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Hearing Aid Satisfaction and Rate of Return for Repairs: a Comparison of Two Kaiser Dispensing Programs

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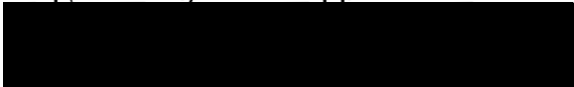
AN ABSTRACT OF THE THESIS OF Lynn Behrendsen for the Master of Science in Speech Communication: Speech and Hearing Science presented October 24, 1990.

Title: Hearing Aid Satisfaction and Rate of Return for Repairs: A Comparison of Two Kaiser Dispensing Programs.

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:


James F. Maurer, Chair


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The purpose of this study was to investigate the hypothesis that a dispensing program utilizing rehabilitative follow-up in the form of a post-fitting check appointment would show: (1) less return for repairs for hearing aids; (2) higher patient satisfaction with the aid; and (3) higher patient satisfaction with the service received during the hearing aid dispense than would a clinic with no follow-up. Data for comparison between the two clinics were drawn from medical chart review, frequency of hearing aid repairs, and from a questionnaire which assessed satisfaction levels. Patients were also asked to estimate the amount of use with the aid and success with manipulation of the

aid for purposes of comparison with other groups previously studied.

Two groups of patients, consisting of 141 patients in group I and 234 patients in group II, were chosen for this study. All patients were 65 years of age or older, were recommended for amplification by an audiologist, and given medical clearance for amplification by a physician. Patients were asked to respond to two questions involving a continuum response and four questions requiring a fill-in-the-blank response.

Results of this study support the hypothesis that there was less return for repairs for the group who received a post-fitting check appointment. Statistical analysis did not support the hypothesis that there was a higher rate of self-assessed satisfaction with the hearing aid for the group who received the post-fitting check appointment. Results did support the hypothesis that there was a higher rate of self-assessed satisfaction with the service received during the dispense for the group which received the post-fitting check appointment.

HEARING AID SATISFACTION AND RATE OF RETURN FOR REPAIRS: A
COMPARISON OF TWO KAISER DISPENSING PROGRAMS

by

LYNN L. BEHRENDSEN

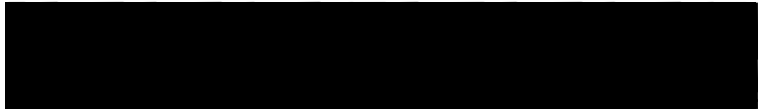
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requirements for the degree of

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in
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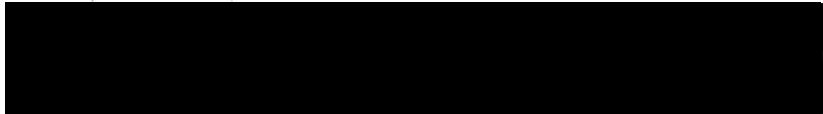
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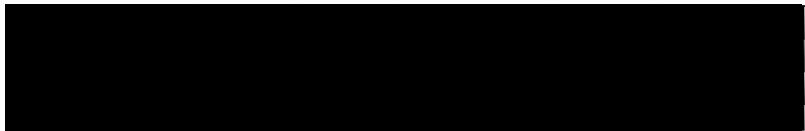
The members of the Committee approve the thesis of Lynn L. Behrendsen presented October 24, 1990.



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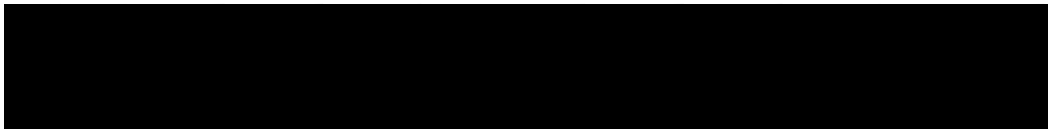


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CHAPTER I

INTRODUCTION

It was estimated that 14-16 million people have hearing loss in this country (Schow & Nerbonne, 1980). Rehabilitation for hearing loss among the aging can include, but is not necessarily limited to, amplification, development of compensatory skills, speech reading and medical intervention. The rehabilitation options can become somewhat limited for the elderly population; vision problems may preclude successful speech reading skills and increased physical problems may negate the chances of medical intervention. This population, then, becomes the largest consumer group for amplification; 57.7% of hearing aids sold in the U.S.A. in 1989 were to clients 65 years and older, according to surveyed dispensers (Cranmer, 1990a).

A person seeking amplification enters an arena where there are endless varieties of protocol and personal preferences by the dispenser. Most qualified and ethical professionals, however, do adhere to some general guidelines for hearing aid dispensing. Traditionally, the extent of aided improvement over the unaided condition in speech reception levels and in speech discrimination scores represent a measure for success during the hearing aid fitting. These clinical measures do not assess user satisfaction directly, however. Walden (1982) theorizes that clinical methods may actually underestimate the benefits of amplification because there are no contextual or visual clues involved that the patient could utilize outside the test situation. Thus, non-auditory factors (factors not related to the audiological assessment) must be considered in order

to increase patient satisfaction with the hearing aid fitting. Smedley (1990) calls assessment of non-auditory factors "client-based strategy." Such assessment requires significant additional time which, due to the cost of the dispensing program, must be quantitatively justified. One program which has been used by some clinics has been the post-fitting check appointment which is conducted after the patient has worn the aid for a set amount of time and involves the patient and audiologist discussing the management of the aid, any problems that may have arisen, patient acceptance of the aid, and benefits/limitations of the aided experience (Maurer & Rupp, 1979a).

This study was initiated to determine if a dispensing program with a post-fitting check appointment will show a decreased return rate for repairs and higher satisfaction with the aid and with the service received during the dispense, compared to a dispensing program without a post-fitting check appointment. For this evaluation two categories of repair rates were utilized: (1) objective repairs relate to inability to use the hearing aid due to malfunction of the aid itself; (2) subjective repairs pertain to patient inability to utilize a functioning hearing aid. Two dispensing clinics were chosen for the study: one which provides the post-fitting check appointment and one which does not. All other protocol for testing, instrumentation and record-keeping was identical between the two clinics. Data for investigation were collected by a chart review for repair data and by a voluntary written questionnaire for self-assessed satisfaction levels. It was anticipated that the program with the post-fitting check appointment would show less return rate for repairs and higher satisfaction with the aid itself.

