

Day to day use and service-related issues with the bone-anchored hearing aid: the Entific Medical Systems questionnaire

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Abstract

Over a 12-year period, the Birmingham implantation otology unit has implanted more than 300 patients with bone-anchored hearing aids (BAHA).

The Entific Medical Systems questionnaire was administered to these patients to evaluate the day to day use of the BAHA, professional needs, after-care, wear and tear concerns and service related issues. Data analysis revealed that most patients used their BAHA for more than eight hours a day (90 per cent of BAHA users) and every day of the week (93 per cent of BAHA users). A high degree of satisfaction was expressed as regards sound amplification, listening to radio or television news, listening to music, speech perception in quiet conditions, during conversation with one person in noisy surroundings and conversation with family at home. Some degree of difficulty was expressed with the use of the BAHA during conversation with two or more people in noisy surroundings. A slow process of perceptual acclimatization was noticed with the majority of the patients. The majority of patients were pleased with the service as regards care of the wound, BAHA nursing clinics, device repairs and other service-related issues.

Key words: Hearing Aids; Osseointegration; Questionnaires; Patient Satisfaction

Introduction

As part of the Birmingham osseointegration programme, bone-anchored hearing aids (BAHA) have been implanted in more than 300 patients including adults and children. The overall philosophy of the programme is an integrated evaluation and rehabilitation package that is ably executed by its multi-disciplinary team.^{1,2} Bone-anchored aids are now more widely used with extended applications. This is in addition to the congenital deafness cases for which BAHA has become the first treatment of choice.³

After more than a decade's experience with the BAHA, the Birmingham team applied instruments of patient satisfaction in the form of questionnaires to all its patient population. One such questionnaire study was the Entific Medical Systems (Nobel Biocare) questionnaire that was modified and administered to the patients to evaluate specific issues such as: (1) daily usage of the BAHA; (2) wear and tear concerns including device failures, repairs and replacements; (3) service-related issues including nursing care and out-patient clinic visits.

The objective of this study was to ascertain the usefulness of the BAHA as a hearing habilitation

device. With this questionnaire, no comparisons were made with the previous conventional air-conduction or bone-conduction aid or even to a no-aid situation.

Patients and methods

The Entific Medical Systems (Nobel Biocare) questionnaire was previously used by the Birmingham team in evaluating a small group of paediatric patients.¹

A modified version of this instrument was used as a retrospective postal questionnaire survey on 312 of the 351 patients who had used their BAHA for more than six months' duration. This was to allow a period of learning with the use of the BAHA and to avoid beginner's enthusiasm and obviate initial difficulties with fitting and maintenance. A period of four months was allowed for return of the questionnaire to the BAHA office.

A small cohort of the patients (15 in number) used bilateral BAHA implants. These patients were instructed to fill in the questionnaires with reference to the use of their first BAHA (longest worn).

TABLE I
DISTRIBUTION OF RESPONSE RATES

Total number of implantees	351 (242 adults and 109 children)
Total included in the study	312 (6 months or more of BAHA use)
Number excluded	39 (less than 6 months of BAHA use) (31 adults and 8 children)
Total respondents	227 (72% response rate)
Total non-respondents	85
Adults (211)	187 respondents (89%) 24 non-respondents (11%)
Children (101) (under 16 years)	40 respondents (40%) 61 non-respondents (60%)

Results

Of the 351 patients implanted between 1988 and 1999, 312 were included in the study. A period of six months' use and familiarity with the BAHA was considered essential for learning and acclimatization. It was also hoped that this eliminated any enthusiasm bias. There was a 72 per cent response rate with 227 completed questionnaires being returned. Of the 227 respondents, 187 were adults and the rest children as shown in Table I.

The study addressed three specific areas, viz., day to day use, wear and tear concerns and service issues.

