

SCREENING FOR COGNITIVE IMPAIRMENT IN PRIMARY CARE: THE ROLE OF OBJECTIVE COGNITIVE TESTS

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INTRODUCTION

Dementia is an age-prevalent neurodegenerative condition that significantly affects the functional ability and quality of life of patients and their caregivers, thereby exacting a substantial cost on society. Its prevalence was estimated in 1995 to be 2.5% among the Chinese elderly and 4.0% among the Malay elderly in Singapore.¹ With our rapidly ageing population, its prevalence is expected to be even higher today, and will likely escalate in epidemic proportions within the next few years, resulting in extensive public health and economic costs. However, like in most other countries, the diagnosis is often missed or delayed.²

Patients suffering from dementia are frequently presented for crisis admission into acute care institutions during moderate stages, when family or carers are no longer able to cope with the social disruption and burden of care caused by significant behavioural problems, which commonly include delusions, hallucinations, agitation, wandering and depression. Retrospective enquiry into the course of the illness invariably uncover a history of forgetfulness that predates the onset of behavioural problems by months to years. Various erroneous perceptions held by patients and carers can account for this delay in presentation for treatment.

Culturally, forgetfulness and even disorientation are commonly perceived locally as an inevitable fate that 'naturally' accompanies old age. This denial of dementia as a disease entity will cause many to decline further evaluation when cognitive impairment is suspected by the physician. On the other hand, even when dementia is acknowledged

as a disease, there exists a view that dementia is incurable and any therapeutic attempt is futile. These misconceptions lead to late or delayed diagnosis of dementia, often associated with unnecessary suffering and under-utilization of health services.

Physicians can also contribute to the problem of ignoring the early symptoms of dementia. A busy ambulatory practice faces practical challenges in terms of time utilisation, and may force the physician to avoid exploring cognitive problems in the elderly. A detailed psychosocial and functional history can be exhausting in terms of time and energy. This can be further aggravated by a lack of updated knowledge on management of dementia, and of information on available referral and community services. Consequently, mild memory complaints that may be suggestive of early dementia are frequently dismissed by the doctor as insignificant or "age-appropriate". Attitudinal barriers in both carers of patients and general practitioners, combined with time constraints, often lead therefore to referrals precipitated by crisis situations, after the carers have experienced significant and prolong carer stress.³

Is screening or case finding necessary at the primary care level?

It is well recognised now that cognitive decline in dementia, in particular Alzheimer's disease, goes through a slow, gradual continuum with subtle deficits present in the early stages. The primary care services are utilised by many elderly patients for chronic care and serve as first point of contact for most mild intercurrent illnesses, thereby offering a valuable window for early diagnosis of cognitive impairment. However, in studies done in Canada⁴ and Australia,⁵ only a minority of

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general practitioners surveyed did routine cognitive screening in the elderly despite the belief of the majority that screening was a necessary function. Perhaps, for primary care physicians in Singapore to serve as a vital link in the early detection of cognitive impairment, they first need to be strongly convinced that early diagnosis is a precursor to proper management and can result in a reasonably good quality of life for both patients and carers.

In spite of its low prevalence, early detection of dementia due to potentially arrestable causes such as Vitamin B12 deficiency, thyroid dysfunction, benign cerebral tumours, can increase the chances of recovery. Optimal treatment may also be symptomatically helpful in the presence of other irreversible causes of dementia. In Alzheimer's disease, pharmacological treatments such as cholinesterase inhibitors are now available for symptomatic improvement, which can enhance quality of life. In dementia due to stroke disease, treatment of vascular risk factors can prevent further vascular events and potentially decelerate progression, an effect which is clinically more meaningful in early stages of the disease. Financial and legal matters are also best attended to at early stages when the disease has not robbed the patients completely of their decision making capacity for financial and estate matters. Behavioural problems can also be better anticipated and managed with drug and non-drug therapies before they become too severe and stressful to carers. Finally, equipping caregivers early with essential information and coping skills will enable them to be better equipped to manage progressive problems with greater confidence and competence.

Can detection be carried out effectively and efficiently at the primary care level?

If primary care physicians are convinced of their crucial role in the detection of early dementia, the next step would be to determine how this can be carried out, both effectively and efficiently. One important question is whether general practitioners should examine all older patients over a certain age for cognitive impairment in screening for early dementia. Studies have shown that the efficacy of and benefits from unselective use of cognitive testing and informant questionnaires for detecting early dementia in older patients attending general practice are limited, with positive predictive values of less than 50%.⁶ Better results may instead be obtained by testing patients who have a relevant history of cognitive or functional decline. Cognitive testing should therefore be targeted at older patients at risk of dementia, either because of an informant history of cognitive or functional decline, clinical observation, or sometimes, very old age.