The specific questions this investigator sought to answer were the following:

- 1) Does a return hearing aid check appointment within six weeks post-fitting reduce the number of returns for repair for hearing aids 0-12 months old?
- 2) Is satisfaction with the hearing aid higher for the group receiving the post-fit check?
- 3) Is satisfaction with the service received during the dispense higher for the group receiving the post-fit check?

CHAPTER II

REVIEW OF THE LITERATURE

There is a great deal of literature addressing the need for assessment of non-auditory factors that can influence a successful hearing aid dispense (Maurer & Rupp, 1979; Rupp et al., 1977; Ventry & Weinstein, 1982; Walden, 1982).

Given the same degree of hearing loss, individuals will experience vastly different degrees of benefit and satisfaction with the aided experience. Ventry and Weinstein (1982) theorize that hearing loss combined with non-auditory factors determine the amount of hearing handicap a person will have. The presence of dexterity problems, visual impairment, financial limitations and age of the patient are just a few of the many variables that can affect satisfaction with a hearing aid (Maurer & Rupp, 1979a). The "Feasibility Scale for Predicting Hearing Aid Use with Older Individuals" (FSPHAU) by Rupp et al. (1977) and the Hearing Handicap Inventory for the Elderly (HHIE) by Ventry and Weinstein (1982) are two scales developed for assessment of such variables to help predict a successful hearing aid fit. Some limitations of self-assessment scales have been found. Walden, et al. (1984) found two sources of bias present in self-assessed reporting for hearing handicaps: (1) acquiescence responses (the tendency to always respond in agreement or always in disagreement); and (2) the possibility that patients rated the difficulty of the situation described in the question, and not the success of amplification when used in the situation

described in the question. However, most literature strongly supports the need for, the basic accuracy of and the usefulness of self-assessment scales for an individual with a hearing handicap. Research by Salomon et al. (1988) has indicated that it is the amount of self-assessed hearing handicap, not the amount of pure-tone hearing loss, that motivates a patient to be a successful hearing aid candidate.

Given the high costs involved with dispensing programs, it would seem cost-effective to formally assess the non-auditory factors involved prior to a fitting. Patients demonstrating poor prognosis for successful amplification could then have intervention and/or rehabilitation prior to the hearing aid fit. In the absence of formal assessment for non-auditory factors affecting the hearing aid fit, it then becomes incumbent upon the audiologist to observe, determine the extent of and remediate as many of these factors as possible over the course of the dispense. Given the relatively short time involved in a dispense, it is critical that the audiologist be aware of current research involving these non-auditory factors.

NON-AUDITORY FACTORS

Gender

For cosmetic and acoustic reasons it would seem women would have a higher level of satisfaction with amplification; they usually have longer hair to hide the presence of the aid, less calloused hands, less presence of tragus and canal hair, and less incidence of precipitous sloping losses (Staab, 1990). However, research does not indicate any trends in satisfaction across the sexes. Brooks (1981) studied 72 elderly patients fit with behind-the-ear hearing

aids. Using the Mann-Whitney U test, he found no significant difference between the amount of use of the aids between the sexes. Higher utilization of the aid would seemingly correlate to at least a moderate level of satisfaction.

Age and Physical Limitations

Advancing age brings certain limitations. Certainly a reduction in sensory modalities and physical limitations might dampen the enthusiasm for new experiences.

Berkowitz (1971) reported a high degree of significance between the self-assessed hearing handicap (assessed by the Hearing Handicap Scale) and audiologic measures. He reported this to be due, in part, to

The fact that aged individuals have to make certain psychological and sociological adjustments while undergoing physiological changes, which tends to create a population which is characteristically aware of increasing sensory deficits that occur with aging. (p. 27)

Maurer and Rupp (1979a) listed three generalized problems for the elderly that can hinder the success of hearing aid use: (1) generalized reduction in sensitivity to touch; (2) reduced mobility and range of motion for fingers, hands and arms; and (3) reduced neuromuscular timing.

Smedley et al. (1989) surveyed a large group of individuals, 60 years of age and older, on satisfaction with hearing aids, eyeglasses and dentures. Although the hearing aid user group (178 subjects) was by far the least satisfied with their prosthesis, there was no significant correlation between chronological age of the patient and level of satisfaction.

Vesterager et al. (1988) surveyed 71 self-reported "active" individuals aged 70-75 years. They found that decreased activity level was not influenced

by hearing loss, but by other physical limitations, tiredness, or lack of interest. It should be noted, however, that the self-reported activity level did not correlate well with the objective, quantified activity level.

In a study of 693 elderly patients by Henrichsen et al. (1988) no significant difference in satisfaction with in-the-ear aids was found as related to age. However, handling problems with the aid (insertion, change of battery and volume-control change) showed a definite correlation with increase in age. Of those surveyed, 16% of the 70-79 years of age group had difficulty inserting the aid as compared to 29% of the patients in the age 80 years and older group.

Twenty-five out of 100 hearing aid users, surveyed by Franks and Beckman (1985) had worn their aids at least one month, but no longer used them. Difficulty manipulating the aid and associated controls was cited as one of the most significant reasons for non-use of the aid.

In the absence of formal testing for vision, manual dexterity, memory span, tactile sensation, etc., an audiologist must assess these areas throughout the dispensing appointments. Creative solutions to manipulation problems, often offered by the physical or occupational therapist, can increase the use and satisfaction with the aid.

