

An Evidence-based Clinical Approach to the Diagnosis of Dementia

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Abstract

With the rapidly ageing population in Singapore, dementia prevalence is on the rise. Early diagnosis is important as dementia impacts not only on patients and their families, but also on the community and healthcare system as a whole; with early treatment plans drawn up, the suffering associated with this illness can be more effectively and efficiently managed. In this paper, we present a 4-step, evidence-based assessment strategy for primary care physicians, which cover the essential objectives of the dementia evaluation, incorporating local data where possible. The first step requires the important exclusion of delirium as the cause of forgetfulness or confusion. The second step involves clinically establishing that the patient's chronic confusional state is due to dementia. The third step looks at the behavioural, functional and social dimensions of dementia. The final step determines the aetiology of dementia with the use of a focused history, physical examination, a predefined battery of haematological tests and, in selected cases, structural neuroimaging.

Ann Acad Med Singapore 2003; 32:740-8

Key words: Aged, Cognitive disorders, Human

Introduction

The prevalence of dementia or cognitive impairment in local studies has been shown to range from 2% to 13%.¹⁻³ These differences in prevalence rates depend very much on the sensitivities of the different locally validated cognitive screening instruments used, as some may be better at detecting early dementia and, thus, report higher prevalence rates compared to the ones that are less sensitive.³ The prevalence rate of dementia is also expected to increase with the rapidly ageing population in Singapore; the number of people suffering from significant dementia is expected to triple from 7,000 in 2000 to 24,000 in 2030.⁴

With this rising trend, the evaluation of dementia, especially at a mild stage, becomes increasingly important because with early diagnosis, the affected patients are more amenable to treatment advances. Interventions to slow down the progression of cognitive decline can translate into prolongation of functioning in the community, delay in institutionalisation and lower healthcare expenditure.^{5,6}

The evaluation of dementia should be targeted at patients in whom there is some suspicion of cognitive impairment. They include: subjects with memory and other cognitive complaints, either reported by the patient himself or a significant other; subjects who arouse the physician's

suspicion of cognitive impairment during interview despite absence of memory or cognitive complaints; those who are at increased risk for dementia (such as those with a strong family history of dementia); and elderly patients who need to make important decisions (such as the sale of a house or making a will) and in whom mental competency is questionable.

The evaluation should be via a multifaceted approach that focuses not only on the complaints of progressive forgetfulness or behavioural changes, but also systematically assesses the functional and social consequences of the cognitive changes. With such an approach, the main aims would be to diagnose dementia early, assess for complications of dementia and establish the cause of dementia.

A more detailed version of the diagnosis and management of dementia can be found in the Ministry of Health's practice guidelines.⁷ This review differs from the diagnostic section of the practice guidelines in that it is more focused on the steps of the clinical approach and it has updated the relevant evidence from all the local studies on dementia. It is written primarily for the primary care physician and hospital-based doctors who have non-specialised contact with dementia patients.

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Evaluation

Assuming that the patient's chief complaint is forgetfulness or confusion, the following 4 main questions that encompass the essential objectives of dementia evaluation are asked: is the forgetfulness or confusion acute or chronic?; if the forgetfulness or confusion is chronic, is it dementia?; if it is dementia, what are the complications?; and if it is dementia, what is the aetiology?

In answering all 4 questions, concise evidence-based clinical recommendations are given wherever feasible. The evidence will be rated good, fair and poor based on the grading system of the United States Preventive Services Task Force for strength of overall evidence.⁸ Good evidence includes consistent results from well-designed studies in representative populations that directly assess health outcomes, while fair evidence is limited by individual studies that require generalisability for routine practice or where the evidence to health outcomes is indirect. Finally, poor evidence reflects insufficient data due to the limited number and power of studies with lack of information on important health outcomes.

Is it Delirium?

If the memory or cognitive complaint was of an acute nature, has a rapid onset and short duration (lasting from a few hours to days), one needs to rule out delirium.

Delirium is defined by the Diagnostic and Statistical Manual of Mental Disorders – fourth edition (DSM-IV)⁹ as a disturbance of consciousness associated with a change in cognition or development of a perceptual disturbance, which occurs over a short period and has a fluctuating course. The DSM-IV criteria, although precise, may be difficult to apply in clinical practice. The Confusion Assessment Method (CAM)¹⁰ is a brief, but structured, assessment commonly used in the clinical setting to diagnose delirium. It requires the presence of 3 of the following 4 features: presence of acute change in mental status and fluctuating course with inattention, coupled with either the presence of disorganised thinking or altered level of consciousness. With respect to identifying delirium, CAM has been shown to have a sensitivity of 94% to 100% and a specificity of 90% to 100%, as well as good inter-observer reliability (kappa test, 0.81 to 1.0).¹⁰

If the cognitive complaints are thought to be secondary to delirium, underlying precipitating factors (such as sepsis, stroke disease or drug causes) should be examined.¹¹ Often enough, if delirium is detected at this stage, the patient would require hospitalisation to manage the acute confusional state and underlying medical illnesses. While both delirium and chronic confusion have been discussed separately, one must also be aware that an acute confusional state can at times be superimposed on chronic confusion. In

fact, studies have established that chronic cognitive impairment is itself an independent risk factor for the occurrence of delirium in hospitalised elderly patients.¹²

If the forgetfulness or confusion occurs over a period of weeks to few months, the cognitive decline is better described as being subacute in onset. Several underlying causes of delirium still need to be thought of and conditions such as stroke disease, space-occupying lesion, Creutzfeldt-Jakob disease and hydrocephalus require specific exclusion. The rest of this review focuses on assessing forgetfulness or confusion that is of a chronic nature, where the duration is generally in terms of many months to years and where the patient's conscious level and attentiveness remain intact.

