

Brief Screening Tests for Dementia

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Objective: To compare brief dementia screening tests as candidates for routine use in primary care practice.

Method: We selected screening tests that met 2 criteria: 1) administration time of 10 minutes or less in studies including individuals with, and without, dementia; and 2) performance characteristics evaluated in at least 1 community or clinical sample of older adults. We compared tests for face validity, sensitivity, and specificity in a clearly defined subject sample; for vulnerability to sociodemographic biases unrelated to dementia; for direct comparison with an accepted standard; for acceptability to patients and doctors; and for brevity and ease of administration, scoring, and interpretation by nonspecialists.

Results: Thirteen instruments met our inclusion criteria. Very short tests (1 minute or less) proved unacceptable by several criteria. Standard instruments requiring more than 5 minutes to complete, including the best-studied Mini-Mental State Examination (MMSE), were found to be too long for routine application. Several failed other performance tests or could not be adequately assessed. Short tests taking between 2 and 5 minutes that can be administered by nonspecialists with little or no training and are relatively unbiased by language and education level appear to be superior to both shorter and longer instruments.

Conclusions: Three tests showed the most promise for broad application in primary care settings: the Mini-Cog, the Memory Impairment Screen, and the General Practitioner Assessment of Cognition (GPCOG). Formal practice intervention trials are now needed to validate the utility of short screens with regard to implementation, effect on rates of diagnosis and treatment of dementia patients, and outcomes for patients, families, and health care systems.

(Can J Psychiatry 2002;47:723–733)

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Clinical Implications

- Methods currently exist that can likely improve recognition of dementia in elderly primary care patients.
- No single dementia screening tool has been shown to pass all the relevant performance tests needed to include it in a guideline-level recommendation.
- Not all screening methods are equal, and care must be used in interpreting the results of published studies. Proof of the value of widespread screening must be established by health services intervention trials in primary care practices.

Limitations

- We included only papers published in English.
- We did not explicitly consider application costs.
- We make no recommendations regarding practical responses to false-positive and false-negative screens.

Key Words: *dementia screening methods, primary care, general practice, short tests*

Should doctors screen their elderly patients for cognitive impairment?

Because of the high prevalence and social costs of dementias in late life and the emergence of useful therapies, a growing consensus favours cognitive screening as part of routine primary care of the elderly (1–4). The goals of cognitive screening in primary care differ considerably from those of dementia epidemiology, and methods for evaluating its utility will also differ. Routine dementia screening in primary care could achieve several useful objectives in addition to dementia detection: it could sensitize primary care physicians to the possibility of declining cognition in their older patients, accelerate translation of research advances into actual practice, promote development of quality standards for dementia care across practice sites and styles, and encourage design of proactive strategies for population-based health care of dementia patients and their families (5,6).

Screening will become increasingly important as the elderly population grows, because dementia prevalence dramatically increases with age (7), and most dementia detection will occur at the primary rather than specialty care level. To meet the unique objectives of screening in primary care, instruments that are brief, reliable, and simple to use are of primary importance. This paper examines various brief dementia screens with the goal of identifying those that 1) best classify subjects with, and without, cognitive impairment, 2) are most suitable for primary care, and 3) are likely to be used routinely by physicians.

Is screening being done? If not, why not?

Dementia screening in primary care settings is infrequent, and questions asked about cognition during a primary care visit generally follow no standard format (8). Several studies conducted in primary care settings over the past 20 years document high rates of missed dementia diagnoses (5). More recently, Valcour and others found that dementia was missed in 67% of all affected patients and in 91% of cases when impairment was mild (9). General practitioner surveys have discovered that only 24% of Canadian (10) and 39% of Australian (3) doctors surveyed routinely screen for dementia using any recognized method. Many of these physicians are familiar with standard dementia screens—the best known being the Mini-Mental State Examination (MMSE) (11)—but consider them too long and too difficult to interpret. Some believe that the process of dementia screening itself would be threatening to patients and are therefore reluctant to do it. However, if a brief and simple instrument were proven effective, 93% of physicians surveyed said they would use it (10).

Administration time is a critical determinant of the acceptability of routine dementia screening. What is too long? Increasingly scarce contact time between doctors and patients

dictates that screening should be possible in a fraction of the time allowed for a typical office visit, or perhaps even be done by office staff while patients wait for appointments (5). The average length of a primary care visit varies from 7.5 minutes in the UK (12) to 19 minutes in the US (13). Screens that can be administered in 5 minutes or less would seem the most likely to be useable in primary care. Given that the MMSE typically requires 5 to 10 minutes to give (although, as for all screens, it requires less time for robust, cognitively intact younger elderly and more time for very old individuals with dementia) and is still underutilized by doctors, we therefore emphasize instruments completed in 10 minutes or less.

