

# Screening for Hearing Impairment in a Cohort of Elderly Patients Attending a Hospital Geriatric Medicine Service

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## ABSTRACT

**Introduction:** This study sets out to determine the usefulness of a questionnaire to screen for hearing impairment, assess the psychosocial impact of hearing handicap and survey older persons' attitudes towards hearing aid usage.

**Methods:** Subjects were recruited from a Geriatric Medicine unit over a six-month period. A questionnaire was administered, followed by an otoscopic examination and audiometric testing.

**Results:** Sixty-three patients were included in the study. Fifty-two (83%) patients had hearing impairment, of which 34 were moderately severe and 18 were mild. Of the six questions used in hearing screening, the question on self-perception was the most specific (91%). Administering the remaining five questions on activities of daily living improved the questionnaire's sensitivity from 58% to 73%, although the specificity was reduced from 91% to 64%. Of the 30 patients with self-perceived and audiometrically-confirmed hearing impairment, about 40% reported negative psychosocial impact as a result of the handicap. 66.7% were not keen to consider using hearing aid, even if recommended. The willingness to use hearing aids was correlated to patients' functional status ( $p=0.002$ ) but not to the severity of hearing impairment ( $p=0.157$ ).

**Conclusion:** Self-perception of hearing problems in the elderly is a strong indicator of hearing impairment. Introducing additional culturally-relevant questions based on activities of daily living improves the detection rate of hearing impairment. Although hearing loss impacts negatively on psychosocial well-being, most elderly subjects are unwilling to consider the use of hearing aids. There is a need to educate the elderly on the importance of intervention in order to reduce their handicap and improve their quality of life.

**Keywords:** audiometric testing, hearing aids, hearing impairment, psychosocial impact, questionnaire

## INTRODUCTION

Hearing impairment is a common but under-reported problem among the elderly. In the United States, the prevalence of hearing loss among community-dwellers above the age of 70 has been estimated at 33% and this figure rises to 40% among those above 75 years old<sup>(1)</sup>. Studies by Wallhagen et al<sup>(2)</sup> and Apollonia et al<sup>(3)</sup> showed that hearing loss is associated with significant adverse effects on a person's social, psychological and physical well-being. Physical disability, depression, altered self-esteem, and diminished functional status are some serious negative outcomes that can arise as a result of hearing impairment<sup>(4-6)</sup> while Bess et al<sup>(7)</sup> showed that poor hearing was associated with greater impairment and dysfunction based on the sickness impact profile (SIP). Unfortunately, the reporting, and hence treatment, of hearing impairment is often delayed. It is estimated that the average time between the onset of hearing loss and seeking of medical help is about 10 years<sup>(5)</sup>. Various studies<sup>(8-10)</sup> have confirmed that hearing impairment in elderly individuals can indeed be improved with the use of hearing aids and the benefits were sustained even at 12 months after fitting. In view of the above findings, screening for hearing impairment becomes an integral part of geriatric assessment for doctors caring for the elderly.

Various forms of hearing evaluation have been compared with the results of audiometric testing. The audioscope, tuning fork test and whisper test are some commonly-used tools for hearing assessment. In a study done locally in Singapore, Lim and Yap<sup>(11)</sup> reported that the "whisper test" is a useful bedside screening tool for hearing impairment among elderly patients, with a sensitivity of 72.3% and specificity of 70%. Swan and Browning<sup>(12)</sup> also quoted a very high sensitivity and specificity of 87% each when using the "whisper test" to screen for hearing loss in an audiology clinic. In spite of the encouraging results of the "whisper test", the difficulty in standardising the "loudness" of the whisper and eliminating background noises in a doctor's consultation room or the open ward of a hospital are practical issues that may affect the reliability as well as the utility of this test.