Is it Dementia?

It is important to realise, from the outset, that not all chronic confusions equate to dementia. Other conditions that can present as chronic confusion include depression and late-onset psychiatric disorders. The implication for the clinician is that dementia needs to be positively identified as the cause of the patient's chronic confusional state.

As there are no biological markers that are specific to dementia, its recognition will perforce be via a clinical approach, which can be done either subjectively (by looking for features of cognitive decline within the subject) or objectively (by testing the patient's cognitive capabilities using performance-based instruments).

Subjective Approach

The DSM-IV criteria¹³ are very often used as the gold standard for the clinical diagnosis of dementia.¹⁴⁻¹⁶ The criteria require memory impairment to be present, as well as deficits in one other cognitive domain (aphasia, apraxia, agnosia and executive dysfunctioning). Moreover, these cognitive *declines* must be of sufficient severity to cause perceptible impairment in social or occupational functioning. The challenge for the clinician is to translate these neurological criteria into common, functional task-based questions that will be conveyed to the patient's caregivers in a non-technical language. Examples of such questions are shown in Table I. It must be noted that the clinical diagnosis of dementia is established purely by history-taking.

Another instrument that looks at cognitive changes is the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE). IQCODE is a 26-item test that relies on questioning the informant regarding the subject's memory, cognition and language ability over the last 10 years. It has the advantage of assessing cognitive decline over an extended period, instead of at the single point in time of the assessment itself; hence it is independent of the subject's premorbid ability.¹⁷ Being an informant-based report,

TABLE I: DSM-IV CLINICAL CRITERIA FOR DIAGNOSIS OF DEMENTIA

Symptom	Questions
Amnesia	Any forgetfulness? Did it start gradually or suddenly? Is it progressively worse? If so, is it smoothly declining or showing a step-wise/fluctuating decline? Is it over short-term or long-term matters?
And with declines in one of the following domains:	
Aphasia	Any word-finding difficulty or other difficulties with communication?
Apraxia	Any problems with buttoning or dressing? Any difficulties with using utensils during mealtimes?
Agnosia	Any problems recognising familiar faces or familiar items?
Executive dysfunctioning	Any problems handling money (loose change)? Any change in general problem-solving abilities? Is one's work getting more disorganised?
Severe enough to cause significant impairment in social or occupational functioning	As a result of the above, is he becoming less independent in the community, home and self-care?

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, fourth edition

IQCODE is, unlike most performance-based cognitive tests, less contaminated by the subject's past educational attainments.^{18,19} IQCODE has been validated locally amongst Singapore's Chinese elderly with an optimal cut-off score of 3.3/3.4 (a sensitivity of 94.3% and a specificity of 94%).³

Objective Approach

The objective approach involves direct observation of the subject's cognitive abilities using performance-based instruments, such as mental status tests (brief cognitive screening instruments), or more detailed neuropsychological tests usually administered by clinical psychologists.

Mental status tests: There are several brief dementia screening instruments that have been validated for use in our local population. These include the Elderly Cognitive Assessment Questionnaire (ECAQ),^{2,3,20} Abbreviated Mental Test (AMT)²¹ and Chinese Mini Mental Status Examination (CMMSE).²¹

ECAQ is a 10-item cognitive test developed in Singapore to screen for dementia. It assesses memory and information-orientation. It has an advantage of using local culture familiar to our elderly patients to derive the memory-recall section (4-number recall like in the lottery). Using an optimal cut-off score of 5/6, it had a sensitivity of 85.3% and a specificity of 91.5%²⁰ for identifying cognitive impairment. However, at that threshold value, it may not detect early cognitive impairment.³ The 10-item AMT

TABLE II: ABBREVIATED MENTAL TEST (AMT)

Items	Score
What is the year?	1
About what time is it? (within 1 hour)	1
What is your age?	1
What is your date of birth?	1
What is your home address?	1
Where are we now?	1
Who is our country's Prime Minister?	1
What is his/her job? (show picture)	1
Memory phase: "37 Bukit Timah Road"	
Count backwards from 20 to 1	1
Recall memory phase	1
Total score	/10

(Table II) and 28-item CMMSE have also been validated in our local population.²¹ For mild cognitive impairment, the AMT's optimal cut-off score was 7/8 (a sensitivity of 81% and a specificity of 89%) and that for CMMSE was 20/21 (a sensitivity of 83% sensitivity and a specificity of 94%). In addition, higher cut-off scores were found to be necessary in the younger and more educated cohort. Between the AMT and CMMSE, the latter is thought to be more useful for those with higher educational attainment as AMT has a ceiling effect on such individuals.²¹

All the above instruments can be quickly administered and, thus, can be useful in a busy clinic. However, they can be difficult to administer in hearing-impaired or aphasic patients. Generally, for greater accuracy in detecting cognitive impairment, all optimal cut-off scores require adjustments for age and education, as these variables have been shown to influence the elderly subject's performance in cognitive tests.²² Lastly, it must be appreciated that these tests can only identify cognitive impairment and not dementia *per se* – a more definitive diagnosis of dementia still requires the subjective approach.

Other cognitive screening instruments including clock-drawing tests,^{23,24} Community Screening Instrument (CSI),²⁵ geriatric mental state (GMS/AGECAT)²⁵ and Cognitive Abilities Screening Instrument (CASI)^{26,27} have been tested in predominantly Chinese communities elsewhere, but they have not been locally validated.