Contrasting Approaches to Dementia Screening

Dementia screening tools fall into 3 main categories: cognitive tests administered to patients, questions about cognition and function asked of proxy informants, and functional assessments that use direct observation-of-test tasks. Cognitive tests provide a snapshot of current cognitive performance, while informant-rated screens can provide a longitudinal view of changes in cognition-dependent behaviours over time. Some instruments combine elements of both approaches in a single composite tool. Direct assessments of function observe the patient's ability to perform specific tasks, usually related to activities of daily living. The Medication Management Test (14), which measures a patient's ability to learn and use a hypothetical daily medication regimen, is an example of this approach that has been validated against direct cognitive screening. However, functional screens are considerably less developed than cognitive- and informant-based approaches and will not be further addressed here.

Conceptual and Methodological Issues in Evaluating Screening Instruments

Several factors influence the effectiveness of screening instruments. Therefore, results should always be interpreted with the study design and goals in mind. In general, screening instruments perform best when the target sample has a high proportion of individuals with dementia and the severity of impairment in cases is high. They perform worst in samples containing infrequent cases of mild dementia. This means that studies examining different tests in samples dissimilar along these dimensions will not be directly comparable. Typical ways of reporting performance, such as sensitivity, specificity, and predictive values of positive and negative tests, are not fixed properties of test instruments but features of how they perform under specific applications to specific study samples.

Tests should be validated against a diagnostic standard applied equally to subjects with, and without, dementia and to those with mild, ambiguous, and questionable impairments. If

the entire sample is not subjected to stringent neuropsychiatric evaluation (for example, if normal subjects are classified only by a screening test and not approached with the same diagnostic rigour as are subjects with dementia), individuals with mild cognitive impairment could be inadvertently classified as normal. If screening tests are examined in clinical or convenience samples that maximize differences between normal subjects and those with dementia (a common and appropriate initial step in instrument development), results will not constitute a definitive performance test in “real-world” application. If studies are conducted on samples that restrict subjects’ education and language (such as samples including only those with at least an 8th grade education who speak English), these sampling constraints could hinder generalizability.

Ideally, tests should be validated in population-based samples that represent the target groups in which a screen will ultimately be used. A reasonable compromise with this gold standard calls for efforts to validate instruments in samples representing as broad a range as possible of education levels and ethnolinguistic and cultural backgrounds. Examining heterogeneous samples is particularly important in regard to screens considered for use in primary care settings. This is because minority elders are the fastest-growing population of older adults in developed countries such as the US (15) and pose the greatest challenges for dementia screening.

Tests can also be validated by comparing them with a known reference standard, such as the MMSE, on the same population. Stuss states that cognitive screening tests must be formally compared to effectively choose between them (16). (Various studies that have done this [16–18] favour comparisons using receiver-operating characteristics [ROC], because these are better measures of performance when cut-off points are not standard or do not apply to a given sample.)

Characteristics of an Ideal Dementia Screening Instrument

A dementia screening tool appropriate for routine use in the primary care setting must be brief; easy to administer; acceptable to older persons; minimally affected by education, sex, age, and other factors unrelated to dementia; and have high sensitivity and specificity (19). Because the performance characteristics of screening instruments vary widely, depending on the study sample characteristics, instruments proposed for general use should perform as well or better in the same sample as do well-established methods such as the MMSE. The optimal screen should directly test cognitive processes considered central to a diagnosis of dementia—most particularly, Alzheimer’s disease (AD), the most prevalent form. The minimum domains tested should therefore include a test of short-term memory and an indicator of executive function.

The ideal screen should also be sensitive to very mild and pre-clinical stages of dementia.

Because physicians have repeatedly indicated that administration time is a key determinant of whether dementia screens are used, we have grouped this review of screening instruments roughly by testing time (Table 1). The instruments are divided into very short screens (0 to 2 minutes), short screens (2 to 5 minutes), and standard screens (5 to 10 minutes).

Very Short Screens (0 to 2 Minutes)

Clock Drawing Tests

Clock drawing tests (CDTs) are widely accepted cognitive screening tools, despite the lack of a single standard for administration or scoring. As a group, a major strength of CDTs is their capacity to reflect, in composite form, the intactness of many interdependent cognitive functions. These include long-term memory, auditory processing, strategy planning, visual memory and reconstruction, visual-spatial function, motor programming and execution, numerical knowledge, abstract thinking, concentration, frustration tolerance, and inhibition of impulsive responding and of the tendency to be pulled astray by perceptual features (20). In an extensive review of CDTs, Shulman found that most achieve sensitivities and specificities of about 85%, can take less than 1 minute to administer, and are acceptable to patients (21).