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**Table I. Questionnaire used for the study.**

<p><b>Part 1:</b></p> <ol style="list-style-type: none"> <li>1. Do you think you have a hearing problem?</li> <li>2. Do your family members ever complain that you turn on the radio or TV too loudly?</li> <li>3. Do you find that other people have to constantly repeat themselves when they are talking to you?</li> <li>4. Do you have difficulty hearing when you talk on the phone?</li> <li>5. Has anyone ever told you that you are speaking too loudly when you are talking to him/her?</li> <li>6. Do you find yourself not being able to hear the doorbell/door-knock/telephone ringing?</li> </ol>
<p><b>Part 2:</b></p> <ol style="list-style-type: none"> <li>7. Do you have difficulty hearing such that you feel frustrated when talking to your family members?</li> <li>8. Do you feel sad because you cannot hear well?</li> <li>9. Do you feel inconvenienced because of your hearing problem?</li> <li>10. Do you think you'll be a happier person if your hearing is better?</li> </ol>
<p><b>Part 3:</b></p> <ol style="list-style-type: none"> <li>11. If you were diagnosed with hearing impairment and recommended hearing aid, are you willing to go for hearing-aid fitting? (If "no", why?)</li> </ol>

The subjective approach of using self- or clinician-administered questionnaires had been found to be useful in screening for hearing handicap in the elderly<sup>(13)</sup>. These tools are inexpensive and easy to administer. The hearing handicap inventory for the elderly screening (HHIE-S) questionnaire designed by Ventry and Weinstein is one well-validated screening tool. It consists of ten scored-questions and has a reported sensitivity of 72% and specificity of 78% for scores of greater than eight<sup>(14)</sup>. However, this screening questionnaire faces limitations if used locally as several of the questions are culturally less relevant to Singapore's elderly population. For instance, many of our elderly patients lead sedentary lifestyles and do not participate in activities mentioned in the HHIE-S questionnaire.

There is therefore the need for a better standardised instrument that is easy to administer, and yet sensitive and specific enough to detect hearing impairment in the elderly. We also require a brief scale that can efficiently identify patients suffering from significant negative impact of hearing impairment so that appropriate interventions can take place. The objectives of this study are: (1) to determine the utility of a simple screening questionnaire for hearing impairment in a cohort of elderly patients, (2) to briefly determine the impact of hearing impairment on the elderly person's psychosocial well-being, and (3) to survey the acceptability of hearing-aid use among the hearing-impaired elderly.

## METHODS

The study was conducted over a six-month period. Subjects were enrolled over six months from the outpatient clinics and on the last Saturday of each month among inpatients under the care of the department. The study protocol consisted of a questionnaire administered verbally by one of the

authors (H Y Wu), followed by an otoscopic examination and audiometric testing by an audiologist in a quiet room. Patients found to have significant cerumen impaction (obscuring more than 50% of the tympanic membrane) were excluded from the audiometric testing.

## Questionnaire

The questionnaire was divided into three main parts: Part 1 consisted of six questions which screened for hearing difficulties in the elderly person. Part 2 consisted of four questions which briefly examined the effect of hearing impairment on the emotional well-being of the individual. Part 3 examined the subject's attitude towards the use of hearing aid. Under the "screening" questionnaire, the first question assessed the elderly person's self-perception of his or her hearing ability (e.g. "Do you think you have a hearing problem?"). This was followed by five other questions relating to normal day-to-day activities at home, e.g. "having a conversation with family members", "watching television", "talking on the phone" and "responding to the doorbell or ringing phone" (Table I). These questions were employed to detect hearing impairment indirectly through its impact on a patient's activities of daily living. We postulate that this may be especially useful in those who lack insight into their hearing impairment.

