Group Screening For Cognition Disorders In Elderly Persons

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Abstract: **Prevalence rates of cognitive impairment in persons aged 75 to 85 years are in the range of 10 to 19 percent, and 20 to 47 percent after the age of 85 years. Screening for dementia in persons aged 75 years and older would therefore identify a significant number of impaired persons. When screening for dementia, group testing would be more cost-effective than individual testing. We modified the Folstein Mini-Mental State examination (MMSE) for screening in a group setting. Community volunteers were tested at a geriatric health fair and at a special exercise class for the elderly. Subjects were subsequently tested individually using the standard Folstein MMSE. Analysis using Pearson correlation and a paired t-test indicates a high degree of concurrent validity between the two methods of administering the MMSE. This pilot study suggests that when screening elderly persons for dementia, a group-administered instrument can be a useful method to obtain a preliminary sample of cognitively impaired individuals. (J Am Board Fam Pract 1991; 4:131-7.)**

Screening for dementia in persons aged 75 years and older would result in the identification of a significant number of impaired individuals. Several population-based studies have reported prevalence rates of 10 percent to 19 percent in persons aged 75 to 85 years and greater than 20 percent in persons aged 85 years and older.[1-3] A recent study conducted in a geographically defined, urban, working class community of approximately 32,000 persons found prevalence rates much higher than previously reported. The estimated prevalence rate ranged from 18.7 percent in persons aged 75–84 years to 47 percent in persons aged more than 85 years.[4]

Despite the common occurrence of cognitive impairment in the elderly, primary care physicians seldom formally test patients' mental status and usually do not make the diagnosis until the problem is moderately advanced or is brought to their attention by the person's family or friends.[5] Assuming availability of reasonably sensitive and specific test instruments, formal screening for cognitive function could identify impaired persons at an earlier stage.

Does screening for dementia make sense, given the usually accepted prerequisites for screening for specific diseases? Screening instruments are available that are easily administered, inexpensive, and yield reasonably sensitive and specific results in both healthy and impaired persons. Whether early recognition of dementia will make any difference in beneficial outcomes is, however, debatable. Because dementia is a symptom complex, not a disease entity, outcomes will vary depending on the specific disease causing the dementia. Using criteria described in the *Diagnostic and Statistical Manual of Mental Disorders* of the American Psychiatric Association,[6] approximately 20 percent of persons identified as demented will have conditions amenable to treatment.[7] Depression, drugs, endocrine disorders, nutritional deficiency states, and such intracranial diseases as infection, tumor, and normal pressure hydrocephalus are some of the more common causes of so-called "reversible dementia." Earlier identification and intervention in those persons could result in significant benefit. Unfortunately, the majority will have one of the primary degenerative dementias, for which little curative treatment is available. Early recognition and intervention in those individuals, however, can lessen the illness burden to the caregivers and patient.[8-10] Such intervention would include educating caregivers about the disease, involving them in support groups, and putting them in touch with a variety of services such as nutritional support services, transportation services designed specifically for the impaired elderly, day care, respite care,

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home health services, and volunteer services. Although many studies have reported the value of such interventions, none has examined whether taking advantage of those services earlier in the dementing illness would make a difference in overall outcomes.

Another potential benefit of early detection of dementia is the initiation of a comprehensive physical evaluation. Comprehensive geriatric assessment has been shown to reduce overall health care costs, the number of hospitalizations, and the need for nursing home placement and to detect unrecognized diseases and increase use of home health services.[11-16]

Preliminary but encouraging evidence suggests that optimal control of risk factors in patients with multi-infarct dementia can improve cognitive function.[17-20] These risk factors include hypertension, cigarette smoking, diabetes mellitus, hyperlipidemia, and heart disease. Identifying potentially impaired persons by mental status screening and initiating measures to control risk factors associated with multi-infarct dementia could be powerful reasons for making the diagnosis of dementia at an early stage.

Screening for dementia does make sense for several reasons. The disease has a protracted course, the family and other caregivers are intimately involved, early comprehensive geriatric assessment is beneficial, reversible causes can be identified, control of risk factors can improve cognitive function, and an array of available support services can be used.

To detect dementia by a group-screening instrument, generally accepted diagnostic criteria must be used. Persons could be falsely identified as abnormal, or they could be suffering from a variety of systemic disorders known to impair cognitive function.[21] Early identification of persons with "reversible dementia" could initiate earlier and more appropriate treatment. On the other hand, persons with primary degenerative dementia, such as Alzheimer disease or multi-infarct dementia, could benefit from early initiation of support services, even though these disorders are not curable.

