‘New efficient method of detecting dementia in general practice’

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EXECUTIVE SUMMARY

This report summarises a project which field tested a new instrument to assist GPs screen for and diagnose dementia in the general practice setting. The aim of the project was to produce a GP protocol for the assessment of cognitive impairment and diagnosis of dementia that:

a. has high validity, reliability, sensitivity and specificity
b. is superior to current methods of assessment
c. is acceptable to GPs and readily used by them
d. is acceptable to patients

Sixty seven GPs recruited 380 subjects, of whom 283 participated in the study. Eight two of these patients were suffering from dementia, while 201 were non-cases. The participating GPs were significantly older than the average of the GP population in Australia, but did not differ in sex or the proportion who had graduated from an Australian institution. Cases of dementia were significantly older than non-cases, but did not differ in sex, place of residence or years of formal education.

Results of the testing resulted in a refined GPCOG which was scored to produce optimal sensitivity and specificity. A two stage method of scoring produced a sensitivity of 85%, a specificity of 86% and a misclassification rate of 14.2% in this population. Test-retest reliability was 0.87 for the patient section and 0.84 for the informant section of the GPCOG. The AUC (Area under the curve) of the two-stage GPCOG score was significantly superior to that of the AMT ($\chi^2 = 17.17$, df = 1, p<0.001).
The refined GPCOG took on average 3.5 minutes for the patient section (SD = 1.08, range = 2 – 5.8 minutes) and 1.5 minutes for the informant section (SD = 0.64, range = 0.5 – 2.5 minutes). Eighty eight percent of GPs indicated that the measure was practical to use and 88% thought it economically viable under the current Australian health care system. Eighty four% of GPs were either satisfied or very satisfied with the GPCOG measure, and 90% said they would continue using it.

Of the 333 patients who completed the satisfaction survey, 76% either liked the examination a bit or a lot, 18% neither liked nor disliked it, 2% disliked it and 2% of subjects felt unsure. The majority of patients felt reassured (or very reassured) by the fact that the doctor had checked their memory and concentration (74%), 2% felt irritated, and 22% felt either neutral or unsure.

We conclude that the GPCOG is a suitable instrument for use to screen for dementia in primary care. It is simple, brief, efficient, reliable, and valid and can meet the needs of GPs. We caution that screening is only the first step in the process of detecting dementia. Supplementary education for GPs is recommended. This should include information about how to administer the GPCOG, information about the differential diagnosis of cognitive impairment, and dementia management principles.
**Background**

The general practitioner (GP) is usually the first health professional to be consulted when dementia is suspected [1]. Unfortunately detection of dementia in general practice has been problematic, milder cases tend to be overlooked [2, 3] and physicians are sometimes reluctant to make a diagnosis [4, 5]. For some GPs, this reluctance may stem from a lack of confidence in their ability to diagnose dementia [6] or feelings of inadequate knowledge or expertise, or pessimism about treatment options [1].

A survey of one in seven Australian GPs (1473 subjects) asked doctors about strategies or services that would help them to identify dementia [1]. Most respondents (89.9%) endorsed the idea of an assessment protocol and screening instrument designed specifically for the general practice setting. General practitioners find that existing screening tests such as the Mini-Mental State Examination [7] take too long to administer and provide insufficient information [8].

Although many brief screening instruments exist, they have either not been designed for or validated in a primary care setting. The Abbreviated Mental Test (AMT) [9] has been recommended for use by GPs to screen for cognitive impairment [10, 11]. Whilst the AMT has been widely used in general practice (particularly in the UK), it has not been adequately validated in this context [12]. The ‘7 minute screen’ [13] and the ‘6 item Cognitive Impairment Test’ (6CIT) [14] have also been proposed for use by GPs. The ‘7 Minute Screen’ was developed outside a primary care setting and was validated on a sample in which dementia had already been diagnosed as present or absent [13]. A pilot validation of the 7 Minute Screen in primary care included 11 subjects who were already
confirmed as having dementia [15]. The 6CIT was validated on a sample derived from two sources – control subjects recruited through advertisements and subjects with pre-established diagnoses of dementia, referred by a geriatric psychiatry department (half of whom were rated as having severe to very severe cognitive decline). Validation studies using populations containing a disproportionate number of subjects with advanced dementia artificially maximise sensitivity and specificity of the instrument under investigation [16]. Therefore it is difficult to assess the real usefulness of these instruments for screening in general practice.