Financial Limitations

Hearing aids can be expensive, especially if a binaural fit is warranted. Vesterager et al. (1988) surveyed 71 elderly hearing aid users and found no significant correlation between hearing levels and social class. Of 406 elderly persons (financial status unknown) responding with comments about their hearing aids, 17% were concerned with the cost of batteries, upkeep and the aid itself (Smedley & Schow, 1990). Financial limitations should never

preclude timely and quality fitting of amplification; community resources or family can generally be recruited for support (Maurer & Rupp, 1979).

Kaiser patients pay a set \$50.00 co-payment for the hearing aid, regardless of what brand or options are ordered with the aid. The majority of patients report they would not be able to afford an aid were it not for this plan. However, three considerations are of interest to Kaiser administration: (1) the low cost of the aid may give the mind-set of inferior quality; (2) poor care of the aid may result because they can receive another one in three years at this low cost; and (3) patients may seek amplification, due to the low cost, when the anticipated use is low.

Support System

If possible, it is wise to include a family member, friend or "significant other" of the elderly patient involved in the hearing aid dispense. The quantity of audiologic and medical terminology, rehabilitation suggestions, instructions for use and maintenance of the hearing aid, and appointment dates can be overwhelming to even a healthy, mentally spry patient. When the elderly patient has physical, emotional, or mental limitations, the dispensing experience can become hopelessly overwhelming. The significant other may provide practical help such as transportation to the appointments, note-taking for future reference, or financial help. Emotional support from the significant other often comes in giving a more realistic picture of the amount of hearing handicap involved, volunteering to practice insertion and use of the aid with the patient, and encouragement and praise to the patient for his/her willingness to seek help for the hearing loss.

At times though, the spouse's perception of hearing loss/handicap may be in disagreement with the actual individual's assessment of his/her hearing handicap. Newman and Weinstein (1986) have found that this difference in perception of handicap may interfere with the rehabilitation process. In their study, thirty elderly males and their spouses assessed the male's hearing handicap using the Hearing Handicap Inventory for the Elderly (HHIE) and the Hearing Handicap Inventory for the Elderly for Spouses (HHIE-SP). The HHIE-SP is a modification of the HHIE in which only the wording is changed to reflect the spouse's perception of hearing handicap. Results of this study showed a significantly higher score for the males, indicating that the hearing-impaired individual judges his/her hearing loss to be more of a handicap than the spouse does.

In another study by Newman and Weinstein (1988), eighteen elderly men and their spouses responded to the HHIE and HHIE-SP at a pre-fitting and a one-year post-fitting appointment. In this study points were used to describe an emotional subscale and social/situational subscales. The mean difference between the hearing-handicapped individual and his spouse at the pre-fitting was 18 points, while the difference decreased to 6.5 points at the one year post-fitting. While the HHIE has reliably expressed a reduction in perceived handicap after amplification, it is interesting that this study suggests the spouse also perceives a reduction in hearing handicap one year after amplification. This post-fitting data from both participants could be valuable information in confirming the benefits of the aided year.

If there is no apparent family support system, then community resources (such as medical transport, visiting nurses agencies and self-help groups) should be offered to the patient, and a special effort should be made to make

sure the patient understands what is being said, how to use the hearing aid and what follow up care is required.

The New User

Traditionally, the majority of individuals in need of amplification are reluctant to acquire their first hearing aid(s), however, sixty-five percent of hearing aid sales in the U.S. in 1989 were to new users (Cranmer, 1990a). The first time user presents some unique challenges: negative attitude about amplification by a family member or friend, unrealistic expectations, and reluctance to use yet another prosthesis all suggest that the stigma associated with hearing aids is not yet fully resolved (Maurer & Rupp, 1979a).

Newby (1979) stated that elderly patients who have had an unaided hearing loss for many years are not used to the intensity of sound, especially amplified speech, after receiving hearing aids for the first time. It requires practice and patience for the first time user to increase the volume to a usable and effective level.

Smedley et al. (1989) compared daily use of eyeglasses, dentures and hearing aids and found that "eyeglasses were worn 40% more hours per day than hearing aids, whereas dentures on average were worn nearly 100% more than hearing aids." It is interesting to note that this group wore canal aids. They also found no significant correlations between the number of years the prosthesis had been worn and the satisfaction with the prosthesis.

Surr and Hawkins (1988) found only about 10% of surveyed hearing aid users reported negative attitudes toward using their aids after six months of use. Malinoff and Weinstein (1989) studied 45 patients over the age of 65 years who were first time hearing aid users. Using the HHIE prior to the hearing aid

dispense, and again after the fitting, an unexpected result was that after only three weeks of amplification a significant reduction in self-perceived hearing handicap was found. These studies would seem to confirm that elderly new users can experience satisfaction with a hearing aid after a relatively short time of use.

New users with special needs may require significant additional follow-up care. The patient who has recruitment, for example, may require special circuitry such as automatic gain control. This option may need adjustments by the dispenser periodically. Sometimes several post-fitting appointments are necessary to facilitate benefit and satisfaction with the aid for the first time user (Smedley & Schow, 1990).

Model of Aid

In an effort to improve user acceptance of the hearing aid, manufacturing trends have resulted in smaller and smaller instruments; first the behind-the-ear, then the in-the-ear, then the canal and most recently the mini-canal. Satisfaction may be hindered somewhat by the increase in manipulation problems associated with the smaller instruments, but sales of canal aids in the U.S. have doubled since 1985 (Cranmer, 1990b).

Of 40 surveyed hearing aid users, who have worn aids one year or longer, Klingler and Millin (1990) reported that 37%, if given the option, would change the original dispense by obtaining a smaller aid. These investigators made an interesting muse as to whether the obsession for smaller hearing aids is due to the industry's advertising trends or is in fact a legitimate consumer demand.

Henrichsen et al. (1988) surveyed 693 elderly patients after at least six months of in-the-ear hearing aid use. They found that 64% used the aids every day, and that 82% were either satisfied or very satisfied with the hearing aids.

Manipulation problems, cerumen occlusion of receivers, faster battery drain and anticipated higher repair rates should be discussed with the patient before the fitting of smaller aids so expectations can be more realistic (Smedley & Schow, 1990).