Day to day usage

The BAHA was most often used all day long by 147 of the 227 (65 per cent) patients. The rest of the patients used the aid for variable periods during the day and some for work only. Eleven of 227 (4.8 per cent) of the patients used their previous aids (air or bone-conduction aids) as a temporary measure. These included seven patients with fixture failures (six paediatric, one adult), three patients with wound problems and one awaiting hearing aid replacement. Figure 1 illustrates the number of days per week the BAHA was used and Figure 2 shows the number of hours per day with BAHA use. It is reassuring to note that the majority of them found the BAHA useful for more than eight hours a day (90 per cent of 227) and for every day of the week (93 per cent of 227).

One hundred and eighty-five of the users (81 per cent) were satisfied with the degree of amplification that the BAHA produced (Figure 3). One hundred and seventy-two (76 per cent) patients reported that the BAHA was 'quite satisfactory' to 'very satisfactory' when listening to radio and television news (Figure 4). Seventy-four per cent (74 + 95) of the respondents were pleased with the BAHA when listening to music (Figure 5).

With 'speech in quiet surroundings' (Figures 6 and 7), a high degree of satisfaction was expressed by 84 per cent (147 + 44) of candidates as regards 'conversation with one person in quiet' and by 67 per cent (86 + 65) of candidates for 'conversation with two or three people in quiet surroundings'.

The results with 'speech in noise' (Figures 8 and 9) were not that encouraging. Twenty-five per cent and 18 per cent of the patients rated their BAHA as 'passable' with regard to conversation with 'one person in noise' and 'with a group of people in noise' respectively. Only 38 per cent (60 + 27) were satisfied with the BAHA during conversation with one person in a noisy environment. About 50 per cent of the respondents (72 + 42) rated the BAHA unsatisfactory as regards 'speech in noise' with a group of people (Figure 9). It was interesting to note that most of these 'unsatisfied' patients had used their BAHAs for less than three years. However, 'speech in noise' in a more familiar environment

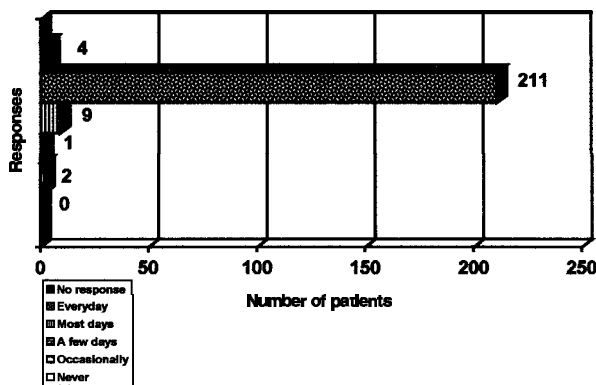


FIG. 1
Number of days per week the BAHA is used.

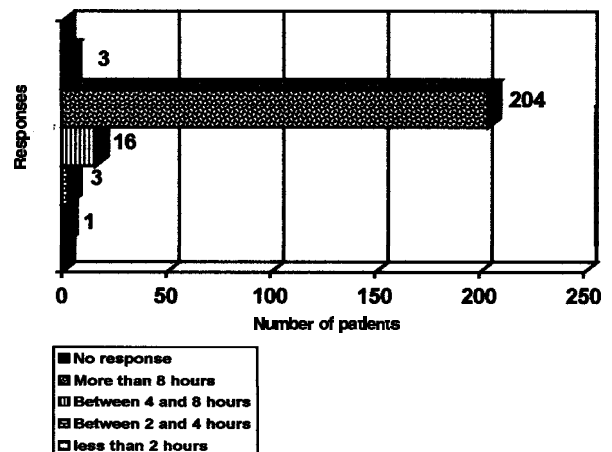


FIG. 2
Number of hours of BAHA use per day.

