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Simple Tests Compare Well with a Hand-held Audiometer for Hearing Loss Screening in Primary Care

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Abstract

OBJECTIVES—Compare hearing loss screening results for 4 simple tests with hand-held audiometry.

DESIGN—Cross-sectional study of patients screened during intake for physicals and other routine procedures.

SETTING—Two primary care clinics in the San Francisco Bay area

PARTICIPANTS—Older patients not wearing hearing aids (N = 125, mean age 72.9, 63% female).

INTERVENTION—Four simple hearing screening tests compared with audiometry

MEASUREMENTS—Direct question about hearing loss, indirect question, finger-rub test, whisper test, and audiometric results using a hand-held audiometer.

RESULTS—Sensitivity of the finger-rub test was 91% compared with 89% for the direct question, 85% for the indirect question, and 79% for the whisper test. For specificity the whisper test was highest followed by the finger rub, indirect, and direct.

CONCLUSION—Simple screening procedures can be used to identify older adults with hearing loss in primary care and facilitate early referral for additional testing and treatment.

Keywords

hearing loss; screening; sensitivity; primary care

INTRODUCTION

Hearing loss that is sufficient to interfere with understanding what other persons are saying affects nearly two-thirds of those age 70 and older in the United States.¹ Similar results have

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Conflicts of Interest: None

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been reported in Europe.² Far from being a benign condition, hearing loss is associated with a number of negative health outcomes, including cognitive function, falls, physical disability, social isolation, and spousal depression.^{3–7}

In spite of the high prevalence of hearing loss in old age, it is estimated that only 10% to 25% of Americans with hearing loss wear hearing aids depending upon the severity of the loss.^{8,9} One contributing factor is the low rate of hearing screening in primary care settings, even for older adults.¹⁰ This low rate of screening was recently confirmed in a 2012 review of the potential benefits of hearing screening accomplished for the United States Preventive Services Task Force.¹¹

Although the Preventive Services Task Force review concluded that existing studies were not strong enough to support the benefits of routine screening, a more recent report by the National Academies of Science, Engineering, and Technology noted the many negative consequences of hearing loss and recommended that health care providers promote hearing health in regular medical and wellness visits.¹²

A majority of primary care practitioners admitted not screening routinely, citing barriers which included lack of time, feeling there are more pressing clinical issues, and lack of reimbursement. However, screening and referral for audiometric testing are essential steps in facilitating the use of hearing health care services by older adults for several reasons. First, Medicare referral is required for audiometric evaluations to be considered diagnostic vs. routine procedures.¹³ And second, lack of screening reinforces perceptions by both practitioners and patients that hearing loss is not an important health problem.

We sought to compare four inexpensive, brief, and low tech assessment methods with hand held audiometry to better inform clinicians of their relative sensitivity and specificity in order to reduce barriers to detection of possible hearing loss in older persons. Because many clinics do not have easy access to audiometers for testing, and because we wished to identify an approach that could be used across settings serving a wide range of individuals with varying levels of resources as well as be concise given the limited time available for screening, we compared the effectiveness of four simple screening tests with the results obtained using a hand held audiometer.

METHODS

We worked with two San Francisco Bay area primary care clinics as part of the pilot phase of a 5-year longitudinal study. Results of the four screening procedures were compared with the results obtained using hand-held audiometry. Both clinics offered a wide range of primary care services. We asked patients age 60 and older coming into the clinics for checkups or routine procedures and who had not worn hearing aids for at least a year if they were interested in being screened for hearing loss to see if they were eligible to take part in a longitudinal study. Those who agreed were seen by the study's research nurse who did the screening. All were able to understand the research nurse's instruction and complete the screening tests.

The protocol involved a direct question, an indirect question, the whisper test, and the finger rub test. The direct question was “Do you feel that you have any difficulty hearing?”¹⁴ The indirect question asked if anyone had told them that they had difficulty hearing. For both questions a positive response was used to indicate possible hearing loss.

For the whisper test, we followed the procedures recommended by Pirozzo, Papinczak, and Glasziou,¹⁵ but selected specific letters like g, s, r, and m that would not be easily confused to combine with the numbers. Briefly, our study nurse stood behind the seated patient and whispered a combination of 3 letters and numbers, such as S-4-G. She asked them to close their eyes and press on the tragus of the opposite ear being tested. Each ear was tested in turn. She exhaled before whispering to ensure as quiet a voice as possible. If the patient repeated the combination correctly the first time, the test was negative for possible hearing loss for that ear. If the response was not correct, the test was repeated with a different combination. Patients were considered to screen positive for possible hearing loss in a given ear if they were unable to correctly hear and repeat 3 of the 6 letters and numbers from the two tests.