## Audiometric screening test

Audiometric screening was used to determine the presence of any organic hearing impairment and to categorise its severity in this study. Tones at frequencies of 1000 Hz and 3000 Hz were used. Patients were screened at two stimulus levels, 50dB hearing level (HL) and 30dB HL for each ear, using headphones from a Voyager 522 diagnostic audiometer. The tests were done in a quiet room. For this study, patients who failed the test at 50dB HL at any one of the

**Table II. Sensitivity, specificity and predictive values of question on self-perception and questions (2)-(6).**

	Hearing impaired	Not hearing impaired	Sensitivity	Specificity	PPV	NPV
<b>Question on self-perception (1)</b>			58%	91%	97%	31%
Yes	30	1	–	–	–	–
No	22	10	–	–	–	–
<b>Questions (2)-(6)</b>			69%	64%	90%	30%
“Yes” to any one question	36	4	–	–	–	–
“No” to all five questions	16	7	–	–	–	–
<b>Combining Question (1) with Questions (2)-(6)</b>			73%	64%	91%	33%
“Yes” to any one question	38	4	–	–	–	–
“No” to all six questions	14	7	–	–	–	–

PPV: positive predictive value

NPV: negative predictive value

frequencies were considered to have moderately-severe hearing impairment while those who failed at 30dB HL only were deemed to be mildly hearing-impaired. Patients who passed the hearing test at 30dB HL for tones at both 1000 Hz and 3000 Hz frequencies were considered to have normal hearing.

#### Subject selection criteria

Patients approached for recruitment into the study were drawn from:

- All patients who attended the Geriatric Medicine outpatient clinics during the six months of the study.
- Inpatients under the care of the Department of Geriatric Medicine in Tan Tock Seng Hospital on the six Saturdays when the audiometric testing was conducted.

All subjects were enrolled on a voluntary basis, and only those who consented were recruited into the study. All subjects must fulfil the following criteria: (a) age 60 years and above; (b) not bed-bound; (c) not confused, drowsy or acutely-ill; (d) not severely demented (by DSM III-R criteria); and (e) has never used any hearing aids in the past.

#### Statistical analysis

The results of the study were analysed using the Statistical Package for Social Sciences (SPSS Version 10) software.

#### RESULTS

A total of 73 subjects were enrolled over the six-month period of the study according to the strategy described above. Ten subjects were excluded due to the presence of significant earwax (as described above). Among the 63 patients who went on to complete the screening test,

43 were from the inpatient sector and 20 from the outpatient clinics.

#### Patient characteristics

A total of 25 male (39.7%) patients and 38 female (60.3%) patients completed the study. The median age was 79 years (range 62 years to 90 years). 38.1% of the inpatient subjects and 90% of the outpatient subjects were independent in all their basic activities of daily living (ADL) while the rest required partial or full assistance in their ADL.

#### Results of hearing tests

83% (n=52) of the subjects were tested positive audiometrically for hearing impairment. 54% (n=34) had moderately-severe hearing impairment and 29% (n=18) had mild hearing impairment according to the pre-defined criteria. The remaining 17% (n=11) had normal hearing.

#### Results of “screening” questionnaire

The results of the “screening” questionnaire are summarised in Table II. Of the six questions used to screen for hearing impairment in this study, the question on self-perception (e.g. “Do you think you have a hearing problem?”) was the most sensitive and specific. A total of 31 patients thought that they have hearing difficulty, out of which 30 tested positive for hearing impairment. Of these 30 patients with self-perceived hearing loss, 24 (80%) had moderately-severe hearing impairment while the remaining six (20%) had mild hearing impairment. This single question has a sensitivity of 58% and specificity of 91%, with a positive predictive value (PPV) of 97%. The remaining five questions when combined, where hearing impairment was indicated by a “yes” answer to any of these questions,

yielded a sensitivity of 69% and specificity of 64%. When the question on self-perception of hearing problem (Question 1) was analysed together with the subsequent five questions (Questions 2-6), the sensitivity increased to 73%. The specificity was, however, reduced from 91% to 64%. By administering the five combined questions to the subjects who perceived themselves to have normal hearing (i.e. “no” to Question 2), we were able to identify eight more patients with hearing impairment in our study.