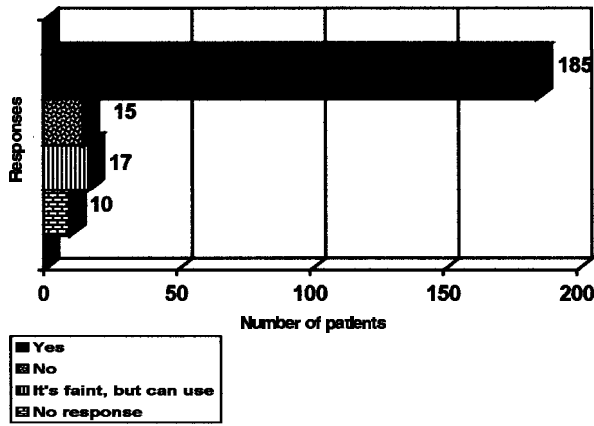


FIG. 3

Sound amplification by the BAHA.

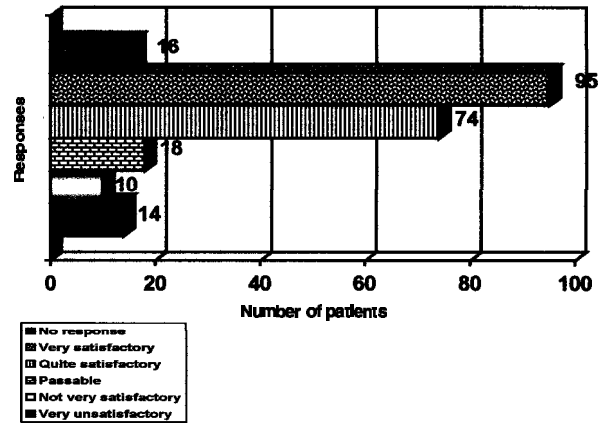


FIG. 5

BAHA rating when listening to music.

such as ‘family and friends at home’ elicited a higher degree of satisfaction (69 per cent) with the BAHA (Figure 10).

Sixty-nine per cent of the respondents perceived no difference with the quality of their own voice with the use of the BAHA (Figure 11). A small percentage (five per cent) perceived their own voices as ‘resonant’ or ‘robotic’ with the BAHA.

Patients who had used their BAHA for more than three years (143 of 227) were more satisfied with the amplification, sound quality and situational uses than those who had been implanted more recently (less than three years).

Wear and tear concerns

Tables II and III list the subjective feelings of the patients with the use of the BAHA and the sound produced by the aid respectively. On a satisfaction scale of 1 to 10, the majority of the patients scored in the range of 7 to 10.

Eighty-nine per cent of the patients were pleased with the repairs and replacement service by the audiological team and the company.

Manual dexterity was an issue with some of the patients (four per cent) but the majority of them had a helping hand (question 2) in their environment.

Care of the wound, the fixture-abutment assembly and the BAHA was a problem with a minority of patients (nine per cent) and these were mostly children.

Ninety-two per cent of the patients required battery changes once a month or longer. Questions on telecoil use and the use of the Bicos produced variable responses. Fifteen per cent used the telecoil system and 20 per cent used the Bicos in public places and social gatherings.

Service related issues

A small percentage (three per cent) of patients were dissatisfied with the surgical aspects. These were patients who presented with wound problems and fixture failures.

An overwhelming 94 per cent of the respondents were satisfied with the nursing care and the ward staff. Two per cent of the patients were dissatisfied with the waiting times in the specialist out-patient clinics and at the audiology services.

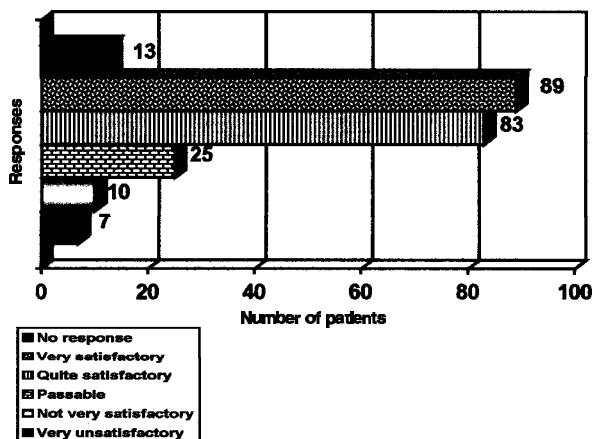


FIG. 4

BAHA rating when listening to the radio or television news.