Binaural Versus Monaural

Localization, improvement in speech discrimination and a greater ability to understand speech in the presence of noise have been the most common justification for the binaural fitting of hearing aids. The vast amount of literature on the advantage of binaural arrangement seems to validate this. Ross (1981) reviewed seventeen studies comparing speech discrimination scores obtained with monaural and binaural aided subjects. Of those seventeen studies, fourteen showed binaural superiority and three showed monaural/binaural equality.

Self-assessment by binaural hearing aid users may not be so generous. Complaints of twice the noise, twice the bother and twice the expense are common at the hearing aid dispense. Brooks (1984) surveyed 150 binaural and 296 monaural hearing aid users and found that for single-source situations and listening in groups without background noise, the binaural users rated their hearing ability much higher than the monaural users. However, the same study indicated no binaural advantage over monaural when background noise was present.

Practical implications for binaural arrangement are numerous. Better localization results in the ability to locate a speaker in a group with greater accuracy. Binaural fitting precludes having to make special efforts for seating so that the "better" ear can be favored. Less power is needed due to the binaural summation effect. The binaural summation effect is that the same loudness sensation will be present with binaural amplification at 6-dB less sound pressure than with monaural amplification (Skinner 1981).

Ross (1981) stated "We should now consider binaural amplification the method of choice for all hearing impaired individuals." Indeed, binaural fittings in 1989 represented 46.5% of all sales in the U.S.; an increase of 20% over the past 10 years (Cranmer, 1990b). Kaiser patients included in this study are eligible for one aid every three years. A binaural arrangement then means the patient must pay a fair market value for the second aid or wait three years until eligible to fit the "other" ear. The audiologist must, therefore, present the listening superiority of the binaural arrangement to the patient in a positive manner so that the patient will be willing to at least try the binaural fit.

Which Ear (Monaural Fit)

Given a bilateral, symmetric hearing loss, counseling on which ear to aid traditionally has been based on the ear with the highest speech discrimination ability, the ear that faces the spouse when watching T.V., the ear not used regularly for the phone and any physical limitations precluding a given side. These are clinician-based directives that hopefully result in the highest benefit to the patient; but they may not result in the highest satisfaction.

Of 58 patients studied by Swan et al. (1986), no significant correlation could be found between the side of the fitted aid and the number of hours

amplification was used. In the 23 patients with asymmetric losses, thirteen chose the poorer-hearing ear to aid, eight chose a side based on practical issues (three of those eight being the poorer side) and two had no preference. Of the 35 patients with symmetrical losses, six had no preference, seventeen chose a side due to reported better hearing with the aid and twelve made a choice based on practical issues. Conclusions made from this study were: (1) most patients have a preference for the side of amplification and should be included in the decision as to which ear to aid; and (2) if the fitting is monaural, the ear fitted should be the poorer-hearing ear.

If the patient is included in the decision-making process, even if it does not appear to be rational to the clinician, a higher degree of satisfaction with the aid would seem likely. At times factors influencing the side of preference do not become apparent until after the dispense, resulting in a change of side for the aid; but the additional effort on the part of the dispenser is worth the trouble if it increases the satisfaction and benefits of the aided experience.

Post-Fitting Check

Given all the previously described variables affecting a successful hearing aid fit, the concern may not be whether to have a post-fitting check-but rather how many post-fitting checks are needed for user satisfaction.

Studying daily use of behind-the-ear aids for 72 elderly patients, Brooks (1981) found a significantly greater use of the aid for the group receiving pre- and post-fitting appointments than for those who did not. He found that 28% of the group receiving the pre- and post-fitting appointments wore the aids eight or more hours per day, compared to 19% for those who received no extra appointments. He also found that seven patients from the non-counseled group

(those receiving no extra appointments) did not wear the aids at all compared to one patient in the counseled group.

Lowe (1990) suggested that a critical question to ask a patient at the hearing aid consult is "What is the main problem that you want the hearing aid to correct?" This can be used to alleviate unrealistic expectations but, more importantly, can give a specific item of reference on which to base benefit and satisfaction of the aid at the post-fitting check appointment.

Maurer and Rupp (1979a) suggested that

within the 30 day trial period, both the hearing aid and the older person's performance with it should be assessed on at least one occasion and more ideally during two separate appointments.
(p.155)

Richardson and Fox (1989) suggest using a follow-up questionnaire as a post-fitting check. Utilization of a questionnaire saves office appointment time, may be performed as often as the dispense feels follow-up is needed, and may document concerns the patient may not volunteer at an appointment. Such concerns include satisfaction with the service received during the dispense. One hundred and seventy clients were surveyed by questionnaire by Richardson and Fox (1989) for follow-up information regarding hearing aid use. Of the 28 clients identified as needing a return visit, 22 indicated they would not have returned on their own initiative.

At the post-fitting check, remediation of factors not apparent at previous appointments can occur. If formal assessment is conducted at the time of consult and/or fitting, a repeat of the same assessment done six months to one year post-fitting could provide valuable information (Malinoff & Weinstein, 1989). A reduction in the perceived handicap would suggest successful

remediation of the handicap. Ideally, this then would suggest a satisfied hearing aid user.

While the Kaiser Hospital system does not lend itself to repeated patient returns after the dispensing appointment, one of two clinics has chosen to implement the post-fitting session as part of the dispensing protocol. It, therefore, seemed propitious to examine the addition of this protocol insofar as its consequences on frequency of repair rate and satisfaction with hearing aids and dispensing service.

CHAPTER III

METHOD

SUBJECTS

Two groups of patients, consisting of 141 patients in group I and 234 patients in group II, were chosen for this study. Group I included 72 females and 69 males, while group II included 106 females and 128 males. Group I subjects were patients who received a hearing aid from Mt. Scott Medical Clinic and group II consisted of patients who received a hearing aid from Health Center West Clinic. Both clinics are member facilities of Kaiser Permanente, a health care system, and both dispense hearing aids under the Federal Medicare and Medicare Plus programs. All subjects were 65 years of age or older.