For the finger rub we followed the CALFRAS-Strong procedure, which assesses hearing at 70 centimeters distance from each ear.¹⁶ We made one modification – rather than have the study nurse stand “nose to nose” less than a foot from the patient as described for CALFRAS, we had her stand behind the person being screened. Prior to proceeding, the patient was seated comfortably in a chair and the nurse rubbed her fingers briskly together close to the patient’s ear so they understood what to listen for. She told them to raise their hand on the side they heard the sound. She then stood behind the patient with her arms extended about 27 inches to each side at ear level, asked the patient to close their eyes, and then tested each ear individually by rubbing her fingers first on one side and then the other. If the patient did not hear the sound on the first finger rub, it was repeated. If heard on the second, a third rub was performed. Those who could not hear the first two rubs or only one of the three were considered to have tested positive for possible hearing loss for that ear.

For the audiometric assessment, we used a hand-held Earscan 3 to test hearing acuity at frequencies of 1,000, 2,000, and 4,000 mhz at 25dB and 40dB. Those who were unable to hear two or more of the frequencies at 25dB or even one frequency at 40dB were scored as screening positive for possible hearing loss.¹⁷

A total of 125 patients agreed to be tested; their mean age was 72.9 years with 63% female. Of those tested, 91 (72.8%) tested positive for possible hearing loss according to the audiometric results. Those testing positive were older (mean =74.5 years vs. 68.6 years) and comprised a higher proportion of men who were tested (41.8%) than of women who were tested (23.5%). All participants were given a brochure explaining hearing loss and what could be done should it occur.

This study was approved by the Committee for Human Research at the University of California, San Francisco.

RESULTS

Screening comparisons for the 125 participants are shown in Table 1. The finger rub test had the highest sensitivity (91%) and negative predictive value (74%). At 89%, sensitivity for the direct question was also high although the direct question had the lowest negative predictive value of any of the tests. Sensitivity for the indirect question and the whisper test was lower than for the other two tests. However, at 91% the whisper test had the highest specificity of the four tests, and specificity for the indirect question was higher than that for the direct question.

DISCUSSION

Primary care clinics face a significant number of time demands, including the need for practitioners to see a large number of individuals in a short time frame. The current pilot study was designed to develop a protocol that would be both efficacious and efficient in terms of time demands. Although we used a nurse researcher for the testing, our goal was to develop a simple assessment that could be used by medical assistants as part of their routine intake protocol. The results are encouraging.

The high sensitivity of the finger rub test was particularly important because it takes little time and requires no special equipment. It does require training, particularly in ensuring that medical personnel rub their fingers hard enough for those with normal hearing to hear the sound. For training we recommend instructing those using the finger rub to make sure they rub hard enough that they can hear it themselves. For those with very smooth fingers, a possible alternative is to rub the distal part of the fingers of one hand against the distal part of the fingers of the other hand.

The direct question also had a high sensitivity but lower results on specificity compared to the finger rub. It and the indirect question have the advantage of being the quickest to perform. The whisper test had the highest specificity and predictive value of a positive test but requires a quieter exam room than the other tests, can be influenced by the pitch and loudness of the practitioner's voice as well as the numbers and letters used, and should be accomplished after an exhalation, which is not easy to do.

We compared the results of four alternative tests with those obtained using a hand-held audiometer that uses pure tones to assess hearing loss. It should be kept in mind that pure tone tests may themselves miss hearing loss in some patients because understanding speech is not always the same as hearing pure tones. There are other tests by audiologists, such as Speech in Noise, that may better assess hearing loss for some patients.^{18–19} For clinics, this means paying attention to patients who say they have difficulty hearing even though their difficulties may not be apparent in screening tests involving pure tones. In addition, the results of this study provide some support for the benefit of screening persons who do not necessarily report problems with their hearing.

While increased screening rates will help identify older persons with hearing loss, many may still hesitate to go for formal testing because of the perceived expense of obtaining hearing aids and concerns about appearance and problems with their daily use. However,

practitioners can emphasize the value of further assessment because hearing is important for an individual's overall health and well-being. Further, hearing aids are now highly sophisticated even though they cannot fully restore hearing and do require adjustments to provide maximum benefit. Written materials can be made available in the office providing additional resources for persons who are referred and/or office personnel can follow-up with additional information once the individual is screened and referred. Given the rapid technological growth in alternatives to hearing aids, those with hearing loss now have a variety of devices and techniques to help them hear better but counseling is necessary to find those that work and are cost effective.

Early screening and referral may promote early remediation of hearing loss, minimize its negative impacts, preserve speech recognition, and promote on-going engagement in valued activities by older adults.

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Table 1

Results for 4 screening tests compared with audiometric testing (N = 125)

Test	Sensitivity	Specificity	PPV*	NPV**
Finger Rub	91%	68%	88%	74%
Direct Question	89%	41%	80%	56%
Indirect Question	85%	56%	84%	58%
Whisper Test	79%	91%	96%	62%

* Positive predictive value

** Negative predictive value