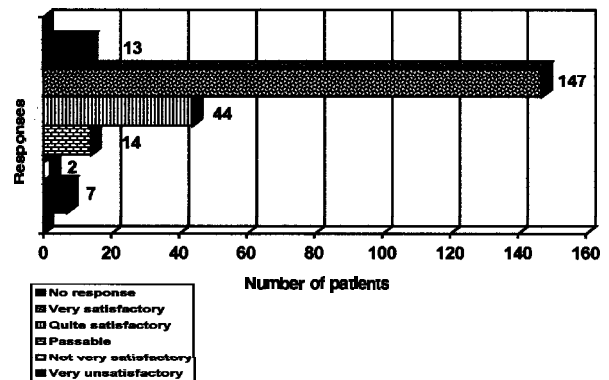


FIG. 6

BAHA rating during conversation with 1 person in quiet surroundings.

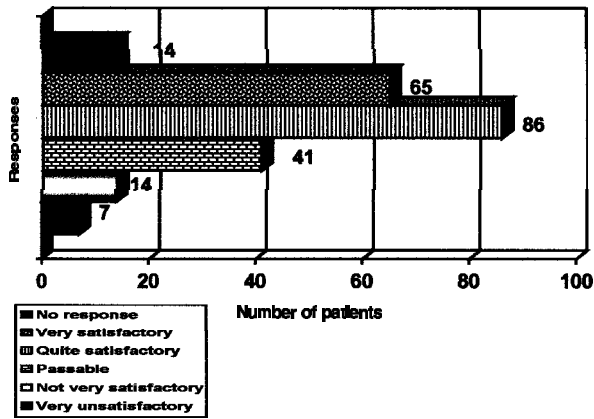


FIG. 7

BAHA rating during conversation with 2 or 3 people in quiet surroundings.

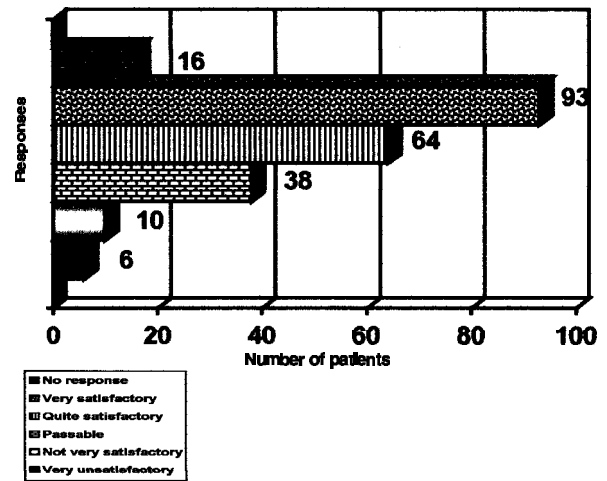


FIG. 10

BAHA rating being with family or friends at home.

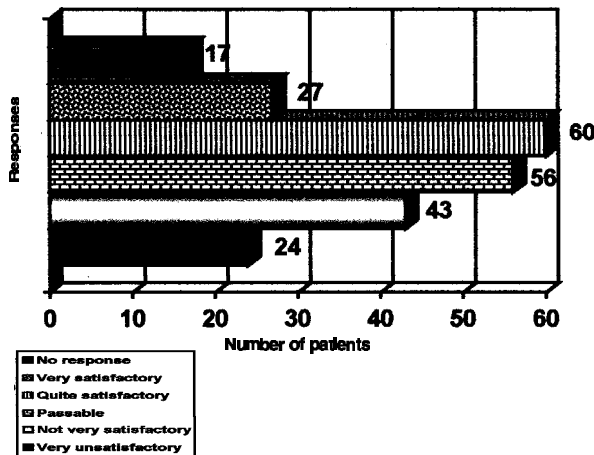


FIG. 8

BAHA rating during conversation with 1 person in noisy surroundings.