In view of the above considerations, the purpose of this pilot study was to explore the feasibility of group screening for cognitive impairment by using an instrument designed to parallel closely an already validated mental status screening test. Group-administered testing that yields results comparable to individual testing would offer a cost-effective alternative. Many elderly persons participate in various community activities (church-affiliated service clubs, special interest clubs, continuing education groups, exercise programs, nutrition sites, and a variety of programs sponsored by local departments of aging), and these groups could be targeted for a cognitive screening program. Individual testing could then be the second stage of the screening process in which more extensive evaluation would be limited to a smaller sample.

Methods

We considered numerous validated mental status screening tests described in the literature for adaptation to group administration.[22-26] In selecting a reference test, the following criteria were important: (1) ease of administration, (2) reasonably short time required to test, (3) broad range of functions tested, and (4) wide use and acceptance. We selected the Mini-Mental State examination (MMSE), described by Folstein, et al.,[23] because it met the above criteria and required minimal changes to adapt it to group administration. We then designed a group test that paralleled it. Some MMSE questions were dropped or modified to allow for group testing—specifically, those asking for repetition, 3-minute recall, 3-step command, and interpretation of written material (e.g., "close your eyes"). The instrument used in this study is presented in the Appendix.

Two groups of volunteers were tested, one at a health fair sponsored by a local county health department, and a second group of seniors participating in a special exercise class. The study was approved by the Human Rights Committee, and informed consent was obtained from persons agreeing to participate in the study. At each site we planned to test between 20 and 30 individuals. At the health fair site, hearing and vision tests were offered. At the exercise group site, no formal testing was done. During subsequent individual testing, examiners noted some volunteers had significant hearing impairment, but none had a vision impairment that interfered with taking the test. The examiner presented the questions to the group, and those taking the test recorded their answers on an answer sheet. To test 3-minute recall, answer sheets were collected, and the re-

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called words were recorded on a second answer sheet. To test 3-step command, those taking the test were asked to place their answer sheet in an envelope (handed out with the answer sheet), write their name on the envelope, and seal the envelope. When their materials were collected, compliance with the 3-step command was easily tabulated. Following the group testing, examinees were contacted to arrange for individual testing using the standard MMSE screening test.

The examiner administering the individual test was blinded to the results of the group test. Some who were tested in the group setting (health fair) could not be located, and others were not interested in individual testing. All who were tested completed a questionnaire that asked for the name of their primary health care provider. For those not agreeing to individual testing, a letter was sent to their primary care providers describing the study and test results and advising follow-up if, in their clinical judgment, it seemed warranted. Examinees who had individual testing following the group testing and who scored below the normal range (24 to 30) were advised to contact their physicians. In addition, we asked their permission to send the test results to their physicians with an explanation about the nature of the study and advising follow-up if clinically it seemed warranted.

Because our modifications adapting the Folstein MMSE for group administration were minor, we assumed this test was not new. Even so, the number of items on the two versions (30 in the individually administered test and 28 on the group test) did affect the numerical scores. To compare the two sets of scores, a simple transformation of scores into percentages of correct items was done. Using 80 percent correct as the norm described by Folstein, et al., the cutting point for the Folstein MMSE was 24, and the cutting point for the group-administered test was 22.6.

To justify the assumption that the two forms of the test were comparable, a correlation coefficient of sufficient magnitude was determined to establish concurrent validity for the new test form. Difference of means tests were calculated to compare the group who took only the group-administered test with those who took both forms of the test to determine whether there were differences in demographic variables or mental status scores.

Results

Two groups totaling 53 persons were tested. There were 41 women (77.4 percent) and 12 men (22.6 percent). The average age was 73 years; range, 53 to 88 years. The average education was 11.2 years; range, 1 to 20 years. Of the 53 persons tested with the group tests, 26 also took an individually administered standard Folstein mental status examination. Of these, 20 (77 percent) were women, and 6 (23 percent) were men. The mean education level was 11.5 years compared with 10.9 years for the sample who took only the group test. The mean age was 71.3 years compared with 74.5 years for those who took the group test. The differences in age and education between the two groups were not statistically significant. The mean score on the group-administered mental status test for the 27 persons who took only the group test was 21.4; the mean for the group who took both tests was also 21.4. In regard to their mean scores, the persons in the group who did not return to take the individual test did not differ from those who took both the group and individually administered MMSE ($t = 0.03$, $P < 0.975$).

Examinees' scores for both the group-administered test and individually administered test are shown in Table 1. Pearson's correlation coefficient calculated for those who were tested in both the group and individual setting was 0.9. Although we requested exclusion of persons with significant hearing loss, it was obvious on individual testing that two individuals were severely hearing impaired. We decided not to exclude them from the statistical analysis because of the small sample size and because we wanted to measure their effect on the Pearson correlation coefficient. The discrepancies in the percentages correct for the individual Folstein MMSE and the group-administered test are presented in Figure 1. Examinees F and I were identified as hearing impaired. Their group scores are much lower than their individual scores.

