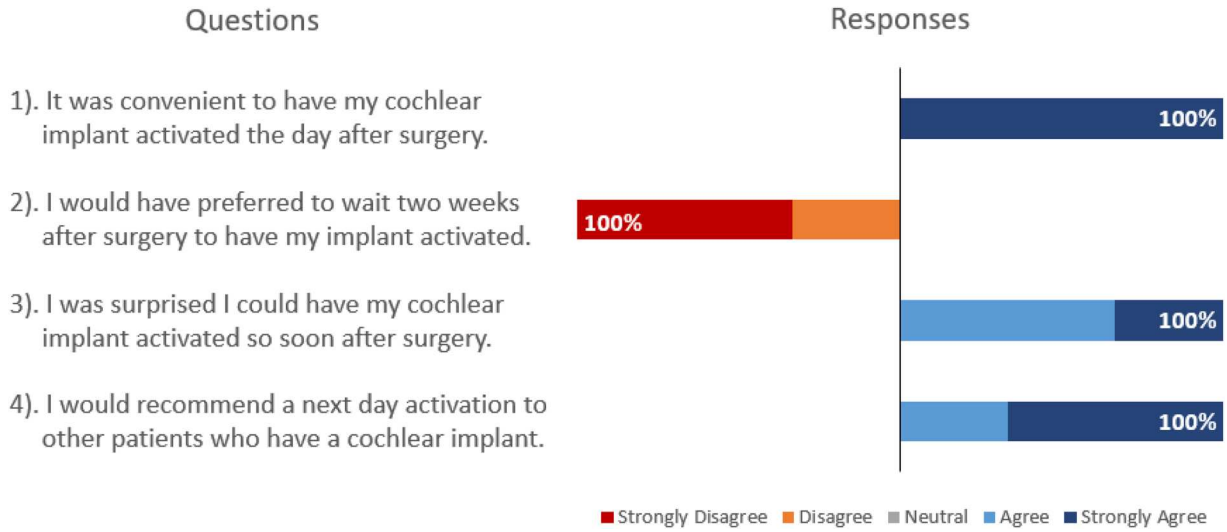

Figure 2. Sub analysis of responses from the three parents of pediatric patients.

Table 3. Responses qualitatively organized to survey question 5: 'What other comments would you want to include about your experience with having your implant activated the day after surgery?' This question received a total of 23 responses.

Theme	Details and codes if applicable	Example
Reduction in travel burden	43% (10/23) commented how early activation reduced their travel burden. Five additional patients detailed how early activation was convenient, and one patient commented that it offered cost savings.	'As I live 200 miles away from Denver, it saved me a trip down.' ' … next day activation makes it so much more affordable.'
Benefit of hearing sooner	30% (7/23) noted they appreciated the ability to hear in the implanted ear sooner than a traditional timeline.	'It was great to hear the improvement immediately.' 'I cannot think of any reason to wait the two weeks.'
General positive comment	30% (7/23) provided a general positive comment.	'I think next day is the best choice.'
Recovery	13% (3/23) commented on their recovery process.	' … the surgery pain wasn't too bad.' 'I did not have any negative issues.' 'I think it is good to have you incision looked at by the audiologist.'
Support	9% (2/23) noted that having support available was beneficial.	'Having a person who could hear was helpful to me.'
Positive psychological impact	9% (2/23) described a positive impact of early activation on their activation experience.	'It made me feel empowered!'

device, and equipment management. Four responses (44%) suggested modifications to the appointment cadence and logistics, with two suggesting a sooner appointment after activation and one detailing process improvements to obtaining an earmold. One respondent (11%) recommended wearing the processor in an off-the-ear configuration to improve comfort, and one (11%) commented on Bluetooth connectivity issues.

Qualitative results: improvements – parents of pediatric patients

One parent suggested that the importance of hearing therapy be emphasized and the other suggested text message appointment reminders.

Qualitative results: special populations – adult

Of the two patients activated early after revision, one noted they appreciated the reduced travel burden, and the other noted additional equipment support would be beneficial, and that appointment logistics could be improved. The patient with SSD reported benefit to hearing sooner and a positive psychological impact in their hearing rehabilitation process.

Discussion

In this study, we surveyed 30 adult patients and three parents of pediatric patients who underwent early cochlear implant activation and found that both groups expressed high levels of satisfaction with early activation. Nearly all patients found early activation convenient and would recommend it to other cochlear implant patients. This finding is consistent with the existing, though limited, literature on patient satisfaction with early activation detailed above (Günther et al., 2018; Roux-Vaillard et al., 2020; Wolf-Magele et al., 2015). Our study extends this current knowledge to include patients who were

Table 4. Responses qualitatively organized to survey question 5: 'How could your experience have been improved?' This question received a total of nine responses.