The aim of this study was to respond to the needs expressed by general practitioners, by designing and demonstrating the utility of a new instrument, the General Practitioner Assessment of Cognition or GPCOG. This new instrument was specifically designed for GPs to assist in detecting cognitive impairment. We aimed to demonstrate that this instrument was valid, reliable, quick to administer, easy to use, acceptable both to GPs and their patients, and that it represented an advance on current screening tests.
AIM AND HYPOTHESES

Aim:

To produce a GP protocol for the assessment of cognitive impairment and diagnosis of dementia that:

   e. has high validity, reliability, sensitivity and specificity
   f. is superior to current methods of assessment
   g. is acceptable to GPs and readily used by them
   h. is acceptable to patients

Hypotheses

Hypothesis 1: That the protocol developed to assist general practitioners in their diagnosis of dementia will be both valid and reliable.

Hypothesis 2: That the GPCOG will perform better than the AMTS in detecting dementia in a general practice setting.
Hypothesis 3: That general practitioners will find the protocol and instrument easy and practicable to use and will want to continue to use it.

Hypothesis 4: That patients will be accepting of the testing procedure.
METHODS

Steering Committee

A steering committee was set up to oversee the project. This Committee consisted of two consumer representatives (Alzheimer's Association and the Council on the Ageing), two GPs representing Divisions of General Practice and the Royal Australian College of General Practitioners (RACGP) and the research team. The team met 3-6 monthly over the course of the project.

The development of the GPCOG instrument and testing protocol

Note: much of this development work had occurred prior to the commencement of the project.

An important aim in designing the GPCOG was to devise a measure with the capacity to combine both historical and mental state testing data in one algorithm. The historical data are obtained from an informant – someone who has known the patient well for an extended period of time. A combination of informant data and cognitive testing is an effective way of increasing the predictive power of tests [17] as it has the potential to increase specificity without compromising sensitivity.

The items of the GPCOG patient and informant section were derived from three sources: the CAMCOG cognitive test [18,19], Psychogeriatric Assessment Scale (PAS) [20] and the
Independent Activities of Daily Living scale (IADL) [21]. Items were selected from the CAMCOG if at least 80% of the “normal” (i.e. non-demented) populations could successfully complete the item, and were demonstrated to be sensitive to mild dementia [22]. Two items from the PAS Cognitive Impairment sub-scale, and four items from the PAS informant-based Cognitive Decline sub-scale were selected because they were particularly predictive of dementia diagnosis [20]. Finally, four items were chosen from the IADL scale because they had been shown to detect community dwelling persons at high risk of dementia, independent of age, sex and education [23].

Items were removed from this original pool if they were redundant, difficult to administer because the items required extra test materials, judged as likely to be unpalatable to patients or demonstrated (by regression analysis on the original Cambridge data) to be markedly influenced by education. The instrument that was field tested comprised two sections: the GPCOG patient section consisting of cognitive items, with a maximum score of fifteen, and the GPCOG informant section consisting of eight historical questions to be asked of an informant. [We subsequently developed a refined GPCOG consisting of nine cognitive and six informant items (see Results and Appendix One)].
GPCOG VERSION ONE – This version was used for field testing in this study (For refined version – see Appendix One)

GPCOG - patient examination:

Unless specified, each question should only be asked once.