All CDTs ask the subject to draw a clock face reading a given time, but specific instructions vary among test methods. Some clock tests present a predrawn circle (22–25), while others require the subject to draw a circle freehand (26–28). Numerous guidelines have been proposed for scoring both the quantitative and qualitative aspects of clock drawings (22,24–28), and several papers have directly compared various CDT methods (18,21,29–31). Overall, the Shulman and Mendez methods, included in most comparison studies, have proven among the most reliable, but still modest, predictors of dementia, with ROC analyses giving areas under the curve of 0.79 for the Shulman and 0.78 for the Mendez (18). Royall compared several CDTs to a version explicitly designed to reflect executive control (CLOX 1), finding good correlations with scores on the MMSE and an interview measure of executive dysfunction (30). Borson reported that the CERAD CDT did better than the MMSE and the Cognitive Abilities Screening Instrument in detecting dementia in poorly-educated English-speaking subjects, but its overall performance was not adequate for dementia screening (32). Storey reached a similar conclusion, finding that CDTs should not be used alone as the sole dementia screening test (18).

The efficacy of CDTs for detecting dementia is influenced by the severity of cognitive impairment. Scanlan compared 7 expert systems and ratings applied by inexperienced judges to a

Table 1 Brief dementia screens

Screening tools	Test time	Sensitivity	Specificity	Acceptable to patients	Education bias	Language or culture bias	Comparison with MMSE	Simple Scoring	Tests key cognitive domains
Very short (0 to 2 minutes)									
Clock tests (18,21,29)	1 minute or less	Adequate	Adequate	Yes	Some	Little or none	Worse	Yes	No
Time and change (35)	1 minute or less	Low	Low	Yes	Little or none	Strong	Worse	Yes	No
WORLD (36)	1 minute or less	Low	Low	Yes	Some	Strong	Worse	Yes	No
Short (2 to 5 minutes)									
Mini-Cog (5,37)	3.2 minutes	High	High	Yes	Little or none	Little or none	Better	Yes	Yes
GPCOG (38)	4.5 minutes	Adequate	Adequate	Yes	—	—	Equal	Yes	Yes
Short Blessed (16,41,81)	5 minutes (telephone)	High	High	Yes	Strong	—	Better	Yes	Yes
MIS (41)	4 minutes	Adequate	High	Yes	Little or none	—	—	Yes	Yes
STMS (43,44)	5 minutes	Adequate	Adequate	—	Strong	—	Equal	Yes	Yes
Long (5 to 10 minutes)									
MMSE (45,62)	7 to 10 minutes	Adequate	High	—	Some	Some	—	No	Yes
7-Minute Screen (67)	8 minutes	High	High	—	Little or none	—	Better	No	Yes
SAS-SI (69)	10 minutes	Adequate	Adequate	—	—	—	Better	Yes	Yes
SPMSQ (70)	(10 items)	Low	High	—	Some	—	—	No	No
Short IQCODE (75,76)	10 minutes	Adequate	Adequate	Yes	Little or none	—	Better	Yes	n/a
Dash marks denote that data are unavailable or unpublished. n/a = not applicable.									
GPCOG = General Practitioner Assessment of Cognition; IQCODE = Informant Questionnaire for Cognitive Decline in the Elderly; MIS = Memory Impairment Screen; MMSE = Mini Mental State Examination; SAS-SI = Short and Sweet Screening Instrument; STMS = Short Test of Mental Status; SPMSQ = Short Portable Mental Status Questionnaire; WORLD = The WORLD test.									

single set of 80 clock drawings (29). All systems worked well in identifying subjects without dementia and subjects with severe dementia. In cases of mild and moderate dementia, however, some scoring methods were clearly better than others, with Mendez' method performing best, followed by the CERAD method. Among the better CDT systems, Mendez' is superior for longitudinal research designs, but, with 20 possible points and the need for specialized scoring rules close at hand, it is too complex for initial screening in primary care. Shulman agrees that the simpler scoring methods are best (21).

Other limitations of CDTs include adverse performance effects of low education (24,32–34) and advanced age (24,33). Language spoken (32) and sex (31) have no direct effects on performance, and not all investigators find an effect of age (31).