Neuropsychological tests: Neuropsychological tests have the advantage of detecting more subtle cognitive impairments that are not picked up by conventional cognitive screening tests. Patients who may require neuropsychological testing include: subjects who have memory complaints, but who do not as yet satisfy all the criteria for a dementia syndrome (that is, mild cognitive impairment or early dementia),^{28,29} depressed subjects who present with memory complaints so as to determine whether the memory complaints are a result of depression (pseudo-dementia) or

TABLE III: BEHAVIOURAL, FUNCTIONAL AND SOCIAL ASSESSMENT IN DEMENTIA

Variable	Questions
Behavioural	
Depression	Has patient been noted to be sad, tearful or having poor sleep or early morning awakening?
Anxiety	Does patient get worried easily?
Agitation	Does patient get agitated easily or lose temper easily? Are the agitations at certain times of the day (sundowning pattern)?
Paranoid	Is patient suspicious of others or accusing people of causing him harm or stealing his possessions?
Hallucinations	Does patient see or hear things that are not present?
Sleep problems	Does patient have problems falling asleep or have sleep-wake reversals?
Functional	
Community functioning	Can patient find his way around in unfamiliar surroundings, manage his finances, do shopping or marketing?
Home-care functioning	Can he prepare his own food, help in housework and cooking? Is he able to choose proper attire to dress himself? Is he safe to be left at home alone?
Self-care functioning	Is he able to bathe, dress himself? Is he able to go to toilet, transfer or feed himself? Is he continent of bladder and bowels?
Social	
Coping difficulties	How are caregivers coping? What is their level of stress? Are they also depressed? Are there features of elder abuse?
Financial difficulties	Are the costs of caring for patient generally tolerable?
Legal issues	Is patient's dementia early? Is he agreeable to transfer or joint ownership of property, bank accounts, etc? Any need to assess decision-making capacity?
Driving safety	Can the patient be persuaded not to drive? (Otherwise, patient may need regular assessments for fitness to drive).

whether these depressed subjects have concomitant dementia,^{30,31} and subjects whose decision-making capacity is being assessed, where psychometric tests can sometimes be an important adjunct to the clinical evaluation of the decision-making capacity.

Neuropsychometric batteries with adjustments for education have been validated locally in Chinese patients with Alzheimer's disease.³² The Vascular Dementia Battery test has also been validated in the Singapore population.³³ If the psychological test results, in combination with clinical findings, are not conclusive for dementia, these subjects (especially those with persistent or worsening forgetfulness) can be asked to return for a reassessment after 6 to 12 months.³⁴ In fact, the greatest value of such tests lies in their longitudinal application to patients over time, looking specifically for declining performance, which would be indicative of an underlying psychopathology.

What are the Dementia Complications?

The complications of dementia can be classified into 3 broad groups: behavioural and psychological symptoms of dementia (BPSD), functional problems and social problems. These should be evaluated in *all* patients with dementia. In fact, cognitive deficits may not cause as much distress as disturbed behaviour, increasing dependence on caregiver and related financial and legal difficulties. Thus, by systematically looking for these multifaceted complications, the clinician is able to target the subsequent management more appropriately and effectively.

Behavioural and Psychological Symptoms of Dementia

Abnormal behaviour in dementia patients can present severe problems to all who interact with them, leading to premature institutionalisation,⁵ increased costs of care and significant loss in quality of life for the patient and family. Most of the major behavioural problems are amenable to treatment and are capable of reducing the suffering of the patients and their caregivers.

Behavioural problems occur frequently in dementia patients; they affect 10% to 75% of all patients at some stage of their dementia.³⁵ The common behavioural problems are agitation, wandering, depression, psychosis, screaming, violence and hypersexuality. In the clinic setting, the physician should *routinely* ask about depression, anxiety, agitation, paranoia, hallucinations and sleep problems, as these are potentially amenable to treatment, by way of either psychosocial interventions or pharmacologic agents. Examples of questions to ask regarding behavioural problems are shown in Table III.

These problems can also be rated objectively using behaviour scales. There are many such scales described in the literature that are either self-rated, caregiver-based or observer reports. The Behavioural Pathology in Alzheimer's Disease Rating Scale (BEHAVE-AD)³⁶ and Neuropsychiatric Inventory (NPI)³⁷ are examples of behaviour scales, but they are often used only in research settings.

Depression is very common in dementia. Our experience shows that 35% of our dementia outpatients had a mood disorder. Depression in the elderly may not show the classical features indicated in the DSM-IV and, in this regard, clinicians may find the brief depression scales useful in practice. Locally, the single-question test for depression, Geriatric Depression Scale (GDS) and Even Briefer Assessment Scale for Depression (EBAS-DEP) have been validated in cognitively intact, community-dwelling Chinese elderly.³⁸ The Cornell Depression Scale in Dementia specifically assesses depression in dementia³⁹ and our preliminary experience had shown it to be a useful instrument.

Functional Problems in Dementia

Functional issues play a major role in dementia, both in the diagnosis and complications of dementia. For a diagnosis of dementia to be made, impairment in social or occupational functioning must be present. Moreover, functional difficulties increase with the severity of dementia⁴⁰ and become a critical predictor of institutionalisation in the cognitively impaired.^{6,40,41}

Functional difficulties that arise from dementia can be examined at 3 levels: community functioning, home functioning and self-care. Adapted from the concept of hierarchical loss of everyday capacity developed by Katz et al,⁴² the 3 levels are generally affected in a descending order and this allows functional deficits to serve as markers of dementia severity.^{43,44} Examples of questions that the clinician can ask regarding the functional domain are shown in Table III. More important than looking at functional deficits *per se*, the clinician should enquire about functional *change*: whether the patient is becoming less independent than before or showing declining standards in his/her daily routines. It is also important to bear in mind that, in the setting of dementia evaluation, the functional difficulties stem from cognitive deficits and not physical disabilities.