Group I and group II each contained patients who were seen for an audiologic assessment, a medical assessment (Appendix B), a hearing aid consult and a hearing aid fitting. Additionally, group I received a post-fitting check appointment within six weeks of the hearing aid dispense. The post-fitting check appointment, conducted after the patient has worn the aid for a set amount of time, involves the patient and audiologist discussing the management of the aid, any problems that have arisen, acceptance of the aid and benefits/limitations of the aided experience.

PROCEDURES

Names and medical chart numbers of the participants for this study were drawn from monthly sales reports from both Kaiser Clinics. All patients were then given a data number which reflected the clinic of dispense and the numeric order for that clinic. Biologic information and hearing aid history (Appendix D) were taken from the patient's medical chart. Repair data was gathered from two sources: a hearing aid file card (Appendix C) kept on all aids dispensed at Kaiser and the patient's medical chart. These were cross-referenced for accuracy of description for the subjective complaint and the objective reason for repair.

A short letter (Appendix E) informing the patients of the intent of study and soliciting voluntary participation was sent to all patients receiving a hearing aid during the 12 months of review. They were asked to respond to two questions involving a continuum response and four questions requiring a fill-in-the-blank response. This was accompanied by a self-addressed, stamped envelope for return of the questionnaire.

All returned questionnaires were matched, cross-checked and then stapled to the individual's data sheet. Ninety-one questionnaires (65%) were returned for Group I and 154 questionnaires (66%) were returned for Group II. All data information was then entered into the Statview 512 statistical program for analysis. Table values for paired comparison tests were obtained from Phillips (1978).

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

Appointments and hearing aid repair data were documented from the records of 375 Kaiser patients. Group II, consisting of 234 patients, did not receive the post-fitting check appointment. Of the 141 patients from group I, 117 received the post-fitting check appointment, 20 were scheduled for but did not return for the post-fitting check appointment, and post-fitting appointment information could not be obtained for four patients. Thus, a total of 117 patients received the post-fitting appointment, 274 patients did not receive the post-fitting appointment and four patients were dropped from the study. Data reflecting the following questions were analyzed statistically:

1. Does a return hearing aid check appointment within six weeks post-fitting reduce the number of returns for repair for hearing aids 0-12 months old?

Repair information was obtained from 371 patients; 117 who received the six week post-fitting and 274 who did not (Table I). To determine whether the post-fitting appointment reduced the number of returns for repair for hearing aids 0-12 months old, unpaired *t*-Tests were performed between the groups that received the additional appointment and those who did not (Table II). This analysis showed that the post-fitting group had significantly fewer objective repairs ($p < .01$) and significantly fewer subjective repairs ($p < .05$).

TABLE I

MEANS, STANDARD DEVIATIONS, ETC., OF POST-FITTING AND
NO POST-FITTING GROUPS RE: NUMBERS OF OBJECTIVE
AND SUBJECTIVE REPAIRS

group	count	Objective Repairs			Subjective Repairs		
		mean	Std. Dev.	Std. Error	mean	Std. Dev.	Std. Error
post-fit	117	.436	.607	.056	.137	.413	.038
no post-fit	254	.764	.99	.062	.256	.542	.034

TABLE II

UNPAIRED *t*-TEST VALUES TO DETERMINE IF POST-FITTING
APPOINTMENT RESULTS IN FEWER REPAIRS*

Comparison	Degrees of Freedom	Unpaired <i>t</i> -Value	Prob. (2-tail)
post-fit obj. rep. vs. no post-fit obj. rep.	369	-3.307	.001
post-fit sub. rep. vs. no post-fit sub. rep.	369	-2.111	.0355

**t*-value = 1.960 for significance at $p = .05$

2. Does the post-fit group have higher satisfaction with the aid?

Each patient answered this question by making one of five choices: very poor, poor, adequate, good or very good. To run a Chi Square analysis, each of these choices was converted to a numerical code (1-5). Analysis by Chi Square revealed that the post-fit group did not have higher satisfaction with the hearing aids ($p > .05$; Table III).

TABLE III

SUMMARY OF STATISTICAL ANALYSIS "DOES THE
POST-FIT GROUP HAVE HIGHER SATISFACTION
WITH THE HEARING AIDS AND WITH SERVICE?"*

Analysis	Degrees of Freedom	Total Chi-Square	Probability
Post-fit/satisfaction with hearing aids	4	7.723	.1023
Post-fit/satisfaction with service	4	16.713	.0022

*Chi Square value = 9.488 for significance at $p = .05$

3. Does the post-fit group have higher satisfaction with the service?

Patients answered this question by making one of the same five choices.

Analysis by Chi Square revealed that the post-fit group did have higher satisfaction with the hearing aid service ($p < .01$; Table III).

4. Does the post-fit group have less difficulty with manipulation of their hearing aids?

Each patient answered a yes/no question to determine if they had difficulty manipulating the hearing aids. Analysis by Chi Square revealed that the post-fit group did not have less difficulty with manipulation ($p > .05$).

TABLE IV

SUMMARY OF STATISTICAL ANALYSIS "DOES THE
POST-FIT GROUP HAVE LESS DIFFICULTY WITH
MANIPULATION OF THEIR HEARING AIDS?"*

Analysis	Degrees of Freedom	Total Chi-Square	Probability
Post-fit/difficulty with manipulation	1	.729	.3932

*Chi Square value = 3.841 for significance at $p = .05$

5. Does the post-fit group wear the hearing aid longer?

Each patient was asked how many hours a day they wore their hearing aids, as well as how many days a week. Unpaired t-tests were utilized to answer this question, and each part was analyzed separately (hours/day and days/week; Table V). Analysis revealed no difference between groups regarding amount of time hearing aids were worn (Tables V & VI). It should be noted, however, that the post-fitting group did wear their aids an average of 5.7 days per week as compared to 4.9 days per week for the non post-fitting group, and just missed significance.