Theme	Details	Example
Additional Support	56% (5/9) suggested an additional touchpoint for more support. Two patients specified this request for additional clarification of expectations, two others requested more details on learning to hear with the device, and one suggested more equipment support.	'Probably another training session on the equipment and adjustments … ' 'More information on what I can expect.' 'We would have liked more support on learning how to adapt to the implant.'
Appointment cadence and logistics	44% (4/9) suggested improvements in appointment logistics with two patients suggesting more frequent appointments and one patient who had an earmold made commenting on improvements to that process.	'Waiting for the next appointment was too long' 'Text message appointment reminders.'
Sound Processor Style Preference	11% (1/9) patient shared their preference for and recommended an off the ear sound processor style or fitting configuration option for the early post-activation period.	'It is good to be able to wear the [off-the-ear sound processor] most of the time the first week or two after surgery.'
Equipment Issue Management	11% (1/9) patient commented on Bluetooth issues.	'My main complaint is with Bluetooth synching … '

activated even earlier and to a pediatric population, though findings for this population should be interpreted with caution due to the limited sample size.

No patients would have preferred to have waited two weeks to have their device activated. This reverse-wording in our survey bolsters the interpretation of a positive patient experience and confirms that they would not have chosen an alternative activation timeline if provided that option.

Patients suggested additional support could improve the early activation process. This emphasizes the importance of pre-surgical counseling and potentially more frequent follow up touch points after activation. Considering that reduction in travel burden was such a strong theme in patient responses, clinicians should consider touchpoints with patients that do not require traveling to the clinic. Our clinic has leveraged telehealth options that include video and telephone visits, synchronous remote programming, and asynchronous patient-driven remote assessments (e.g. Carner et al., 2023). All cochlear implant manufacturers in our region offer direct patient support and education services, which could satisfy the patient's appetite for additional support. Remote care tools are continually advancing which allow for an additional clinical touchpoint to optimize the patient's hearing while not requiring travel to the clinic. Ultimately, these results highlight the importance of patient-centered care where the patient can be directed to the appropriate resources as needed.

This is the first report to our knowledge of parental satisfaction of early activation in a pediatric population. The trends seen in the larger adult group were reflected in the responses of parents of pediatric patients in both the quantitative and qualitative domains. Our center's workflow requires follow-up with a local provider in the early postoperative period to ensure the incision is healing appropriately before their first follow-up appointment at our center three to four weeks after activation. Those considering early activation in a pediatric patient population should have a clear plan to ensure patient adherence to medical and audiologic recommendations.

The patients in this study were offered early activation either due to distance, unique hearing circumstances, or a combination of both. This has potential to create bias since the individual needs of the patients selected were considered for subject recruitment. The most prevalent theme in the comments was a reduction in travel burden, which is not surprising as adult and pediatric patients traveled, on average, 245 and 358 miles one way to the clinic, respectively. Early activation saves a trip to the clinic, resulting in significant travel cost savings. Applying the IRS mileage rate for 2025 of $0.70 per mile, the round-trip savings amount was $343 (USD) for adults, while for pediatric populations, the savings were over $501 (USD).

Despite this, the second most prevalent theme in the qualitative comments was the appreciation of the ability to hear sooner after surgery. The traditional 3-to-6-week gap between surgery and activation often results in reduced hearing function in the interim period, delaying the patient's hearing rehabilitation process and ultimately the return to their normal life. Early access to hearing has the potential to benefit all patients.

The results of this study suggest that patients who travel significant distances to the clinic can benefit greatly from early activation. However, a limitation of our study is the minimal representation from patients who live closer to the clinic who might express different benefit profiles. Based on this study and the anecdotal patient feedback, our center has started offering early activation to all patients based on their individual preferences and hearing circumstances. While patient travel burden can guide clinicians in selecting a patient population likely to benefit from early activation, the authors believe all patients should be considered for early activation based on the unique needs of the individual patient.

Another limitation of the present study is the inconsistent administration of the survey in terms of duration from activation. Günther et al. (2018) reported higher levels of satisfaction with early activation at later intervals so the findings of this study may be influenced by the variable and generally later assessment timeframe. Additionally, the small number of pediatric patients is cause for limitation when drawing conclusions for this population.

Future studies should consider randomization to capture patient satisfaction of both early and standard activations. A randomized study design would provide the opportunity to assess patient readiness for earlier activation for all recipients. To be able to generalize patient attitudes and perceptions of early activation to the greater cochlear implant population, future studies should standardize counseling processes of early and standard activation for all patients unless medically or audiologically contraindicated. Consideration should be given to patient demographics, specifically the distance the patient travels to the clinic.

Conclusion

This study demonstrates high levels of patient satisfaction with early activation in both adult and pediatric populations. Patient comments emphasize the importance of considering travel burden as a critical factor in patient care pathways, particularly for those residing far from the clinic. Additionally, patients reported benefits in other areas, including earlier access to

hearing and positive psychological impacts. These findings suggest the need to consider broad application of early activation, tailored to individual patient preferences and circumstances.

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