The severity of dementia can also be clinically staged using the Diagnostic and Statistical Manual of Mental Disorders—3rd revised-edition (DSM III-R) criteria,⁴⁵ where mild dementia is defined by impairment for work or social activities with the capacity for independent living remaining largely intact. Moderate dementia takes place when independent living is hazardous and would require some degree of supervision. Severe dementia is characterised by activities of daily living that have become so impaired that continual supervision is required.

There are formal functional assessment scales (either informant-based or direct observation), including the Clinical Dementia Rating Scale (CDR),⁴⁶ Functional Assessment Staging (FAST),^{47,48} Barthel Index and Blessed Dementia Scale (BDS).⁴⁹ Our preliminary experience with the BDS has shown it to be satisfactory. CDR, while excellent as a staging measure of dementia severity and is capable of discriminating between no dementia and mild dementia, is probably more useful in tertiary care settings.⁵⁰

Social Problems in Dementia

As a result of dementia, there is also loss of social role of the patient as a parent, spouse, friend and member of the larger society and these often result in caregivers' coping difficulties.^{5,51}

Identification of caregiver's stress can allow targeted family education and counselling at tertiary dementia care centres, or even dementia day-care centres, and this has

been shown to reduce institutionalisation.⁶ Elder abuse may also occur when the frustrated caregiver directs his or her stress at the vulnerable patient whose care is proving to be difficult.⁵² Likewise, financial difficulties should be asked for and if problems are identified, families can be referred to a social worker.

Legal issues (such as the need for surrogate decision-makers) and driving safety should also be looked into. In the West, there are guidelines on safe driving which state that since patients with dementia may be hazardous drivers, they need to be continually road-tested in order to keep their driving licence.^{53,54} Currently, there are no regulations by the Registry of Vehicles in Singapore with regards to this group of patients, but physicians can soon expect to assume more responsibilities in this area with the increasing number of ageing drivers. Table III summarises the major areas of concern in the social assessment of dementia.

What is the Dementia Aetiology?

Having determined the cognitive impairment to be chronic and having met the criteria for dementia, as well as asking for the complications of dementia, the last step of the clinical evaluation involves determining the aetiology of dementia. This, too, helps in the subsequent management of the patient in terms of selecting more appropriate treatment strategies. The more common causes of dementia can be classified into irreversible and potentially reversible causes. The irreversible causes of dementia include degenerative causes (Alzheimer's disease [AD], fronto-temporal dementia and diffuse Lewy body dementia), cerebrovascular disease (vascular dementia [VD]), prion-associated disorders (Creutzfeldt-Jakob disease) and neurogenetic disorders. The potentially reversible causes include infectious disorders (meningitis and encephalitis), toxic or metabolic encephalopathies (hypothyroidism, vitamin B₁₂ deficiency, alcohol-related syndromes), neoplastic causes and hydrocephalus (obstructive or normal pressure hydrocephalus). The main aim of determining the aetiology is to rule out potentially reversible causes of dementia and it begins with a focused history-taking and physical examination, followed by selected laboratory tests and neuroimaging. Various guidelines and practice parameters have suggested approaches for determining the aetiology of dementia^{34,55-57} and more specific criteria for the diagnosis of common conditions, such as AD or VD.⁵⁸⁻⁶²

History-taking

Relevant information that can help in the differential diagnosis of dementia include: nature of cognitive decline (whether sudden or gradual); evolution over time, either gradually progressive (more suggestive of AD) or in a step-wise/fluctuating pattern (suggestive of VD); history of significant alcohol ingestion⁶³ and medication (such as

antipsychotics, antidepressants, anticholinergics and sedative-hypnotic agents); and past or existing histories of medical, neurological and psychiatric illness.

Physical Examination

A targeted physical examination should be performed, especially for focal neurological deficits (such as visual field defects, hemiparesis, hemisensory loss, asymmetric deep tendon reflexes or unilateral extensor plantar responses). Extrapyramidal signs, such as rigidity or bradykinesia, movement disorders and gait abnormalities, are looked for as well, as these clinical signs can be important in the differential diagnosis of dementia.

Laboratory Investigation

Dementias related to some of the metabolic abnormalities (which can be detected by biochemical testing) are typically thought to be reversible. The most commonly recommended haematological tests are easy to perform and of a relatively low cost: full blood count, urea and electrolytes, serum calcium, serum glucose, thyroid function tests and vitamin B₁₂ levels. Larson et al⁶⁴ evaluated 200 older patients with dementia and found that 33.7% of them had metabolic abnormalities. Generally, however, only a small percentage of these have been found to be completely reversible,⁶⁵⁻⁶⁷ and the more common of such conditions are hypothyroidism and vitamin B₁₂ deficiency.^{64,68}

Given the problems in interpreting the serology for neurosyphilis (both the serum and cerebrospinal fluid [CSF]), we do not advocate routine testing for neurosyphilis. Serum Venereal Disease Research Laboratory (VDRL) testing detects only 75% of cases of tertiary syphilis and CSF VDRL may be negative in 30% to 70% of cases of neurosyphilis. Thus, we recommend the selective use of serum VDRL and treponemal antibody, when patients are already manifesting some of the clinical features of neurosyphilis.⁶⁹

Other biochemical markers to establish the aetiology of dementia include apolipoprotein E ε4 allele,⁷⁰ CSF-tau and CSF β-amyloid for Alzheimer's disease; for Creutzfeldt-Jakob disease, these include CSF 14-3-3, neuron-specific enolase and the electroencephalogram.^{34,56,57} These tests are not done routinely for reasons of either cost or invasiveness and, in several instances, their lack of demonstrable superiority over the accuracy of the basic clinical diagnosis.