TABLE V

MEANS, STANDARD DEVIATIONS, ETC., OF POST-FITTING AND NO POST-FITTING GROUPS RE: TIME HEARING AIDS WORN

group	Hours worn each day				Days worn each week			
	count	mean	Std. Dev.	Std. Error	count	mean	Std. Dev.	Std. Error
post-fit	63	8.921	5.603	.706	62	5.661	2.476	.314
no post-fit	140	7.836	6.095	.515	149	4.879	2.871	.235

TABLE VI

UNPAIRED *t*-TEST VALUES TO DETERMINE IF POST-FITTING APPOINTMENT RESULTED IN WEARING THE HEARING AIDS LONGER

Comparison	Degrees of Freedom	Unpaired <i>t</i> Value	Prob. (2-tail)
post-fit hours/day. vs. no post-fit hours/day	201	1.202	.2306
post-fit days/week. vs. no post-fit days/week.	209	1.874	.0623

**t*-value = 1.960 for significance at $p = .05$

6. Did the binaural hearing aid users have higher satisfaction than the monaural users?

Chi Square was used to determine if there was a difference between binaural and monaural group users regarding their satisfaction with their hearing aids. There were 92 binaural users and 149 monaural users. To run this analysis satisfaction levels (very poor to very good) were again recoded

numerically (1-5). Results revealed no significant difference between groups ($p > .05$; Table VII).

TABLE VII

SUMMARY OF STATISTICAL ANALYSIS "DID THE BINAURAL USERS HAVE HIGHER SATISFACTION THAN THE MONAURAL USERS?"*

Analysis	Degrees of Freedom	Total Chi-Square	Probability
Binaural/satisfaction with hearing aids	4	1.32	.8579

*Chi Square value = 9.488 for significance at $p = .05$

7. Was there a gender difference regarding satisfaction with the hearing aids?

There were 141 males and 102 females. Chi Square revealed no significance between males and females in relation to their satisfaction with their hearing aids ($p > .05$; Table VIII).

TABLE VIII

SUMMARY OF STATISTICAL ANALYSIS "WAS THERE A GENDER DIFFERENCE RE: SATISFACTION WITH THE HEARING AIDS?"*

Analysis	Degrees of Freedom	Total Chi-Square	Probability
Gender/satisfaction with hearing aids	4	3.519	.475

*Chi Square value = 9.488 for significance at $p = .05$

8. Did the ITE users have higher satisfaction than the BTE users?

Chi Square was used to determine if there was a difference between ITE and BTE groups regarding their satisfaction with their hearing aids. There were 131 ITE users and 103 BTE users. Results revealed no significant difference between groups ($p > .05$; Table IX).

TABLE IX

SUMMARY OF STATISTICAL ANALYSIS "DID THE ITE USERS HAVE HIGHER SATISFACTION THAN THE BTE USERS?"*

Analysis	Degrees of Freedom	Total Chi-Square	Probability
ITE/satisfaction with hearing aids	4	6.83	.1451

*Chi Square value = 9.488 for significance at $p = .05$

9. Was satisfaction with hearing aids a function of patient age?

A simple regression was performed to determine if satisfaction changed with increasing age. Results showed a low correlation ($R = .05$) between satisfaction and age, based on the 240 patients who were included in this analysis.

DISCUSSION

Results of this study support the hypothesis that there were less returns for objective repairs for the group that receives a post-fitting check appointment. Return visits for objective repairs were evenly distributed across descriptors

(Appendix D) for both groups with the exception of twice as many returns for weak hearing aids and for physical defects for group II compared to group I. A weak hearing aid is often the result of excessive cerumen in the receiver or excessive perspiration or debris in the microphone. Physical defects of the hearing aid such as a broken battery drawer or cracked case can often be the result of misuse or improper maintenance. Group I received a post-fitting check at which time additional instruction in care and maintenance of the aid is discussed. Thus, the conclusion can be made that this additional time spent with the patient does indeed reduce the return for possibly preventable repairs.

Results of this study also support the hypothesis that there was less returns for subjective repairs for the group that received a post-fitting check appointment. Again, return visits for subjective repairs were evenly distributed across descriptors with the exception of "can't get in ear." Sixty-three percent of group II's subjective repair returns were for this reason compared to 37% for group I. The second highest reason for return for subjective repair (for both groups) was the descriptor "can't remember maintenance instructions." At the post-fitting check appointment, additional time with the patient can be spent for demonstration and practice in insertion and manipulation of the aid. Again, additional time spent discussing maintenance of the aid may not only prevent repairs but can reduce unnecessary return appointment time.

Results of this study did not support the hypothesis that there was a higher rate of self-assessed satisfaction with the hearing aid for the group that receives the post-fitting check appointment. The style of hearing aids dispensed between the two groups was comparable (Group I: 59% ITE and 41% BTE; Group II: 48% ITE and 52% BTE); therefore, satisfaction levels were independent of model preferences. Satisfaction levels for both groups were in

good agreement with Henrichsen et al. (1988) who found 82% of the 693 patients they surveyed to be "satisfied" or "very satisfied" with their aids. Group I had 70% and Group II had 66% of patients who expressed at least adequate satisfaction with their aid.

Patients participating in this study were asked "How would you rate your satisfaction with the aid itself?" Group I responded with "very poor" (7%), "poor" (22%), "adequate" (30%), "good" (22%), and "very good" (18%). Group II responded with "very poor" (17%), "poor" (17%), "adequate" (27%), "good" (24%), and "very good" (15%). No description of "satisfaction" was given and no additional comments or interpretations were elicited. An inherent variable here is in the interpretation of "satisfaction." Patients may be very satisfied with the aid for the listening experience (for instance in the increase in understanding conversation), but still not be satisfied with the aid for cosmetic appeal (color, size, etc.). A better approach may have been to ask the patients to rate satisfaction with the "benefit" from the aid, and then satisfaction with the aid itself. For the patients who regard their hearing aid as a "necessary evil," satisfaction levels may never be high regardless of how much time and counseling is spent with them.