**Impact of hearing impairment**

Responses of the 30 patients with hearing impairment and accurate self-perception of their hearing problem (i.e. answer “yes” to Question 1) were further analysed to study the impact of hearing impairment on their emotional well-being.

Out of the 30 patients, 12 (40%) felt frustrated because of difficulty in communicating with family members, five (16.7%) felt that they were inconvenienced by their handicap, 13 patients (43.3%) felt sad because of the handicap, while 21 (70%) thought that they would be a happier person if their hearing had been normal. (Fig. 1)

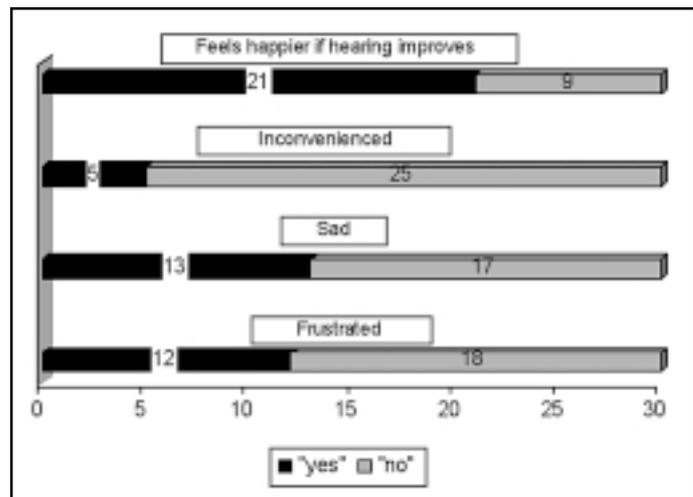
**Use of hearing aids**

When all the subjects were interviewed with regard to their willingness to consider using a hearing aid if tested positive for hearing impairment, only 33.3% responded positively to the suggestion. 34% of those who were not keen to consider the use of hearing aid felt that it would be inconvenient for them. Twenty-three percent were concerned about the cost, 10% felt that they were already old, while 23% felt that there was no need for it as they were able to cope with their hearing disability. The remaining 10% thought that it would be too difficult to use a hearing aid and hence rejected the idea.

The severity of hearing impairment and the functional status of the older person were cross-tabulated against the willingness to consider using a hearing aid (Table III) to determine if there were any strong associations. There was a significant association between willingness to consider using a hearing aid and the functional status of the elderly patient (p=0.002), with the functionally-independent elderly more willing to consider the use of a hearing aid than the partially or fully dependent elderly (odds ratio= 5.6). However, we were not able to find any association between the willingness to consider using a hearing aid and the severity of the hearing impairment (p=0.157).

**Table III. Distribution of patients’ willingness to use hearing aids according to severity of hearing impairment and basic ADL status.**

	Willingness for hearing aid		Odds ratio	p value
	Yes	No		
Moderately-severe hearing impairment	7	27	0.4	0.157
Mild hearing impairment	7	11		
Independent in basic ADL	17	17	5.6	0.002
Partially/fully dependent in basic ADL	4	25		



**Fig. 1** Psychosocial impact of hearing impairment on the elderly subjects.

**DISCUSSION**

In our study, 83% of the subjects were found to have either mild or moderately-severe hearing impairment on audiometric testing. Among the inpatient subjects, hearing impairment was detected in 84%. This is much higher than the rate of 52.4% quoted in a Thai study conducted among the community elderly<sup>(15)</sup>. Elderly inpatients represent a select group of frail, older persons with more co-morbidities as compared to the healthy elderly. It is therefore not surprising to find a high proportion of patients with hearing problem. 80% of the outpatient subjects tested positive for hearing impairment, which was surprisingly comparable to the rate among the inpatients. This may be due to a select effect since those with hearing problems were more likely to turn up for the hearing screening.