Despite their limitations, however, CDTs may have distinct advantages in certain situations, because they can be used by individuals with little or no experience in cognitive assessment and minimal training in test administration. Scanlan (29)

found that a simple binary rating of clock drawings (normal or abnormal) by untrained raters was surprisingly effective in classifying subjects as having dementia or not, though inferior to the best systems studied (Mendez and CERAD). A common mistake of naïve scorers was failure to recognize incorrect spacing of numbers on the clock face as abnormal. Training directed at this type of error should improve concordance between naïve and expert raters and could improve dementia detection rates in geriatric care settings where detailed cognitive assessment is not an option.

Time and Change Test

The Time and Change Test, developed by Froehlich, has 2 sections: telling time from a preset clock and making change for a dollar using ordinary coins (35). While very brief (reportedly < 1 minute) and unaffected by race or education in initial testing (35), tradeoffs between sensitivity and specificity for this test were unacceptable. To meet desirable standards for dementia detection, the test requires refinement and recalibration.

WORLD Test

The “spell ‘world’ backwards” item of the MMSE was modified to create a stand-alone screen, the WORLD Test. Subjects are asked to spell world forwards and backwards, and then to arrange its letters in alphabetical order (36). In a sample of 127 subjects, 57% of whom suffered from dementia, the WORLD Test gave a sensitivity of 85% and a specificity of 88%. Education biased results, but age and sex did not. The test is easy to score. Tests of this type are bound by cultural and linguistic factors as well as by education and literacy, and would therefore be difficult to use over a broad range of subjects.

Summary: Very Short Screens

CDTs used as dementia screens have the advantages of brevity, acceptability to patients, and, in some cases, simple scoring. Their performance may be less strongly affected by level of education, language, and other variables not related to dementia than are some other screens, but they lack a measure of short-term memory. In general, clock tests may not be accurate enough for use as a stand-alone dementia screen. Like clock tests, the Time and Change Test is extremely brief, but it is not sufficiently developed for general application. The WORLD Test is highly constrained by demographic variables irrelevant to dementia classification.

Short Screens (2 to 5 Minutes)*Mini-Cog*

The Mini-Cog was developed as a very brief screen for primary care settings. It can be administered with minimal training in an average of 3.2 minutes (5,37). In the Mini-Cog, a memory test (specifically, recall of 3 unrelated words) is included because memory loss is a core symptom of dementia and develops early in AD, the most common dementia of later life. A CDT (adapted from CERAD) is included as a distractor for the memory task, and adds important information reflecting a broad array of cognitive competencies impaired in dementias. A third consideration in the Mini-Cog’s development is the increasing ethnic diversity of elderly populations, which has established a need for simple tests that are relatively free of language, education, and cultural biases. The Mini-Cog had high sensitivity (99%) and specificity (96%) in a community sample of 249 ethnolinguistically diverse elderly, one-half of whom had dementia and one-half of whom were cognitively intact. Its performance was unaffected by education or language, whereas the MMSE was affected by both (5). Further testing in a mainstream epidemiological sample of 1119 older adults with a dementia prevalence of 6.3% identified individuals with dementia as well as the MMSE and a standard neurocognitive battery (19). The sensitivities of these 3 approaches ranged between 0.75 and 0.79, with specificities of 88% to 90%.

In a multiethnic sample, the Mini-Cog detected most of the subjects with mild dementia and essentially all the subjects with moderate and severe dementia—many of whom were not recognized by their physicians as cognitively impaired (6). In addition, over one-half of the subjects with mild cognitive impairments (that is, below the threshold for a dementia diagnosis) were detected by the Mini-Cog.

General Practitioner Assessment of Cognition

The General Practitioner Assessment of Cognition (GPCOG), developed by Brodaty, is an example of a test that combines cognitive and informant data (38). Comprising 9 cognitive questions and 6 informant-rated items, it was (like the Mini-Cog) developed for primary care. The GPCOG was compared with the MMSE and the Abbreviated Mental Test (AMT) in a nonrandom sample of 283 community-dwelling elderly patients with memory complaints or aged 75 years and over. Of this sample, 29% were definitely diagnosed with dementia; an additional 18% were thought to have dementia, but collateral history could not be obtained. Non-English-speaking subjects were excluded. When both cognitive and informant portions were completed, the GPCOG detected subjects with dementia about as well as the MMSE. Administration time is estimated at 4 to 5 minutes, with a sensitivity of 0.85 and a specificity of 0.86. Two-fifths of the individuals without dementia who scored in the demented range on this screen were found to have subthreshold cognitive impairments, suggesting utility in detecting those with mild cognitive impairment (MCI). Physicians who participated in this study found the GPCOG acceptable and feasible for use in their practices. However, at least 1 of the instruments from which the GPCOG was derived (the CAMCOG [39]) is significantly biased by sociodemographic factors, urging caution when interpreting scores.