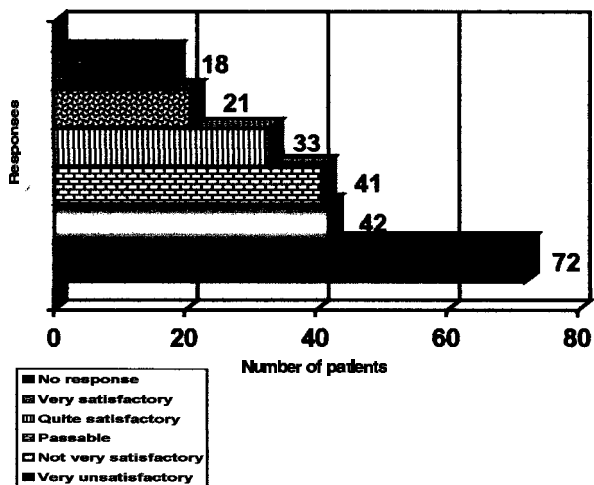


FIG. 9

BAHA rating during conversation with a group of people in noisy surroundings.

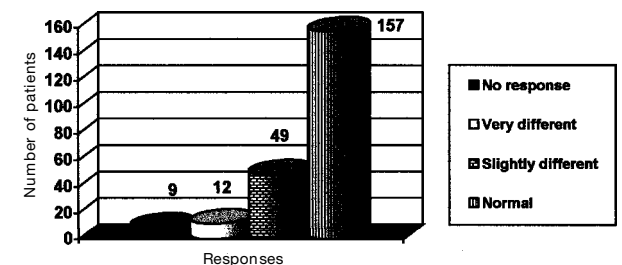


FIG. 11

How does your own voice sound when you are using the BAHA?

Discussion

The selection protocol, referral practice and rehabilitation regimens for both adult and paediatric groups of patients on the Birmingham BAHA programme have been extensively discussed earlier.^{1,2} Two other pioneering centres of BAHA implantation i.e. Gothenburg and Nijmegen have published their long-term results with encouraging outcomes.^{3,4}

The questionnaire used is a modification of the one previously produced by the Nobel Biocare Company and evaluated by the Birmingham team.¹ A 72 per cent response rate is significant and adds value to the results. Individual questions in the questionnaire have a small 'no response' rate and these were attributed to (1) question not applicable to the candidate and, (2) some of the paediatric group who perhaps did not seek help from their parents in completing the questionnaire.

Cleaving data into adult and paediatric groups did not prove satisfactory as some of the children who were implanted when they were under 16 years of age had since moved on to the adult programme. In general, the responses of both adult and paediatric groups were comparable. However, 72 per cent of the non-respondents were children (Table I). Similarly, comparison of the patient satisfaction with respect to the model of the BAHA used, i.e. BAHA

TABLE II
WORD OR PHRASE THAT BEST DESCRIBES YOUR PRESENT FEELINGS ABOUT YOUR BAHA AND ITS USE
(one or more options possible)

Difficult to put in	26	Unnecessary	10
Conspicuous	44	A very great help	152
Tiring	12	Reduces stress	102
Makes me feel awkward	19	Easy to use	156
Not very helpful	7	Very useful in company	116
Noisy	10	Invaluable	142
Difficult to use	3	Wish I had obtained one earlier	160
Uncomfortable	6		

TABLE III
WORD OR PHRASE THAT BEST DESCRIBES YOUR PRESENT FEELINGS ABOUT THE SOUND PRODUCED BY YOUR BAHA
(one or more options possible)

Soft/pleasant	63	High/thin	5
Hard/sharp/blaring	29	Deep/dull	3
Natural/clear/pure	113	Muffled	18
Impure	10	Echoing	18
Uncomfortably loud	8	Cracking	18
Far too weak	21	Others	14

Classic (all generations) and the BAHA Cordelle produced comparable results (data not in figures and tables). The data was again complicated by the fact that a significant number of patients had used various models for variable periods of time, with the company (Entific Medical Systems, Nobel Biocare, Nobel Pharma) upgrading the devices at various stages.