Neuroimaging

Neuroimaging is useful in the differential diagnosis of dementia and is necessary in the diagnostic criteria for AD⁵⁸ and VD.^{59,60} It also allows for the detection of early dementia.⁷¹⁻⁷⁴

Structured neuroimaging techniques include computed tomography (CT) scan of head and magnetic resonance imaging (MRI) of the head. These mainly focus on the detection of brain infarcts and medial temporal lobe structure atrophy, particularly hippocampal atrophy. Other conditions such as subdural haematomas, cerebral tumours, normal pressure hydrocephalus, fronto-temporal dementia, Huntington's disease, progressive supranuclear palsy, multi-system atrophy and olivopontocerebellar atrophy, can also be differentiated on structural imaging.⁷⁵ The MRI scan is not routinely indicated, but if there is clinical suspicion of stroke disease and it is not shown on CT, then MRI may be better.

With recent advances in technology, functional neuroimaging techniques were developed. Positron emission tomography and single-photon emission tomography examine changes in brain metabolism and cerebral blood perfusion. These tests can be useful in detecting early AD.^{76,77}

Whether all patients with dementia require a structural imaging procedure as part of their initial evaluation is an important clinical question, for which there is no consensus. The principal value of neuroimaging in the patient with dementia is the identification of cerebral infarcts and clinically important surgical brain lesions (SBLs), such as subdural haematomas, cerebral tumours and normal pressure hydrocephalus.⁷⁸ Some recommend it routinely for all patients,^{79,80} while others have attempted to show that with the judicious application of certain clinical indicators, a significant number of neuroimaging studies can be avoided with relatively little meaningful information missed.⁸¹⁻⁸⁵

The Canadian Consensus Conference on the Assessment of Dementia (CCCAD)⁸⁶ has outlined the criteria for undertaking a CT scan of the head, only if certain clinical conditions are met (Table IV). These criteria can be useful for SBLs and the decision to use a brain scan to diagnose AD or VD.

The criteria are reasonably valid in our own practice, though the authors believe that the *additional* consideration of the functional stage of dementia is both relevant and important. In a patient with advanced dementia of a long duration (>2 years based on CCCAD's recommendations), we believe a brain scan is not warranted to detect potentially reversible SBLs. Likewise, with current cognitive treatment modalities, it matters little to this group of patients that the clinician has clearly distinguished AD from VD. Conversely, if the patient's dementia is only mild to moderate (even after 2 years), it is still advisable to request for an initial CT scan of the brain.

When advanced demented patients present to our clinic, caregivers are very often not looking to the doctor for the

TABLE IV: CANADIAN CONSENSUS CONFERENCE CRITERIA FOR PERFORMING CRANIAL CT IN PATIENTS WITH DEMENTIA

Criteria:
<60 years old
Rapid (e.g. over 1 to 2 months), unexplained decline in cognition or function
Dementia of relatively short duration (<2 years)
Recent, significant head trauma
Unexplained neurologic symptoms (e.g., new onset of severe headache or seizures)
History of cancer, especially of a type or at a site associated with metastasis to the brain
Use of anticoagulants or history of bleeding disorder
History of urinary incontinence and gait disturbance early in the disease (suggestive of normal pressure hydrocephalus)
Presence of any new localising signs on physical examination (hemiparesis, Babinski's sign)
Unusual or atypical cognitive symptoms or presentation (e.g. progressive aphasia)
Gait disturbance
CT is recommended if one or more of these criteria are present.

CT: computed tomography

precise aetiological diagnosis; rather, they seek the doctor's help in managing the attendant behavioural, functional and social problems. Nevertheless, if the clinician is not inclined to perform a brain scan, there is immense value in discussing the matter with the caregivers and in securing their agreement not to order a neuroimaging procedure.

Conclusion

In summary, a 4-step evidence-based approach is recommended to evaluate a patient who presents with forgetfulness or confusion.

Firstly, it is important to determine whether the forgetfulness or confusion is acute in onset. The CAM is effective in detecting delirium (good evidence).

If the forgetfulness or confusion is of a chronic nature, dementia must be clinically diagnosed and the DSM-IV criteria are useful for this purpose. The optimal cut-off scores of the locally validated AMT and CMMSE can identify mild cognitive impairment (good evidence). Neuropsychological tests, using locally validated batteries, are useful in selected circumstances (good evidence).

Behavioural, functional and social problems should be next assessed in all patients with dementia. The areas can be evaluated by a semi-structured clinical approach or by the use of relevant, validated scales. For the purpose of screening for depression, the GDS, EBAS-DEP and single-question test are brief scales that have been locally validated (fair evidence).

A focused history taking and targeted physical examination are important initial modalities to determine the aetiology of dementia. Laboratory tests to exclude

potentially reversible metabolic causes of dementia include a full blood count, serum electrolytes (including calcium), thyroid function tests and vitamin B₁₂ level (fair evidence). Syphilis serology should be done in individuals suspicious for neurosyphilis (fair evidence). To determine if neuroimaging is indicated, we recommend using the CCCAD criteria and assessment of the patient's dementia severity status (fair evidence). If neuroimaging is deemed to be not necessary, this decision should be explained and discussed with the patient's caregivers.