In our study, we attempted to investigate the utility of a set of short, simple and easy-to-administer screening questionnaires for hearing impairment among older persons. The single question enquiring about the patient’s self-perception of a hearing problem (Question 1) turned out to be the single most specific question (specificity 91%) in screening for a hearing problem. This implied that an elderly person’s self-perception of a hearing problem can

reliably indicate the presence of a hearing impairment. However, the sensitivity of this single question was only 58%, comparatively lower than the 76% quoted for the HHIE-S questionnaire<sup>(14)</sup>. This difference in sensitivity may be the result of the older person's lack of insight, or denial of his or her hearing problem. To overcome this problem, the five other questions (Questions 2-6) relating to daily activities could be administered following the question on self-perception, as this increases the sensitivity of the questionnaire to 73%.

The results in this study suggest that elderly patients should be routinely asked about their perception of their own hearing status as a useful screening question for hearing impairment. If self-perception of a hearing problem were positive, a referral to the audiologist for a proper hearing test is recommended. If the patient denied any problem with his or her hearing, it would be worthwhile to proceed with the remaining five questions in the questionnaire which look for surrogate indicators of hearing impairment to identify patients who may lack insight or deny the existence of the problem.

Hearing impairment affects a person's ability to communicate with other people. A study conducted by the National Council on the Aging in the U.S. in 1999 on the consequences of untreated hearing loss in older persons<sup>(16)</sup> showed that hearing-impaired senior citizens who do not use hearing aids participated significantly less in organised social activity compared to users. This has a significant negative impact on an elderly person who may already have other underlying problems such as impaired mobility and vision. Social isolation sets in when engagement in daily activities or hobbies such as watching television, listening to the radio and talking on the phone become a problem. Wallhagen et al<sup>(2)</sup> reported that it is more likely for an elderly patient with hearing impairment, however mild, to feel lonely, remote or left out. Those with moderate or significant hearing impairment are also more likely to feel depressed, echoing the results of this study. Although well-validated tools such as the Geriatric depression scale (GDS) are available for psychosocial assessment of the subjects, the few short questions used in this study were similarly able to illustrate the negative impact hearing impairment had on the older person's life. Results of this study showed that as much as 40% of patients actually suffered from some form of adverse psychological effects because of impaired hearing. There is hence a need for greater vigilance among physicians caring for the elderly with hearing loss to actively look out for mood disorders, and treat them if necessary.

Hands<sup>(14)</sup> showed that 79% of elderly patients who were diagnosed with hearing impairment and fitted with hearing aids actually reported a reduction in their hearing handicap after six months of hearing aid usage. In the 1999 US survey, most hearing-impaired elderly patients reported significant improvements in the quality of their lives after they started using hearing aids. Half or more reported better relationships at home and improved feelings about themselves<sup>(16)</sup>. Despite the proven efficacy of hearing aid in improving the outcomes mentioned, it is unfortunate that many hearing-impaired elderly patients are still unwilling to consider its use.

Lim and Yap<sup>(11)</sup> reported, in a local study on hospitalised elderly patients, that only one out of five (20%) hearing-impaired patients wanted hearing aids. In our study, only one in three patients (33.3%) were willing to consider using hearing aids. However, it is notable that when the data was further analysed, the percentage of elderly patients who were willing to consider hearing aids were 80% among the outpatient subjects but only 16.3% among the inpatient subjects. The outpatient subjects in this study were better off in terms of their functional status as compared to the inpatient subjects, where almost 62% of them required partial or full assistance in their activities of daily living (ADL). We were able to show an association between the subject's functional status and his or her willingness to consider the use of a hearing aid, which implied that an older person who is ADL-independent is more likely to consider a hearing aid when recommended, compared to another who is not so independent. This is not surprising as an elderly person who is independent and active is likely to find his or her hearing impairment more of a handicap than another who is house-bound and dependent in ADL. It is also interesting to note from the results of the study that the severity of hearing impairment alone is not associated with an elderly person's willingness to consider using a hearing aid.