Short Blessed Test

The Short Blessed Test (SBT), also known as the 6-CIT or the 6-OMC, is a 6-question test developed as a more concise version of the Blessed Information Memory Concentration Test (BIMC) (40). The 6 questions take approximately 5 minutes to administer and query time orientation (that is, year, month, and time of day), ability to count backwards from 20 to 1, ability to say the months of the year in reverse order, and ability to repeat a memory phrase. The SBT was tested on 287 nonrandomly selected patients and community control subjects, comprising a sample with 53% of subjects having dementia (12). SBT and MMSE scores were highly correlated overall ($r = 0.91$), but the SBT was superior for detecting mild dementia and more sensitive to subthreshold impairments. Test scores are adversely affected by age and education (16).

Memory Impairment Screen

The Memory Impairment Screen (MIS), developed by Buschke, comprises 4 items administered in 4 minutes (41). In a sample of 438 English-speaking community volunteers (11% with dementia, which is only slightly higher than the population prevalence), sensitivity was 80% and specificity was 96%, using the optimal cut-off score. Age, education, and sex did not significantly affect performance. In comparison with a 3-item recall task (42) in a partly randomly selected population with a similar prevalence of dementia (11%), the MIS showed superior sensitivity and specificity.

Short Test of Mental Status

The Short Test of Mental Status (STMS) is a 5-minute test very similar in content to the MMSE. It encompasses orientation, attention, learning, arithmetic calculation, abstraction, information, construction, and recall (43). In a sample of 180 English-speaking subjects (48% with AD or other dementia), sensitivity of the STMS was 92% and specificity was 91% at a cut-off of 29 out of a possible 38 points. However, performance was highly correlated with education, limiting its value as a screen for general use. In a replication study of 267 individuals, 41% of whom had dementia, sensitivity was somewhat lower (86%), but specificity was somewhat higher (94%), when scores were adjusted for age and education confounders (44).

Summary: Short Screens

All the screens in this group share certain core components. All include a test of short-term memory with either 3 (Mini-Cog), 4 (MIS), or 5 items (GPCOG and SBT). Both the Mini-Cog and the GPCOG use a CDT. In theory, the Mini-Cog and the GPCOG should be more efficient than the MIS, because their recall distracters generate useful information that contributes to dementia detection, whereas the distracter task in the MIS does not. However, there has been no direct test of the comparative performance of these 3 approaches.

The short screens examined here share the advantages of requiring 5 minutes or less to administer, of testing core components of dementia syndromes, and of displaying good-to-excellent psychometric properties. Relative to the established standard of the MMSE, 3 of the 4 tests (Mini-Cog, GPCOG, and SBT) have been shown to perform as well (GPCOG in a clinical sample and Mini-Cog in an epidemiological sample) or significantly better (Mini-Cog in a multiethnic sample and SBT in a clinical sample). Some have the additional advantage of relative freedom from bias by educational attainment (Mini-Cog and MIS) or language (Mini-Cog). While the GPCOG is also presented as being free from education bias, the actual data and analyses demonstrating these effects have not been published.

The weaknesses of these procedures are relatively minor. The full form of the GPCOG involves obtaining informant data as well as cognitive testing. This requires clinicians to contact and gain the assistance of a knowledgeable individual, generally assumed to be a family member. Unlike the other 3 tests, the SBT has been shown to have significant education biases, and it may also have language or cultural biases that have yet to be examined.

“Standard” Screens (7 to 10 Minutes)*Mini-Mental State Examination*

The Mini-Mental State Examination (MMSE) remains the most familiar and widely used cognitive screening test worldwide (45). In various forms, its 17 items have been in use for almost 30 years, and it has been translated into many languages and modified in various ways. It takes, on average, 5 to 10 minutes to administer and covers orientation, registration, short-term memory, attention, calculation, visuoconstructional skills, and praxis. Points are given for correct answers, and the traditional cut-off score for dementia in mixed neuropsychiatric samples is < 24/30. In varying samples, appropriate cut-off scores must be established and reset for optimal performance (46).

MMSE scores are affected by age, education level, cultural background, social class, literacy, and language (16,47–61). Since the MMSE was released, there have been several attempts to adjust for the performance biases introduced by these factors (62). In a study of over 4000 MMSEs given to predominantly white, English-speaking, primary care patients (63), optimal performance could be achieved only by adjusting cut-offs for education and age, a feature that makes the MMSE complex and time consuming for general use. Moreover, most participant physicians found the MMSE too long and believed that it contributed little to their recognition of dementia. Importantly, this belief was not empirically tested against research diagnoses.