A high degree of satisfaction was expressed by most patients using the BAHA. These results are comparable to published literature from other centres.⁵⁻⁸

In many of the day-to-day situations, the candidates perceived a certain degree of learning process. Some patients who were extremely dissatisfied with their previous conventional aids were overwhelmed by the benefits of the BAHA soon after fitting. To obviate this enthusiasm bias and allow a natural trial and learning process, the team chose to test and question only those patients who had used their BAHA for longer than six months. As mentioned, it appeared that patients who had used the BAHA for more than three years were more satisfied with the amplification, sound quality and situational uses as above than those who had been implanted more recently. This was the gradual process of perceptual acclimatization that was expected.

The Birmingham BAHA team includes two specialist BAHA nurses in the adult programme and an advanced nurse practitioner in the paediatric service. They have been involved in the management of dressings, wound care and care of the fixture-abutment assembly. Ninety-four per cent of the respondents were extremely pleased with this service and the nursing care they received during their recovery from surgery. With surgery, a one stage complete procedure under local anaesthetic for adults and a two stage procedure under general anaesthetic for children is the norm as described previously.³

Most of the patients were pleased with the care and time allocated for them in the multidisciplinary specialist BAHA and FAITEC (facial and audiological implantation technology) clinics. Out-patient attendance for suction clearance of draining ears was understandably reduced in a number of patients whose mastoid cavities and perforated ears were rendered dry.^{9,10}

Audiological services include a robust pre-assessment protocol, post-implantation periodic evaluation and liaison for repairs, battery changes and replacements with Entific Medical Systems. The service of specialist speech and language therapists is also available on both the adult and paediatric teams.¹¹ Most patients were quite satisfied with these services, however, there were few less satisfied individuals. Some of the interesting responses are listed in Appendix 2.

Conclusion

In summary, a high degree of satisfaction was expressed by most of the respondents with the use of the BAHA in their day to day activities at home and at work.

The majority of the respondents were pleased with the care and service provided by the multidisciplinary teams involved.

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Mr S. Dutt takes responsibility for the integrity of the content of the paper.