Diagnosis of dementia can be reached in two broad approaches. One method is the global approach, which elicits a history of cognitive deterioration that has reached sufficient level of seriousness in terms of functional and social declines. This method is deemed by many GPs to be too tedious and time-consuming. The second approach is to ask patients to perform selected cognitive tests. Though the first method is considered the definitive diagnostic modality, objective cognitive test is useful and practical in a busy general practitioner's clinic to select those who have subjective complaints of forgetfulness and whose cognitive screening test scores are suggestive of an underlying pathological process. These patients can then be referred to a specialist clinic

for further evaluation. An ideal cognitive screening test should therefore possess the following qualities: quick to administer (preferably within 5 to 7 minutes), well tolerated and acceptable to patients, easy to score, relatively independent of culture, language and education, good inter-rater and test-retest reliability, high sensitivity and specificity, and has predictive validity. To date, there is no one single instrument for cognitive screening acknowledged to have all these features. However, depending on the time available and the familiarity of the clinician, some tests are more suitable than others. Each of these tests briefly assesses several different cognitive domains and each has reasonable sensitivity and specificity for the detection of cognitive impairment early in course of dementia. The utility and limitations of several commonly used tests will be discussed.

Elderly Cognitive Assessment Questionnaire (ECAQ)⁷ (Table 1)

This 10-item questionnaire was developed by Kua and Ko, who felt that most instruments constructed in the West, where literacy is high, may not be applicable in the current cohort of elderly in Singapore because of cultural differences or low literacy. Based on the methodology adopted in its validation study, the ECAQ is a full-fledged screening instrument which can be used in community dwelling elderly with no cognitive symptom. Using a score of 5 and below out of a possible 10 as the cut-off to suggest cognitive impairment, it has a sensitivity of 85.3%, specificity 91.5%, and a positive predictive value of 82.8%. However, the issue of spectrum bias was not addressed in its validation study, and it has been felt that the cut-off score of 5 and below may have been too stringent for the identification of mild

Table 1: Elderly Cognitive Assessment Questionnaire (ECAQ)

Score 1 point for each answer.

Memory

1. I want you to remember this number. Can you repeat after me: 4517?
2. How old are you?
3. When is your birthday? Or Where were you born?

Orientation information

4. What day of the week is this?
What is the date today?
5. Day?
6. Month?
7. Year?
8. What is this place called (e.g. clinic, hospital)? No necessity to give name of place.
9. What is his/her job (e.g. nurse, doctor)?

Memory Recall

10. Can you recall the number again?

5 points and below – high risk of cognitive impairment

dementia.⁸ No education- or age-adjusted cut-off values have been developed for ECAQ. Nevertheless, despite these limitations, ECAQ is a robustly validated cognitive screening test that was custom-made for the local elderly, and can be practically administered in a busy clinic to screen for cognitive impairment.

Abbreviated mental test (AMT)⁹ (Table 2)

The Abbreviated Mental Test (AMT) is another 10-item cognitive screening instrument designed to identify cognitive impairment. In a validation study in 1991, a cut-off score of 7 and below was found to optimally identify cognitive impairment.¹⁰ This instrument has been validated locally by Sahadevan and colleagues⁸ with adjusted cut-offs established for age and education, two

factors shown in an earlier study to have significant influence on normative psychometric test performance.¹¹ Patients who are relatively younger and greater number of education-years had higher cut-off scores. (Table 3) The strength of this instrument lies in its brevity, and the available age- and education-adjusted cut-off scores to enhance diagnostic accuracy. The validation study addressed the issue of spectrum bias by using predominantly the test results of patients with mild dementia. One limitation of this test is a tendency towards ceiling effect in the more educated patients. Owing to the design of the validation study, these adjusted cut-off scores and their respective sensitivities and specificities, are applicable only when used for patients who have first complained of progressive forgetfulness. This, however, fits well into the needs of a general practitioner's clinic, where the application of cognitive tests should be targeted at those who have a problem of worsening amnesia.

Table 2: Abbreviated Mental Testing (AMT)

Please remember the following phrase : "37 Bukit Timah Road". I will be asking you to repeat the phrase to me later.

1. What is the present year? (Western calendar, i.e. 19__)
2. What time is it now (within 1 hour)?
3. What is your age? (for Chinese, +1yr is usually the norm and hence acceptable).
4. What is your date of birth? (Western year +/- month and day)
5. Where are we now? (For community survey, "my home" or "my son's home" etc. is probably acceptable.)
6. What is your home address? (complete address excluding postal code)
7. Who is Singapore's present Prime Minister?
8. Show picture of a nurse or doctor – what is his/her job?
9. Count backwards from 20 to 1
10. Please recall the memory phrase.

Table 3: AMT – optimal cut-off values adjusted for age and education

	60 – 74 years	> or = 75 years
0 to 6 education years	7 / 8 (97% [#] , 83% [*])	5 / 6 (91% [#] , 100% [*])
> or = 6 education years	8 / 9 (80% [#] , 91% [*])	8/9 (85% [#] , 100% [*])

[#] sensitivity

^{*} specificity

Note: a cut-off score of "8 / 9" denotes high risk of cognitive impairment when scores are 8 and below.