REFERENCES

1. Kua E H. The prevalence of dementia in elderly Chinese. *Acta Psychiatrica Scand* 1991; 83:350-2.
2. Kua E H, Ko S M. Prevalence of dementia among elderly Chinese and Malay residents of Singapore. *Int Psychogeriatr* 1995; 7:439-46.
3. Lim H J, Lim J P, Anthony P, Yeo D H, Sahadevan S. Prevalence of cognitive impairment amongst Singapore's elderly Chinese: a community-based study using the ECAQ and the IQCODE. *Int J Geriatr Psychiatry* 2003; 18:142-8.
4. Ministry of Health, Singapore. State of Health Report. Singapore: Ministry of Health, 1997:45. Available at: <http://app.internet.gov.sg/scripts/moh/newmoh/asp/pub/pub01.asp#5>. Accessed on 28 May 2003.
5. Lim P P, Sahadevan S, Choo G K, Anthony P. Burden of caregiving in mild to moderate dementia: an Asian experience. *Int Psychogeriatr* 1999; 11:411-20.
6. Mittelman M S, Ferris S H, Shulman E, Steinberg G, Levin B. A family intervention to delay nursing home placement of patients with Alzheimer's disease. A randomized controlled trial. *JAMA* 1996; 276:1725-31.
7. Ministry of Health, Singapore. Clinical practice guidelines 5/2001. Dementia. (Accessed on 28 May 2003 at, <http://www.gov.sg/moh/pub/cpg/cpg.htm>)
8. US. Preventive Services Task Force, Agency for Healthcare Research and Quality, Rockville, Maryland. (Accessed on 28 May 2003 at, <http://www.ahrq.gov/clinic/uspstfix.htm>).
9. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington, DC: American Psychiatric Association, 1994:124-7.
10. Inouye S K, van Dyck C H, Alessi C A, Balkin S, Siegel A P, Horwitz R I. Clarifying confusion: the Confusion Assessment Method. A new method for detection of delirium. *Ann Intern Med* 1990; 113:941-8.
11. Inouye S K, Charpentier P A. Precipitating factors for delirium in hospitalised elderly persons. Predictive model and interrelationship with baseline vulnerability. *JAMA* 1996; 275:852-7.
12. Inouye S K, Viscoli C M, Horwitz R I, Hurst L D, Tinetti M E. A predictive model for delirium in hospitalised elderly medical patients based on admission characteristics. *Ann Intern Med* 1993; 119:474-81.
13. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington, DC: American Psychiatric Association, 1994:142-3.
14. Holmes C, Cairns N, Lantos P, Mann A. Validity of current clinical criteria for Alzheimer's disease, vascular dementia and dementia with Lewy bodies. *Br J Psychiatry* 1999; 174:45-50.
15. Jobst K A, Barnetson L P, Shepstone B J. Accurate prediction of histologically confirmed Alzheimer's disease and the differential diagnosis of dementia: the use of NINCDS-ADRDA and DSM-III-R criteria, SPECT, X-ray CT, and ApoEε4 in medial temporal lobe dementias. Oxford Project to Investigate Memory and Aging. *Int Psychogeriatr* 1998; 10:271-302.
16. Lim A, Tsuang D, Kukull W, Nochlin D, Leverenz J, McCormick W, et al. Clinico-neuropathological correlation of Alzheimer's disease in a community-based case series. *J Am Geriatr Soc* 1999; 47:564-9.