As can be seen in the Appendix, several questions not part of the standard MMSE examination were presented to individuals in both the group and individual testing. These questions covered such cognitive areas not assessed in the MMSE as attention, proverb interpretation, judgment, reproduction of the three-dimensional figure, and word fluency. These items were being field tested and were not included in the analysis presented

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Table 1. Comparison of Individual Folstein MMSE Scores with Group-Administered Test Scores.

	Individual Folstein Scores		Group-Administered Scores	
Examinee	Score	Percent Correct	Score	Percent Correct
A	29	97	28	100
B	30	100	27	96
C	28	93	27	96
D	29	97	25	89
E	22	73	20	71
F*	26	87	16	57
G	23	77	20	71
H	23	77	20	71
I*	21	70	8	28
J	28	93	22	78
K	30	100	27	96
L	22	73	18	64
M	29	97	26	93
N	30	100	28	100
O	30	100	28	100
P	23	77	18	64
Q	19	63	12	43
R	28	93	22	78
S	21	70	18	64
T	29	97	26	93
U	19	63	18	64
V	19	63	14	50
W	21	70	19	68
X	29	97	28	100
Y	22	73	16	57
Z	29	97	26	93

*These two individuals were later found to be hearing impaired.

here. Those items that yielded consistent results in group testing will be used in future testing trials. An expanded group-administered test is planned that will cover cognitive areas known to be affected relatively early in dementia syndromes.

Discussion

Significant practical, medical, ethical, and socioeconomic issues need careful consideration before launching any effort to identify community-based persons with cognitive impairment by the use of a group-administered screening instrument.[27] The instrument used in this pilot study was designed to parallel closely an already validated test (the Mini-Mental State examination). Not surprisingly, this study shows that a group-administered test can be given to literate persons, and it seems to produce results essentially equivalent to individual testing.

In a study designed to pilot a screening test, it is most important to include persons with both normal and abnormal functions. The distribution of scores (one-third of examinees with MMSE scores below 24) indicates that we accomplished this goal.

The problems encountered in considering the results of such testing are similar to the problems found when analyzing the results of other already described screening tests for dementia. Anthony, et al.[28] reviewed the limits of the MMSE as a screening test. In the inpatient setting with a score of 0 to 23 considered abnormal and a score of 24 to 30 considered normal, the MMSE was 87 percent sensitive and 82 percent specific; the false-positive rate was 39.4 percent, and the false-negative rate was 4.7 percent. Because all subjects with false-positive tests in their analysis had less than a 9th grade education, eliminating them from the screening process would most likely eliminate an unacceptably high false-positive rate. If one were to pursue population screening for cognitive dysfunction, it would be necessary to develop a nonliteracy-based screening instrument to avoid the problems encountered in using MMSE or other similar literacy-based tests.

The cost of evaluating large numbers of persons identified as abnormal is prohibitive at current Medicare and Medicaid reimbursement levels. In personal communication with several directors of geriatric assessment units and in our personal experience, Medicare and Medicaid reimburse for approximately 25 to 35 percent of usual and customary charges for dementia work-up. With reimbursement far below operating costs, physicians who accept Medicare assignment likely will be unable to accept great numbers of patients for evaluation. Physicians who do not accept Medicare assignment could well be out of reach of the poor and those living on modest fixed incomes. Because minority groups are the most rapidly growing portion of the over-65-year-old population and the least likely to seek or afford a comprehensive evaluation, a population-based mental status screening program would discriminate against the poor and would result in less than adequate follow-up services for them.[29,30]

Few physicians possess sufficient expertise to assess the validity of screening test results. Kane, et al.,[31] in their discussion of health manpower

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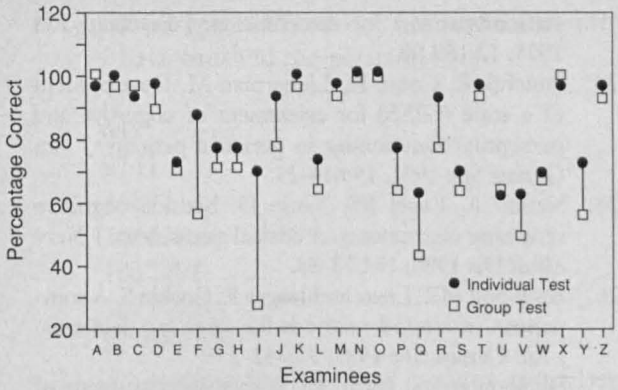

Figure 1. Discrepancies in the percentages of correct answers for the individual Folstein Mini-Mental Status examination and the group examination.

issues, predicted a need for 7000 to 8000 trained geriatricians in 1990. Approximately 4000 physicians have passed a board examination certifying added qualifications in geriatrics. If this number represents the pool of qualified geriatricians, it is far short of projected needs. With the rapid expansion of the number of national geriatric fellowship training programs, we hope that this pool of trained geriatricians will gradually improve. In the interim, however, experts in the area of dementia evaluation are in short supply.