Several attempts have been made to extract from the MMSE the items that best predict dementia, to shorten the screening process but still retain its familiar concepts. Braekhus analyzed the individual items on the MMSE (64). This author found that, with a cut point of 23/24, 12 items which could be scored binomially performed as well as the whole instrument. Magaziner proposed a shorter 7-item version that significantly predicted total score and suggested that selective weightings of specific questions can adjust for age and education biases (55). Wind reduced the MMSE to 4 items that detected dementia as well as the full MMSE (51). Other attempts to reduce education or ethnolinguistic bias or length of the MMSE include those of Mungas (47), Molloy (65), and Ganguli (66). Each emphasizes modifications for a particular

cultural group, a strength for research and clinical use when a population is large but an impediment in multicultural settings.

The 7-Minute Screen

The 7-Minute Screen (7MS), developed by Solomon for rapid diagnosis of probable AD cases, comprises 4 tests (that is, orientation, memory, clock drawing, and verbal fluency) and takes an average of 7 minutes and 42 seconds to administer (67). Developed on a sample of 120 English-speaking subjects, 50% of whom had probable AD, the 7MS correctly identified 92% of subjects with, and 96% of subjects without, dementia. It detected patients with mild and very mild dementia better than the MMSE (using the standard cut point). Age, education, and sex had no significant effects on test performance, but all subjects had at least 8 years of education. Results from a follow-up study in a primary care sample suggested that the 7MS could be an effective screen in that setting (68), but tests of its practicality have not yet been done. This test requires considerable training, together with a specially designed, hand-held computer programmed to yield a likelihood of dementia and AD, based on individual test results entered by the tester.

Short and Sweet Screening Instrument

The Short and Sweet Screening Instrument (SAS-SI) (69) derives from analysis of tests used in the population-based MoVIES study of dementia prevalence and incidence. In a sample of 1366 predominantly white subjects, the component items combined detected dementia better (sensitivity and specificity of 94% and 91%, respectively) than did a full neuropsychological battery. Used by itself, it can be given in 10 minutes. However, the SAS-SI does not contain a memory test and therefore does not test a core symptom of dementias in general and of AD in particular.

Short Portable Mental Status Questionnaire

The Short Portable Mental Status Questionnaire (SPMSQ) was among the first cognitive screening tests designed for geriatric application; it was first reported the same year as the MMSE (70). This 10-item test aims to detect "organic brain syndrome" and is easy to score. It covers short- and long-term recollection, orientation, current event information, and mathematical tasks. The number of errors determines whether the subject is classified as having intact intellectual functioning or mild, moderate, or severe intellectual impairment. To develop population norms for this test, the SPMSQ was administered to a random population sample of 997 elderly white and African-American southerners in the US. Error scores were assessed as percentiles of the population, assuming a priori that 10% or less of the population were likely to be impaired. In a subsequent comparison with a clinical sample of 133 elderly patients, 40% of whom had a psychiatric

diagnosis of dementia, the SPMSQ had a sensitivity of 67% and a specificity of 96%. The same evaluation of an institutional sample with a 34% prevalence of dementia showed a sensitivity of 26% and a specificity of 98%. A language- and content-modified version administered to 2407 Spanish-speaking elderly in 3 separate studies (71) found large effects of literacy on error scores but showed that short versions were as informative as the longer test. As in the original study by Pfeiffer (70), cut-off scores had to be adjusted for education and literacy. The test has been criticized for its lack of a learning and memory task (43).

Summary: Standard Screens

The MMSE has a long history of use in many populations and can have acceptable psychometric properties, but administration time and cut-off score adjustments for education, literacy, language, and age compromise its general utility. (Similar concerns pertain to the STMS.) While reduced forms of the MMSE are promising, they will require testing for educational and linguistic biases.

The 7MS has excellent psychometric properties when used to separate AD patients from cognitively normal individuals who speak English and have at least 8 years of education. Its specialized administration, scoring, and training requirements, as well as its length, limit its value in primary care. The SAS-SI also has acceptable psychometric properties but, at 10 minutes, is clearly too long. It does not test memory, compromising its face validity.

Informant- or Proxy-Rated Screening Instruments

Informant-based tools can be as effective as cognitive tools for dementia screening and have many advantages: they can measure change longitudinally, they can be used for subjects unable to do cognitive testing for any reason, they are relevant to everyday cognitive activities, and they can be used cross-culturally (72). Jorm and others also point out that intelligence, education, and physical disabilities do not affect informant tests, but that the informant's personality, relationship with the patient, and observational capacities do (73).