17. Jorm A F, Scott R, Cullen J S, MacKinnon A J. Performance of the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) as a screening test for dementia. *Psychol Med* 1991; 21:785-90.
18. Jorm A F, Broe G A, Creasey H, Sulway M R, Dent O, Fairley M J, et al. Further data on the validity of the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE). *Int J Geriatr Psychiatry* 1996; 11: 131-9.
19. Fuh J L, Teng E L, Lin K N, Larson E B, Wang S J, Liu C Y, et al. The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) as a screening tool for dementia for a predominantly illiterate Chinese population. *Neurology* 1995; 45:92-6.
20. Kua E H, Ko S M. A questionnaire to screen for cognitive impairment among elderly people in developing countries. *Acta Psychiatr Scand* 1992; 85:119-22.
21. Sahadevan S, Lim P P, Tan N J, Chan S P. Diagnostic performance of two mental status tests in the older Chinese: influence of education and age on cut-off values. *Int J Geriatr Psychiatry* 2000; 15:234-41.
22. Sahadevan S, Tan N J, Tan T, Tan S. Cognitive testing of elderly Chinese people in Singapore: influence of education and age on normative scores. *Age Ageing* 1997; 26:481-6.
23. Lin K N, Wang P N, Chen C, Chiu Y H, Kuo C C, Chuang Y Y, et al. The three-item clock-drawing test: a simplified screening test for Alzheimer's disease. *Eur Neurol* 2003; 49:53-8.
24. Lam L C, Chiu H F, Ng K O, Chan C, Chan W F, Li S W, et al. Clock-face drawing, reading and setting tests in the screening of dementia in Chinese elderly adults. *J Gerontol B Psychol Sci Soc Sci* 1998; 53: 353-7.
25. Prince M, Acosta D, Chiu H, Scazufca M, Varghese M. Dementia diagnosis in developing countries: a cross-cultural validation study. *Lancet* 2003; 361:909-17.
26. Liu H C, Chou P, Lin K N, Wang S J, Fuh J L, Lin H C, et al. Assessing cognitive abilities and dementia in a predominantly illiterate population of older individuals in Kinmen. *Psychol Med* 1994; 24:763-70.
27. Teng E L, Hasegawa K, Homma A, Imai Y, Larson E, Graves A, et al. The Cognitive Abilities Screening Instrument (CASI): a practical test for cross-cultural epidemiological studies of dementia. *Int Psychogeriatr* 1994; 6:45-58.
28. Jacobs D M, Sano M, Dooneief G, Marder K, Bell K L, Stern Y. Neuropsychological detection and characterization of preclinical Alzheimer's disease. *Neurology* 1995; 45:957-62.
29. Tierney M C, Szalai J P, Snow W G, Fisher R H, Nores A, Nadon G, et al. Prediction of probable Alzheimer's disease in memory-impaired patients: a prospective longitudinal study. *Neurology* 1996; 46:661-5.
30. Visser P J, Verhey F R, Ponds R W, Kester A, Jolles J. Distinction between preclinical Alzheimer's disease and depression. *J Am Geriatr Soc* 2000; 48:479-84.
31. desRosiers G, Hodges J R, Berrios G. The neuropsychological differentiation of patients with very mild Alzheimer's disease and/or major depression. *J Am Geriatr Soc* 1995; 43:1256-63.
32. Sahadevan S, Lim J P, Tan N J, Chan S P. Psychometric identification of early Alzheimer disease in an elderly Chinese population with differing educational levels. *Alzheimer Dis Assoc Disord* 2002; 16: 65-72.
33. Tham W, Auchus A P, Thong M, Goh M L, Chang H M, Wong M C, et al. Progression of cognitive impairment after stroke: one year results from a longitudinal study of Singaporean stroke patients. *J Neurol Sci* 2002; 203:49-52.
34. Corey-Bloom J, Thal L J, Galasko D, Folstein M, Drachman D, Raskind M, et al. Diagnosis and evaluation of dementia. *Neurology* 1995; 45: 211-8.
35. Eastwood M R. Abnormal behavior associated with dementia. *Int Psychiatry Today* 1994; 4:8-10.
36. Reisberg B, Borenstein J, Salob S P, Ferris S H, Franssen E, Georgotas A. Behavioral symptoms in Alzheimer's disease: phenomenology and treatment. *J Clin Psychiatry* 1987; 48:9-15.
37. Cummings J L, Mega M, Gray K, Rosenberg-Thompson S, Carusi D A, Gornbein J. The Neuropsychiatric Inventory: comprehensive assessment of psychopathology in dementia. *Neurology* 1994; 44:2308-14.
38. Lim P P, Ng L L, Chiam P C, Ong P S, Ngui F T, Sahadevan S. Validation and comparison of three brief depression scales in an elderly Chinese population. *Int J Geriatr Psychiatry* 2000; 15:824-30.
39. Alexopoulos G S, Abrams R C, Young R C, Shamoian C A. Cornell scale for depression in dementia. *Biol Psychiatry* 1988; 23:271-84.
40. Sahadevan S, Lim P P, Choo P W. Dementia in the hospitalised elderly – a study of 100 consecutive cases in Singapore. *Int J Geriatr Psychiatry* 1999; 14:266-71.
41. Riter R N, Fries B E. Predictors of the placement of cognitively impaired residents on special care units. *Gerontologist* 1992; 32:184-90.
42. Katz S, Downs T D, Cash H R, Grotz R C. Progress in development of the index of ADL. *Gerontologist* 1970; 10:20-30.
43. Juva K, Makela M, Erkinjuntti T, Sulkava R, Ylikoski R, Valvanne J, et al. Functional assessment scales in detecting dementia. *Age Ageing* 1997; 26:393-40.
44. Barberger-Gateau P, Fabrigoule C, Helmer C, Rouch I, Dartigues J F. Functional impairment in instrumental activities of daily living: an early clinical sign of dementia? *J Am Geriatr Soc* 1999; 47:456-62.
45. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 3rd ed. Washington, DC: American Psychiatric Association, 1987.
46. Morris J C. The Clinical Dementia Rating (CDR): current version and scoring rules. *Neurology* 1993; 43:2412-4.
47. Reisberg B. Functional assessment staging (FAST). *Psychopharmacol Bull* 1988; 24:653-9.
48. Sclan S G, Reisberg B. Functional assessment staging (FAST) in Alzheimer's disease: reliability, validity and ordinality. *Int Psychogeriatr* 1992; 4:55-69.
49. Blessed G, Tomlinson B E, Roth M. The association between quantitative measures of dementia and of senile change in the cerebral grey matter of elderly subjects. *Br J Psychiatry* 1968; 114:797-811.
50. Berg L, McKeel D W Jr, Miller J P, Storandt M, Rubin E H, Morris J C, et al. Clinicopathologic studies in cognitively healthy aging and Alzheimer's disease: relation of histologic markers to dementia severity, age, sex, and apolipoprotein E genotype. *Arch Neurol* 1998; 55:326-35.
51. Kua E H, Tan S L. Stress of caregivers of dementia patients in the Singapore Chinese family. *Int J Geriatr Psychiatry* 1997; 12:466-9.
52. Cham G W, Seow E. The pattern of elderly abuse presenting to an emergency department. *Singapore Med J* 2000; 12:571-4.
53. Dubinsky R M, Stein A C, Lyons K. Practice parameter: risk of driving and Alzheimer's disease (an evidence-based review): report of the quality standards subcommittee of the American Academy of Neurology. *Neurology* 2000; 54:2205-11.
54. Johansson K, Lundberg C. The 1994 International Consensus Conference on Dementia and Driving: a brief report. *Swedish National Road Administration. Alzheimer Dis Assoc Disord* 1997; 11:62-9.
55. Geldmacher D S, Whitehouse P J. Evaluation of dementia. *N Engl J Med* 1996; 335:330-6.
56. Knopman D S, DeKosky S T, Cummings J L, Chui H, Corey-Bloom J, Relkin N, et al. Practice parameter: diagnosis of dementia (an evidence-based review). Report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology* 2001; 56:1143-53.
57. Small G W, Rabins P V, Barry P P, Buckholtz N S, DeKosky S T, Ferris S H, et al. Diagnosis and treatment of Alzheimer disease and related disorders. Consensus statement of the American Association for Geriatric Psychiatry, the Alzheimer's Association and the American Geriatrics Society. *JAMA* 1997; 278:1363-70.
58. McKhann G, Drachman D, Folstein M, Katzman R, Price D, Stadlan E M. Clinical diagnosis of Alzheimer's disease: report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services Task Force on Alzheimer's disease. *Neurology* 1984; 34:939-44.
59. Roman G C, Tatemichi T K, Erkinjuntti T, Cummings J L, Masden J C, Garcia J H, et al. Vascular dementia: diagnostic criteria for research