In the survey done in the US, denial, concern about the expense and stigma (or vanity) were the three major reasons why some elderly patients refused the hearing aid<sup>(16)</sup>. Our study demonstrated similar reasons for rejecting the hearing aid among local elderly, except that stigma (or vanity) did not seem to be a concern here. Judging from the attitude of the elderly patients towards the use of hearing aids, many who are screened positive for hearing impairment, especially those who are functionally-dependent in one way or other, are likely to reject the doctor's recommendation to wear a hearing aid. Hearing impairment affects not only the older person with the

handicap but also the family members. It is therefore important to raise the awareness of both the hearing-impaired elderly and the family members about the potential consequences of untreated hearing loss and to educate them about the benefits of using hearing aids. We believe that with proper counselling, we may be able to change the attitude of some of the hearing-impaired elderly towards the use of hearing aids. The outcome of such related interventions warrants a proper study of its own.

It is a well-known fact that prevalence of hearing impairment in the elderly is high. In view of its negative impact on elderly patients, it is worthwhile for doctors to actively and routinely screen for the problem using an easy-to-administer and culturally-relevant questionnaire, which should include a question on patient's self-perception of the problem. The simple screening questionnaire designed for this study serves as a fairly comparable but culturally more relevant substitute for existing screening questionnaires such as the HHIE-S. However, the tool will need to be further validated using a larger sample or cohort of elderly subjects. Although many elderly patients are not keen to wear hearing aids even after being tested positive for hearing impairment, it should not deter physicians from routinely screening their elderly patients since this will improve the detection rate. It is hoped that with early identification of the hearing problem and timely intervention and counselling in the elderly, we can improve their acceptance of hearing aids, thereby reducing the handicap associated with hearing impairment and improving their quality of life.

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Hearing-impaired patients use a variety of ways to communicate, eg lip-reading, British Sign Language (BSL), writing, and other methods.[2]. Encourage patients to inform the surgery of any hearing impairment - using posters, appointment screen messages, etc. Highlight the hearing impairment on notes and computer records. Add a 'screen message' available to all staff viewing the record. The Royal National Institute for Deaf People (RNID) provides Deaf Awareness Training. Booking appointments.

@article{Wu2004ScreeningFH, title={Screening for hearing impairment in a cohort of elderly patients attending a hospital geriatric medicine service.}, author={H. Wu and J. Chin and H. Tong}, journal={Singapore medical journal}, year={2004}, volume={45 2}, pages={79-84 } }. H. Wu, J. Chin, H. Tong.Â METHODS Subjects were recruited from a Geriatric Medicine unit over a six-month period. A questionnaire was administered, followed by an otoscopic examination and audiometric testing. RESULTS Sixty-three patients were included in the study. Fifty-two (83%) patientsâ€| Expand. View on PubMed. Screening for hearing impairment in a cohort of elderly patients attending a hospital geriatric medicine service. Singapore Med J 2004;45:79â€“84Google Scholar. 3 Brink, P, Stones, M. Examination of the relationship among hearing impairment, linguistic communication, mood, and social engagement of residents in complex continuing-care facilities. Gerontologist 2007;47:633â€“41CrossRef Google Scholar PubMed.Â Self-reported hearing difficulties, communication strategies and psychological general well-being (quality of life) in patients with acquired hearing impairment. Disabil Rehabil 2008;30:203â€“12CrossRef Google Scholar. 5 Tsuruoka, H, Masuda, S, Ukai, K, Sakakura, Y, Harada, T, Majima, Y. Hearing impairment and quality of life for the elderly in nursing homes. Objective: To examine whether a BGA administered to elderly patients admitted to the ED may predict the risk of a long hospital stay in the geriatric acute care unit.Â The cognitive impairment in the elderly may also alter results when studying the implant benefits [11][12][13][14][15].Â Background: Screening for inpatients at risk for long length of stay (LOS) is the first step of an effective hospital care plan for older inpatients.Â Other patient populations have benefited from specialized emergency services, including psychiatric and geriatric patients; however, little has been done thus far with complex surgical populations.