Informant Questionnaire for Cognitive Decline in the Elderly

The IQCODE, developed by Jorm, assesses prior cognitive decline over time, based on ratings of everyday cognitive abilities (74). Informants are asked about the subject's change in capabilities in relation to performance 10 years ago, rating change on a 5-point scale (1 = much better, 3 = little change, 5 = much worse). The original test had 26 questions, but a shortened 16-question version has proven just as effective, with a correlation between the 2 versions of 0.98 (75,76). The short

IQCODE takes an average of 10 to 12 minutes (range 8 to 15 minutes) to administer (Borson, unpublished data).

The IQCODE has been tested in several non-English-speaking populations with varying levels of education and literacy. A study of Thai elderly with 4 years of education or less found the predicted negative correlation between scores on a short version of the IQCODE and the Thai MMSE but no effect of age, education, or sex (77). Three items carried most of the instrument's power to classify cognitive status: learning to use new gadgets, knowing the day and month, and handling everyday arithmetic problems. The IQCODE has also been examined in Chinese (78), Japanese (79), and Spanish (80) versions, further supporting its cross-cultural validity.

Jorm and others compared the Canberra Interview for the Elderly, a cognitive test battery that includes the MMSE, with the IQCODE (73). They found that mean IQCODE scores of 4 or 5 (representing moderate or severe decline in everyday cognitive abilities) coincided with a decline in scores on the MMSE and several other cognitive tests over the previous 3.5 years. A follow-up study (76) found that subjects with baseline IQCODE scores as near normal as 3.5 were likely to show deteriorating performance on directly administered cognitive tests over a period of 7 to 8 years, suggesting that knowledgeable informants are able to identify small changes in everyday abilities that presage future decline.

Summary: Informant- or Proxy-Rated Screens

Informant-based dementia screens provide an estimate of change over the long time periods typically seen in evolving dementias, evaluate cognitive abilities related to everyday function, and appear minimally affected by cultural, educational, and language biases. However, proxy screens do not substitute for direct cognitive assessment in practice settings, since many older patients do not arrive at the doctor's office with someone who has known them well for a long time and is willing to discuss the subject's failing abilities (which may be against cultural or personal norms). In a general practice study (38), 38% of patients thought to have possible or probable dementia failed diagnostic criteria because no reliable history of cognitive decline could be obtained—a history that must come from someone who knows the patient intimately. Also, existing proxy screens are too long for primary care use: even the "short" IQCODE needs 10 minutes or more. A promising line of investigation uses item reduction analyses to create ultra-short IQCODE versions containing only the essential dementia-detecting items. Early work with Thai elderly suggests that as few as 3 items may be sufficient (77), but additional study is needed to determine the number and nature of the questions that most consistently and reliably detect dementia and whether these are affected by ethnocultural factors.

Remote Dementia Screening: Telephone and Mail Screens

Several cognitive- and informant-based dementia screening tests have been adapted for telephone administration, including a 5-minute telephone version of the SBT (81) that correlates highly ($r = 0.96$) with face-to-face administration, and the Telephone Interview for Cognitive Status (TICS) (82), which correlates highly ($r = 0.94$) with the MMSE. The 11-question TICS was tested in a clinical sample of 133 patients, 75% of whom had probable AD, giving a sensitivity of 94% and specificity of 100% (82) and discriminating between subjects with mild dementia and normal subjects. The time taken to administer the test was not provided. Scores were unrelated to age but were affected by education. Several other telephone screening instruments (the Structured Telephone Interview for Dementia Assessment [STIDA] [83], the Dementia Questionnaire [84], and the Minnesota Cognitive Acuity Screen [85]) take longer to administer than the 10 minutes we set for inclusion in this review.

Dementia screening has also been attempted by mail. Ball used a survey that included a clock completion test (CCT) and questions about various putative AD risk factors (86). Response rates were inadequate for population screening (63%) and were much lower among subjects determined to have dementia, and scores were not closely related to SBT scores. The CCT failed to detect the 82% of individuals with SBT scores below the dementia-screening cut point. This approach merits further development as a population screening concept but does not work well in its present form.

Summary and Comments

Evaluating dementia-screening tests is a complex task. Reports of excellent sensitivity and specificity for a given instrument must consider whether performance may be inflated by high rates of dementia in the study sample, by high average severity of cognitive impairment among affected persons, or by exclusion of subjects with demographic characteristics that compromise many screens. The practical aspects of test administration must be measured against the constraints of primary care practice.