- studies. Report of the NINDS-AIREN International Workshop. *Neurology* 1993; 43:250-60.
60. Chui H C, Victoroff J I, Margolin D, Jagust W, Shankle R, Katzman R. Criteria for the diagnosis of ischemic vascular dementia proposed by the State of California Alzheimer's Disease Diagnostic and Treatment Centers. *Neurology* 1992; 42:473-80.
 61. Hachinski V C, Lassen N A, Marshall J. Multi-infarct dementia. A cause of mental deterioration in the elderly. *Lancet* 1974; 2:207-10.
 62. Rosen W G, Terry R D, Fuld P A, Katzman R, Peck A. Pathological verification of ischemic score in differentiation of dementias. *Ann Neurol* 1980; 7:486-8.
 63. Thomas V S, Rockwood K J. Alcohol abuse, cognitive impairment, and mortality among older people. *J Am Geriatr Soc* 2001; 49:415-20.
 64. Larson E B, Reifler B V, Sumi S M, Canfield C G, Chinn N M. Diagnostic tests in the valuation of dementia. A prospective study of 200 elderly outpatients. *Arch Intern Med* 1986; 146:1917-20.
 65. Clarfield A M. The reversible dementia: do they reverse? *Arch Intern Med* 1988; 109:476-86.
 66. Walstra G J, Teunisse S, van Gool W A, van Crevel H. Reversible dementia in elderly patients referred to a memory clinic. *J Neurol* 1997; 224:17-22.
 67. Siu A L. Screening for dementia and investigating its causes. *Ann Intern Med* 1991; 115:122-32.
 68. Martin D C, Francis J, Protetch J, Huff F J. Time dependency of cognitive recovery with cobalamin replacement: report of a pilot study. *J Am Geriatr Soc* 1992; 40:168-72.
 69. Jacobs R A. Infectious diseases: Spirochetal. In: Tierney L, McPhee S J, Papadakis M A, editors. *Current Medical Diagnosis and Treatment*. 39th ed. USA: McGraw-Hill, 2000:1376-86.
 70. Mayeux R, Saunders A M, Shea S, Mirra S, Evans D, Roses A D, et al. Utility of the apolipoprotein E genotype in the diagnosis of Alzheimer's disease. *N Engl J Med* 1998; 338:506-11.
 71. LeMay M, Stafford J L, Sandor T, Albert M, Haykal H, Zamani A. Statistical assessment of perceptual CT scan ratings in patients with Alzheimer type dementia. *J Comput Assist Tomogr* 1986; 10:802-9.
 72. de Leon M J, Golomb J, George A E, Convit A, Tarshish C Y, McRae T, et al. The radiologic prediction of Alzheimer disease: the atrophic hippocampal formation. *Am J Neuroradiol* 1993; 14:897-906.
 73. Jack C R Jr, Petersen R C, O'Brein P C, Tangalos E G. MR-based hippocampal volumetry in the diagnosis of Alzheimer's disease. *Neurology* 1992; 42:183-8.
 74. Kaye J A, Swihart T, Howieson D, Dame A, Moore M M, Karnos T, et al. Volume loss of the hippocampus and temporal lobe in healthy elderly persons destined to develop dementia. *Neurology* 1997; 48:1297-304.
 75. Laakso M P. Structural imaging in cognitive impairment and the dementias: an update. *Curr Opin Neurol* 2002; 15:415-21.
 76. Salmon E. Functional brain imaging applications to differential diagnosis in the dementias. *Curr Opin Neurol* 2002; 15:439-44.
 77. Gill S S, Rochon P A, Guttman M, Laupacis A. The value of positron emission tomography in the clinical evaluation of dementia. *J Am Geriatr Soc* 2003; 51:258-64.
 78. Engel P A, Gelber J. Does computed tomographic brain imaging have a place in the diagnosis of dementia? *Arch Intern Med* 1992; 152:1437-40.
 79. National Institutes of Health Consensus Conference. Differential diagnosis of dementing diseases. *JAMA* 1987; 258:3411-6.
 80. Katzman R. Should a major imaging procedure (CT or MRI) be required in the workup of dementia? An affirmative view. *J Fam Pract* 1990; 31:401-5.
 81. Martin D C, Miller J, Kapoor W, Karpf M, Boller F. Clinical prediction rules for computed tomographic scanning in senile dementia. *Arch Intern Med* 1987; 147:77-80.
 82. Dietch J T. Computerized tomographic scanning in cases of dementia. *West J Med* 1983; 138:835-5.
 83. Alexander E M, Wagner E H, Buchner D M, Cain K C, Larson E B. Do surgical brain lesions present as isolated dementia? A population-based study. *J Am Geriatr Soc* 1995; 43:138-43.
 84. Freter S, Bergman H, Gold S, Chertkow H, Clarfield A M. Prevalence of potentially reversible dementias and actual reversibility in a memory clinic cohort. *CMAJ* 1998; 159:657-62.
 85. Massoud F, Devi G, Moroney J T, Stern Y, Lawton A, Bell K, et al. The role of routine laboratory studies and neuroimaging in the diagnosis of dementia: a clinicopathological study. *J Am Geriatr Soc* 2000; 48:1204-10.
 86. Patterson C J, Gauthier S, Bergman H, Cohen C A, Freighner J W, Feldman H, et al. The recognition, assessment and management of dementing disorders: conclusions from the Canadian Consensus Conference on Dementia. *CMAJ* 1999; 160:S1-15.