Results of this study also support the hypothesis that there was a higher level of satisfaction for the service received during the dispense for the group receiving the post-fitting check appointment. Both dispensing clinics used in this study have comparable facilities, equipment and trained personnel. The conclusion can be made then that additional time spent with the patient results in a higher level of satisfaction for the service received during the dispense. Although no additional comments were elicited, a fair number of patients (30 in group I and 48 in Group II) responded with written observations, complaints,

suggestions and compliments. Many revealed that they had had a problem or complaint with their hearing aid but had returned to the dispensing clinic for remediation and were now satisfied with the aid. It would be reasonable to assume that the returns for repair would have been higher and satisfaction with the service lower for these patients had follow-up not been completed either by a post-fitting check or by the patient returning on their own. Many of the patients expressed pleasure that their hearing needs seemed important to the clinic, and that they would return to the same clinic for future amplification needs. This finding is in good agreement with Richardson and Fox (1989).

Also of interest were the results that indicated the group who received the post-fitting appointment wore their aids slightly longer (however, not a significant difference) but did not have less difficulty with manipulation of their hearing aid. Subjective repairs dealing with manipulation ("can't get in ear," "can't replace/remove battery," and "can't adjust volume") accounted for 73% of the returns for both groups. These findings are in good agreement with Maurer and Rupp (1979a) who discussed how physical limitations in the elderly contribute to manipulation problems with the aid. This also agrees with Henrichsen et al. (1988) who found handling problems with the aid to have a definite positive correlation with increase in age of the patient.

Statistical analysis for the two groups combined indicated no significant difference between monaural and binaural hearing aid wearers for self-assessed satisfaction with the aid. Analysis showed no significant difference between genders for satisfaction with the hearing aid, which is consistent with the findings of Brooks (1981). Results also revealed no significant difference between ITE and BTE hearing aid wearers for satisfaction with the aid. No significant difference was found for satisfaction levels with the aid as a

function of patient age. This is in good agreement with Smedley et al. (1989) and Henrichsen et al. (1988) who also found no significant correlation between chronological age of the patient and levels of satisfaction with the hearing aid.

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

The purpose of this study was to investigate the hypothesis that a dispensing program utilizing a post-fitting check appointment would show (1) less return for repairs for hearing aids; (2) higher patient satisfaction with the aid; and (3) higher patient satisfaction with the service received during the dispense. Two dispensing clinics were chosen for the study, with the difference between the two being the use of the post-fitting check by only one clinic. The study was conducted by a medical chart review for appointment and repair data and by a voluntary written questionnaire for self-assessed satisfaction levels. Patients were also asked to estimate the amount of use with the aid and success with manipulation of the aid for purposes of comparison with other groups previously studied.

Two groups of patients, consisting of 141 patients in group I and 234 patients in group II, were chosen for this study. All patients were 65 years of age or older, were recommended for amplification by an audiologist, and given medical clearance for amplification by a physician. Patients from both groups were seen for an audiologic assessment, a hearing aid consult, and a hearing aid fitting. Additionally, group I received a post-fitting check appointment within six weeks of the hearing aid dispense while group II did not.

Patients were asked to respond to two questions involving a continuum response and four questions requiring a fill-in-the-blank response. All returned questionnaires were matched, cross-checked and then stapled to the individual's data sheet. All data information was then entered into the Statview 512 statistical program for analysis.

Results of this study support the hypothesis that there is less return for repairs, both objective and subjective, for the group who received a post-fitting check appointment. Statistical analysis did not support the hypothesis that there would be a higher rate of self-assessed satisfaction with the hearing aid for the group who received the post-fitting check appointment. Results also supported the hypothesis that there would be a higher rate of self-assessed satisfaction with the service received during the dispense.

IMPLICATIONS

The findings in the present study suggest areas that would be enhanced by further study. A longitudinal study, such as self-assessment scales done at the time of dispense, post-fitting check appointment, and various intervals post-fitting, would provide more accurate information on the individual's expectations for the aid, the benefit derived from the aided experience, and the satisfaction with the aid itself. Such information would prove useful in determining a profile for a successful hearing aid user. In the absence of formal assessment for non-auditory factors affecting the hearing aid fitting, the audiologist should be aware of current research in these areas and should strive to spend as much time with the patient as possible. As found in this study, the implementation of one

additional appointment significantly reduced repairs and increased patient satisfaction with the service received during the dispense.

As discussed previously, there is some concern regarding the mind-set of the Kaiser patient toward the hearing aid. Due to the fact that they pay a set co-payment of fifty dollars every three years for a hearing aid, it is questioned whether the patient has the same attitude toward the aid and the dispensing process as the non-Kaiser patient. It would be of interest to compare rate of return for repairs and satisfaction levels between a private practice dispenser and Kaiser clinics.

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APPENDIX A

OPERATIONAL DEFINITIONS OF TERMS

Sources: Audiology (Newby, 1979); Webster's New Collegiate Dictionary (1981); Handbook of Clinical Audiology (Katz, 1982); Hodgson, W. (1981); Hearing & Aging (Maurer & Rupp, 1979b); These definitions reflect current practices at the Kaiser-Permanente Clinics selected for this study.

Audiologic Assessment (AA): An audiologic assessment is a test battery including an otoscopic exam, pure-tone thresholds, bone-conduction thresholds, speech reception thresholds, most comfortable listening levels, speech discrimination ability and loudness discomfort levels. Other special testing, such as impedance or retro-cochlear, may be used at the audiologist's discretion but are not usually part of the test battery prior to a hearing aid dispense. All test information, recorded on a standard audiogram, is used in the ordering of the selected hearing aid.

Automatic Gain Control (AGC): Output compression circuitry on a hearing aid that can limit the output to acceptable listening levels for the wearer.

Behind-The-Ear Hearing Aid (BTE): Also referred to as post-auricular aid. A hearing aid worn behind the pinna; sound is conducted to the tympanic membrane via a plastic mold and polyurethane tubing.