Brevity, effectiveness, freedom from biases irrelevant to dementia status, and simplicity are the key characteristics of an effective dementia-screening tool. Some longer tests may have higher diagnostic precision but are inefficient for use in general practice settings because of time requirements; complexity of administration, scoring or interpretation; and biases associated with demographic factors. Such biases degrade the performance of longer tests to a greater extent than shorter tests. A brief, simple screen that works across a broad range of ages, education levels, languages, and other possible confounding variables would be ideal.

Achieving a balance between minimum administration time and maximum performance is a goal for cognitive screening as part of the primary care of older adults. The shortest tests developed to date are diagnostically inferior to longer ones: none has consistently performed as well or better than the MMSE, and none contains a test of short-term memory. For these reasons, very short screens (taking 1 minute or less) cannot be recommended for routine application. In general, the short screens (2 to 5 minutes) have much better psychometric properties. Most have been compared with the MMSE in the same study sample, and are at least equal to it in sensitivity, specificity, and general accuracy. All such instruments described here also test short-term memory, which is universally recognized as a core feature of most if not all dementias. Some short screens have been shown to detect a proportion of subjects with MCI who are either in the very earliest stages of an evolving progressive dementia or have suffered a cognitive insult that has left them with mild stable deficits. The Mini-Cog is an example of a test that detects such individuals with much greater efficacy than do physicians caring for them. The "long" short screens (5 to 10 minutes) have simply proven too long for routine use in primary care; this, and other limitations compromise the likelihood that proxy screens such as the IQCODE will be widely applied in clinical settings. Informant-based screens can help primary care physicians when the results of cognitive screening are ambiguous and when family members are seen as part of a dementia workup.

Critical tests of the value of dementia screening in primary care are lacking, and important unresolved issues merit exploration in practice-based health services trials. The first issue is whether any screening procedure will be adopted in the primary care setting, either by physicians or other office staff (with the approval of the doctors they support and the blessing of cost-conscious practice managers). The second issue is whether implementing such screening will improve case finding and, if so, whether better detection will lead to better management and better outcomes for patients and their families. Now that promising short screens are available, these questions are ripe for systematic inquiry. Reliable answers are essential for developing a healthy dementia care policy for the world's aging societies.

Funding Support

This review was supported by a grant from the US National Institute on Aging, AG 05136.

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Manuscript received and accepted September 2002.

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Résumé : Tests rapides de dépistage de la démence

Objectif : Comparer des tests rapides de dépistage de la démence comme candidats à une utilisation de routine dans les soins primaires.

Méthode : Nous avons choisi des tests de dépistage qui satisfaisaient à 2 critères : 1) une durée d'administration de 10 minutes ou moins dans le cadre d'études comprenant des sujets avec et sans démence; et 2) des caractéristiques de rendement évaluées dans au moins 1 échantillon communautaire ou clinique de personnes âgées. Nous avons comparé les tests quant aux aspects suivants : la validité apparente; la sensibilité et la spécificité dans un échantillon de sujets nettement définis; la vulnérabilité aux biais sociodémographiques non liés à la démence; la comparaison directe avec une norme acceptée; l'acceptabilité pour les patients et les médecins; ainsi que la brièveté et la facilité d'administration, de notation et d'interprétation par des non-spécialistes.

Résultats : Treize instruments satisfaisaient à nos critères d'inclusion. Des tests très brefs (1 minute ou moins) se sont avérés inacceptables selon plusieurs critères. Les instruments normalisés nécessitant plus de 5 minutes à remplir, y compris le très étudié mini-examen de l'état mental (MMSE), se sont révélés trop longs pour une application de routine, et plusieurs ont échoué aux tests de rendement ou ne pouvaient pas être évalués adéquatement. Les tests rapides prenant de 2 à 5 minutes qui peuvent être administrés par des non-spécialistes peu ou pas formés et qui sont relativement non biaisés par la langue ou le niveau d'instruction semblent être supérieurs aux instruments plus brefs et plus longs.

Conclusions : Trois tests sont les plus prometteurs pour une application répandue dans des établissements de soins primaires : le Mini-Cog, le test de dépistage de diminution de la mémoire, et l'évaluation de la cognition de l'omnipraticien (GPCOG). Il faut des essais officiels d'intervention dans la pratique pour valider l'utilité des tests rapides quant à la mise en oeuvre, à l'effet sur les taux de diagnostics et de traitements des patients souffrant de démence, et aux résultats pour les patients, les familles et les systèmes de santé.