Mini-Mental Status Examination (MMSE)¹² and (modified) Chinese Mini-Mental Status Examination (MMSE)¹³ (Table 4)

The Mini-Mental State Examination (MMSE) was originally designed to provide a brief, standardised assessment of mental status that would serve to differentiate between organic and functional disorders in psychiatric patients. Over the years, it has become a widely used instrument to detect and track progression of cognitive impairment associated with AD and other neurodegenerative disorders. It consists of 19 items which assess immediate and short-term recall, orientation to place and time, attention and concentration, word recall, language, visual construction and the ability to follow simple verbal and written commands.. The optimal cut-off score to indicate cognitive impairment varies in various studies from 23 to 27, out of a possible of 30.

The Chinese Mini-Mental Status Examination (CMMSE) is a modified form of the original MMSE and was used as a cognitive screening instrument in a large-scale epidemiological study of dementia in Shanghai,

Table 4: (modified) Chinese Mini-Mental Status Examination

	Score
1. a) What day of the week is it?	1
b) What is the date today?	1
c) What is the current month?	1
d) What is the current year?	1
2. Where are we now?	1
3. What floor are we on?	1
4. In which estate are we?	1
5. In which country are we?	1
6. Repeat the following words : "lemon, key, balloon"	3
7. Subtract \$7 from \$100 and make 5 subtractions.	5
8. Can you recall the 3 words?	3
9. What is this? (Show a pencil)	1
10. What is this? (Show a watch)	1
11. Repeat the following : English – "No ifs, ands or buts" Chinese – "Forty four stone lions"	1
12. Follow a 3-stage command : "Take this piece of paper, fold it in half, and put it on the floor."	3
13. Say a sentence of your choice.	1
14. Read and carried out the instruction written on this piece of paper: "Raise your hands"	1
15. Copy this drawing on a piece of paper.	1
TOTAL 28	

China.¹³ It was further modified when validated in Singapore by Sahadevan et al, with 2 items ('season of the year' and 'county of present location') removed due to lack of local relevance, giving a maximum score of 28 instead of 30. As in the AMT, Sahadevan and colleagues have also established the different age- and education-adjusted cutoffs. (Table 5)⁸ Although the CMMSE is more cumbersome and requires more time to complete, it is believed to be more useful than the AMT when testing patients with more than 12 years of education or greater levels of literacy.

7-Minute Screening test and the Clock drawing test

The 7-Minute Screen is a brief neurocognitive screening battery consisting of 4 brief tests: enhanced cued recall test for memory, Category Fluency for verbal fluency, Clock Drawing Test (CDT) for visuospatial and visuoconstruction abilities, and Benton temporal Orientation Test for temporal orientation.¹⁴ It was developed as an instrument which can be administered rapidly, requiring minimal clinical judgment and training, and which can reliably distinguish Alzheimer's disease from normal age-related cognitive deficits. Mean time of administration was 7 minutes 42 seconds in the validation study, but was found to be longer in at least one subsequent validation study in a non-English speaking population.¹⁵ It would be reasonable to expect a longer administration time for the current local cohort of elderly in Singapore, which is predominantly non-English speaking. The relatively lower literacy rate will also lead to education-bias which may increase the number of false-positives. All these problems suggest that the utility of this instrument may be lower compared to the West, at least for the present cohort of older persons in Singapore.

Table 5: (modified) CMMSE – optimal cut-off values adjusted for age and education

	60 – 74 years	> or = 75 years
0 to 6 education years	20 / 21 (94%#, 93%*)	18 / 19 (94%#, 92%*)
> or = 6 education years	23 / 24 (93%#, 87%*)	22 / 23 (100%#, 88%*)

sensitivity

* specificity

One component of the 7-Minute Screen is the Clock Drawing Test, which has been extensively validated and achieved widespread clinical use in western countries as a cognitive screening instrument. This test requires the patient to draw a circle, write the numbers from 1 to 12 in the circle so that it resembles a standard clock face, and to draw the hour and minute hands to indicate a specified time. Although intuitively this seems to be a good test to bypass language barrier in a multi-ethnic society like ours with a majority of our elderly being of low literacy levels, data in published literature,^{16,17} as well as local experience, suggest that the sensitivity and specificity of CDT is significantly affected by low education. Many normal older persons find that such a task, though simple, is unfamiliar and culturally alien, thereby affecting the ability of the test to reflect their true cognitive status. Nevertheless, in the coming years, CDT may emerge as a useful screening test as demographic patterns indicate significantly higher literacy rates in future cohorts of older persons.

CONCLUSION

Cognitive screening of the elderly in primary care has, and indeed will, become a crucial public health challenge.⁶ As the ageing proportion of elderly in our population rises and the prevalence of dementia escalates, an increasing number of elderly patients will seek help from primary care physicians for early cognitive deficits or inadvertently reveal clues to early diagnosis of dementia.¹⁸ It becomes imperative therefore for primary care physicians to recognize early dementia or cognitive impairment within their own practices. One

practical approach for a busy practice is to target patients who have symptoms of progressive forgetfulness, using locally developed or validated brief cognitive tests. Selecting an appropriate instrument, and using different cut-off scores for patients of different age groups and literacy levels will further improve the accuracy and efficiency of the screening process.

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