Binaural: Relating to the use of two ears.

Bone-Conduction Threshold: Measured in decibels of hearing level with an audiometer, it is the lowest level in which a patient can detect the presence of a tone, through a vibrator usually against the mastoid process of the temporal bone, fifty percent of the presentation trials. Standard frequencies tested are 250 through 4000 Hz.

Canal Aid: A hearing aid that is one unit, worn in the canal with little or no filling of the concha.

Hearing Aid Consult: The hearing aid consult is an appointment in which the patient and the audiologist discuss the differences between styles of aids, which ear should be aided, whether binaural or monaural fitting will be performed, and set realistic expectations for the aided experience. Past experiences with hearing aids, family involvement, and community support groups can also be discussed at this time.

Hearing Aid Dispense: An individual program which documents the patient's hearing ability, explores rehabilitation needs, tests the patient with one or more appropriate hearing aids, and instructs the patient in care and use of the aid.

Hearing Aid Fitting: The hearing aid fitting consists of fitting the instrument to/in the ear, testing via sound field the threshold gain over unaided thresholds, demonstrating the insertion and manipulation of the aid, and a discussion of the care of the aid.

Hearing Handicap: Represents the interference that the hearing loss creates for the individual in successfully meeting personal communicative goals.

In-The-Ear Hearing Aid (ITE): A hearing aid that is one unit, worn in the canal and partly or completely filling the concha.

Mini-Canal Aid: A smaller version of the canal aid, most claim to be hidden behind the tragus portion of the ear.

Monaural: Relating to the use of one ear.

Most Comfortable Loudness Level (MCL): Measured in decibels of hearing level on the audiometer, it is the subjective level at which the patient determines running speech to be the most comfortably loud.

Non-Auditory Factors: Elements affecting the hearing aid dispense that are not strictly related to the audiologic assessment.

Objective Repair: Relates to the inability of the patient to use the hearing aid due to malfunction of the aid itself.

Post-Fitting Check: The post-fitting check, conducted after the patient has worn the aid for a set amount of time, involves the patient and audiologist discussing the management of the aid, any problems that have arisen, acceptance of the aid, and benefits/limitations of the aided experience.

Pure-Tone Threshold: Measured in decibels of hearing level with an audiometer, it is the lowest level at which a patient can detect the presence of a tone, through the ear phones, fifty percent of the presentation trials. Standard frequencies tested are 250 through 8000 Hz.

Recruitment: An abnormally rapid growth in loudness; the range between comfortable listening level and uncomfortable listening level is narrower than in a normal ear.

Speech Discrimination Ability: Administered at a comfortable listening level, it is the percent of words heard and repeated correctly from a list of phonetically balanced (PB) words.

Speech Reception Threshold (SRT): Measured in decibels of hearing level with an audiometer; it is the lowest level at which a patient can successfully repeat simple bi-syllable words.

Subjective Repair: Pertains to patient inability to utilize a functioning hearing aid.

Uncomfortable Loudness Level (UCL): Measured in decibels of hearing level on the audiometer, it is the subjective level at which the patient determines running speech to be uncomfortably loud. Also called the tolerance level.

APPENDIX B

MEDICAL RELEASE FORM



THIS IS TO CERTIFY THAT _____
HAS BEEN MEDICALLY EXAMINED AND MAY BE CONSIDERED
A CANDIDATE FOR AMPLIFICATION IF INDICATED BY
AUDIOLOGICAL EVALUATION.

DATE _____ PHYSICIAN _____ M.D.

APPENDIX C

HEARING AID REPAIR CARD

Name

Hearing Aid Stock Card

Make _____ Battery Type _____

Model _____ Warranty Date _____

Serial No. _____ Cost _____

Patient's chart #: _____

Address _____

Phone _____

Date Dispensed: _____

Age _____

Received in stock: _____

Service Record

Date Rec'd	Sent to	Date Ret'd	E/A Eval.	Cost	Description of Service

APPENDIX D

DATA/DESCRIPTOR SHEET

Data # _____

Chart # _____

Sex _____ Age _____

Aid:

Brand _____ Model _____

Style _____ Ear _____

1. Has patient worn aids before? Yes _____ No _____

a) this ear? Yes _____ No _____

2. Does use of this aid make patient a binaural user? Yes ___ No ___

3. Did patient return for post-fitting? Yes ___ No ___

Repairs from _____ (Dispense Date) to _____ (12 months)

Objective Repairs (list date and descriptor number):

1) _____

2) _____

3) _____

4) _____

Descriptors:

1) Dead

2) Noisy (Internal)

3) Excessive Feedback

4) Intermittant

5) Distorted

6) Excessive Battery Drain

7) Weak

8) Physical Defect (case, drawer, etc.)

9) Too loud

Subjective Repairs (list date and descriptor number):

1) _____

2) _____

3) _____

4) _____

Descriptors:

- 1) can't get in ear
- 2) can't adjust volume
- 3) can't remove from ear
- 4) can't replace/remove battery
- 5) can't remember maintenance instructions

APPENDIX E

INFORM LETTER / PATIENT QUESTIONNAIRE

Dear Kaiser Member:

We at Kaiser Audiology Departments are continually seeking to improve our service to you and assess the quality of materials we use. Please take a moment and respond to the questions regarding the Hearing Aid you received from us in 1985 and the quality of our service.

Your name will not be published in any form as a result of this study and your participation is voluntary (but very much appreciated). Please return this form in the envelope provided.

1) How would you rate the service you received?

1	2	3	4	5
very poor	poor	adequate	good	very good

2) How would you rate your satisfaction with the aid itself?

1	2	3	4	5
very poor	poor	adequate	good	very good

3) How much time do you wear the aid (0-24 hours) _____

4) How many days a week do you wear your aid? _____

5) Are you able to manipulate the aid satisfactorily? Yes ___ No ___

6) How many days does your battery last? _____

Thank you for your time,

Lynn Behrendsen
Audiology, Mt. Scott