Changes in cognitive function associated with early dementia are difficult to distinguish from benign memory loss.[32-34] Often, the only way to distinguish the difference is to do repeated evaluations on a semi-annual or annual basis, and persons falling into a "borderline abnormal" range can potentially face an uncertain future. One can certainly argue that little can be done in the earlier stages of a developing dementia syndrome and that the anguish raised by early recognition is not justified by the amount of disability present or the interventions currently available. On the other hand, there are data to suggest that attention to such risk factors as hypertension and smoking may improve cognition in persons with multi-infarct dementia. Unfortunately, as yet there is no intervention that will slow or reverse the relentless progression of intellectual loss associated with Alzheimer disease. The only current justification for early detection of this disease is the possible benefit from a comprehensive assessment and the resulting use of appropriate support services by affected individuals and their caregivers. The benefits of many recommended interventions have not been scientifically studied or established, and they are described mostly anecdotally by geriatric specialists.[6,35] Participants in a mental status screening program would need to be fully informed of the limitations and potential benefits of the test and be willing to have adequate follow-up of abnormal results. In addition, mental health professionals should be available to counsel persons who might require such support.

In this pilot study, the findings of a mental status screening instrument designed to be administered in the group setting demonstrated a high correlation with those of the individually administered MMSE. Evaluation of an expanded instrument appropriate for group administration that will test a broader array of cognitive functions and offer testing options for illiterate persons is planned. A team of expert clinicians will establish norms through comprehensive evaluation of study subjects. Such an instrument may prove useful in population-based screening programs designed to identify persons in need of thorough evaluation, potential diagnosis, and treatment of a dementing illness at an early stage.

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Appendix

Group Mental Status Screening Test

(The following statements and questions were read to the subjects.)

Today, I will give you a test that has been used for many years to test mental function. I will also add a few additional questions that I have found to be useful.

I will ask you some questions, and you will write your answers on the answer sheet that has been handed out to you.

1. I will say sets of numbers and after each set you should write down the numbers as you

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recall them. Do not write the numbers until I have finished the entire set.
79
642
9741
36892
741628
1037491
36259761
821943649

2. Write down the names of as many animals as you can think of. You will have 1 minute to do this. Don't worry about your spelling, I'm only interested in how many you can recall in 1 minute. Start now.
3. Write down your explanation of the following saying: "A stitch in time saves nine."
4. If you found a letter on the sidewalk that was addressed and had an uncancelled stamp on it, what would you do with it? Write your answer in the space on your answer sheet next to number 4.
5. What is today's date?
6. What year is it?
7. What month is it?
8. What day in the week is it?
9. What season is it?
10. What is the name of this place?
11. What floor are we on?
12. What is the name of this town?
13. What county is this?
14. What state is this?

15, 16, and 17. I will say three words, and I want you to listen carefully. When I have finished, write the words in spaces marked 15, 16, and 17 on your answer sheet.
The words are: BALL, FLAG, TREE
Try to remember these words because in 3 minutes I will ask you to recall them.
Please hand in your answer sheet at this time. Make sure your name is written on the sheet.
We will now pass out another sheet. Place your name on this sheet.

18, 19, 20, 21, and 22. Now I will test your ability to do some simple calculations. Starting with 100, count backward by subtracting 7s and stop after five subtractions.

23, 24, and 25. Now recall the three words I asked you to remember and write them down in the spaces marked 23, 24, and 25.

26 and 27. I will show you two objects. I want you to write down the name of the objects in the spaces marked 26 and 27.
WATCH, PENCIL

28. Write a short but complete sentence in the space marked 28.
29. Copy the figure in this drawing exactly as you see it. Draw it in the space marked 29. (A flip chart is used to display two intersecting pentagons.)
30. Copy the following figure exactly as you see it. (A flip chart is used to display a 3-dimentional cube.)

31, 32, 33, 34, 35, and 36. Write down the names of the objects in the drawing. (A flip chart is used to display six common objects that are shown to the group.)

37, 38, and 39. I will give each of you an envelope. Place your answer sheet in the envelope. Seal the envelope. Then write your name on the front of the envelope.

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