Competing interests: None declared

Appendix 1

The Entific Medical Systems (Nobel Biocare) Questionnaire

- | | previous AC/BC aid | BAHA |
|---|--------------------|--------|
| 1. The hearing aid most often used- | | |
| 2. At home, do you often have someone in your immediate vicinity,
e.g.: husband/wife/children/mother/father/sister/brother etc | | Yes/No |
| 3. How many days per week do you use your hearing aid? | | |
| 1. Every day | | ___ |
| 2. Most days | | ___ |
| 3. A few days | | ___ |
| 4. Only occasionally | | ___ |
| 5. Never | | ___ |
| 4. How many hours would you say that you use your hearing aid during the course of a normal day? | | |
| 1. Less than two hours | | ___ |
| 2. Between two and four hours | | ___ |
| 3. Between four and eight hours | | ___ |
| 4. More than eight hours | | ___ |
| 5. How often do you change the battery? | | |
| (Type of battery: Zinc/Mercury/Other) | | |
| 1. Once a week | | ___ |
| 2. Twice a month | | ___ |
| 3. Every three weeks | | ___ |
| 4. Once a month | | ___ |
| 6. Does your hearing aid amplify sound sufficiently? | | |
| 1. Yes | | ___ |
| 2. No | | ___ |
| 3. It's faint but I can use it | | ___ |
| 7. How would you rate your hearing aid in the following situations? | | |
| 1. Very satisfactory Score 5 | | |
| 2. Quite satisfactory Score 4 | | |
| 3. Passable Score 3 | | |
| 4. Not very satisfactory Score 2 | | |
| 5. Very unsatisfactory Score 1 | | |
| a) When listening to the radio or TV news | | ___ |
| b) When listening to music | | ___ |
| c) Conversation with 1 person in quiet surroundings | | ___ |
| d) Conversation with 1 person in noisy surroundings | | ___ |
| e) Conversation with 2 or 3 people in quiet surroundings | | ___ |
| f) Being with family or friends at home | | ___ |
| g) Being with a group of people in noisy surroundings | | ___ |
| 8. How does your own voice sound when your are using your hearing aid? | | |
| 1. Normal | | ___ |
| 2. Slight different | | ___ |
| 3. Very different | | ___ |
| 9 Please tick the word or phrase, which best describes your present feelings about your hearing aid and its use
(you may tick more than one) | | |
| 1. Difficult to put in | | ___ |
| 2. Conspicuous | | ___ |
| 3. Tiring | | ___ |
| 4. Makes me feel awkward | | ___ |
| 5. Not very helpful | | ___ |
| 6. Noisy | | ___ |
| 7. Difficult to use | | ___ |
| 8. Uncomfortable | | ___ |
| 9. Unnecessary | | ___ |
| 10. A very great help | | ___ |
| 11. Reduces stress | | ___ |
| 12. Easy to use | | ___ |
| 13. Very useful in company | | ___ |
| 14. Invaluable | | ___ |
| 15. Wish I'd obtained one earlier | | ___ |

Remarks

10. Please tick the word or phrase, which best describes your present feelings about the sound produced by your hearing aid

- 1. Soft/pleasant _____
- 2. Hard/sharp/blaring _____
- 3. Natural/clear/pure _____
- 4. Impure _____
- 5. Uncomfortably loud _____
- 6. Far too weak _____
- 7. High/thin _____
- 8. Deep/dull _____
- 9. Muffled _____
- 10. Echoing _____
- 11. Crackling _____
- 12. Others (please describe) _____

Remarks

11. Please try to indicate how satisfied you are with your present hearing aid by giving it a mark out of 10

1 = very dissatisfied 10 = very satisfied _____

12. Please give your views whether positive or negative on your present hearing aid and the service that has been provided

Audiology service and advice

Battery replacements

Device repairs and replacements

Surgical procedure

Nursing service

Ward care

Outpatient clinic visits and care

13. Do you have a Bicos? Yes/No

If yes,

Do you use the additional microphone? Yes/No

Situations used in and reasons for not using

14. Do you use the telecoil function? Yes/No

Situations used in or reasons for not using

15. Does the BAHA satisfy your professional needs? Yes/No/Not applicable

Appendix 2

Interesting Responses

- *The surgeons and the nursing staff are a wonderful team. I offer my sincere thanks to all the members of the team.*

- *Another odd bit of information about my aids (I use binaural BAHAs) is to do with walking in a strong wind. I find that the noise of the wind blocks out the sound of traffic. So I find that I cope better if the aid that faces the wind is switched off and I can hear with the other one which is on the sheltered side, and I just reverse the procedure on the walk back.*

- *I would be very interested in helping to trial an updated BAHA that incorporates an FM receiver that will operate like cordless headphones. I can see the benefits in having the transmitter connected to audio outputs from HiFi, TV, telephone or simply having a microphone input. Having a BAHA that only contains an FM receiver (rather than a microphone) would probably be worthwhile.*

- *We are very sorry that our son broke his BAHA and the abutment accidentally when a ball hit the side of his head.*

- *I lost my BAHA when I was at a concert and was carried by the crowd above their heads and thrown around.*

- *Now this BAHA is very, very good only when it works, which is never. I seem to have problems with it all the time.*

- *I must congratulate the company that produces the BAHA and all the members of the surgical and audiological teams for their splendid service. All the problems I had with the device were readily repaired.*