**Name and Address for subsequent recall test**

1. I am going to give you a name and address. After I have said it, I want you to repeat it. Remember this name and address because I am going to ask you to tell it to me again in a few minutes: John Brown, 42 West Street, Kensington. (Allow a maximum of 4 attempts)

**Time Orientation**

**Correct** **Incorrect**

2. What is the date? (exact only)  

3. What is the month? (within one day, eg. allow May on 1st June)  

4. What is the year? (if first week of new year, allow previous year)

**Clock Drawing (visuospatial functioning) - use blank page**

5. Please draw a (large) circle  

6. Please mark in all the numbers to indicate the hours of a clock (correct spacing required)  

7. Please mark in hands to show 10 minutes past eleven o’clock (11:10)
Recall

8. What was the name and address I asked you to remember? (exact only)
   John
   Brown
   42
   West (St)
   Kensington

Information

9. What is the name of the prime minister?

10. Can you tell me something that happened in the news recently?
    (Recently = last week. If a general answer is given, e.g. “war”,
    “a lot of rain”, ask for details)

Similarities

11. I am going to name two things and I’d like you to tell me
    in what way they are alike. For example, a dog and a
    monkey are alike because they are both animals.

In what way are a dress and a shirt alike?

| Generally speaking, any answer which is an appropriate abstract response, e.g. clothing, garments, apparel, or any answer which is more or less correct, e.g. you wear them, made of cloth, keep you warm, should be scored correct. Responses should be scored incorrect for any of the following reasons: inadequate - e.g. you use them, they are manufactured irrelevant - e.g. they both have 5 letters unnecessary features - e.g. have buttons, have sleeves wrong - e.g. they grow on trees. |

Calculation

12. If you had a dollar, and spent 15 cents, how
much change would you have left? (exact only)  

Approximate time to complete GPCOG - patient examination:

_______ minutes

GPCOG - informant section:
to be completed with only informant present

Please circle appropriate option:  
Face to face  
Telephone

Informant initials:  
Date:  

Note: If difficulties are deemed to be due to physical rather than cognitive impairment please tick ‘no’.

Ask the informant:
Compared to a few years ago:

• Does the patient have more trouble remembering things that have happened recently?  

• Is the patient worse at remembering where belongings are kept?  

• Does he or she have more trouble recalling conversations a few days later?  

• When speaking, does the patient have more difficulty in finding the right word or tend to use the wrong words more often?  

• Is the patient less able to manage money and financial affairs (e.g. paying bills, budgeting)?  

• Is the patient less able to manage his or her medication independently?  

• Does the patient need assistance in using the telephone?
• Does the patient need assistance with transport (either private or public)? □ □ □ □

Approximate time to complete GPCOG - informant section:

_______________ minutes
Methods of scoring the GPCOG

One advantage of the GPCOG is its ability to combine information from two sources (patient and informant) in a manner that is easily interpretable in primary care. In deciding how to achieve this, two alternatives were considered: adding the sub-scores to make a total score, or a two-stage approach, based on decision rules. In the two-stage method the decision of whether or not to obtain informant data is based on the patient’s results in the cognitive testing. Such structured or staged decision making has been used in diagnosis of other disorders [24]. The two-stage procedure may be more efficient for a primary care setting in which GPs have limited time and resources. We hypothesised that the two-stage procedure would be at least as effective and more efficient than using the whole instrument.

Instruments used in the Study:

The Abbreviated Mental Test (AMT) [9, 26] is a 10-item cognitive scale examining orientation and memory. It is capable of differentiating normal from cognitively impaired patients in an acute geriatric ward and in that context has a reported sensitivity of 81% and specificity of 85% using the recommended cut-point of a total score of 7 or less [27]. The AMT was administered as a comparison test for the GPCOG (See Appendix Two).

The 15-item Geriatric Depression Scale (GDS) [28, 29] is a screening instrument for depression in the elderly. The GDS was used in the current study to investigate the
influence of level of depressive symptoms on GPCOG test scores. The GDS has been validated for use in older populations except for those who have severe cognitive deficits [30] or lack self awareness of their own cognitive deficits [31].

The 12-item Short-form health survey (SF-12) [32] is a self-report measure with two subscales, used to evaluate the physical and mental health of subjects. The physical health subscale contains items that evaluate physical functioning, bodily pain, role limitations due to physical problems and general health. The mental health sub-scale comprises items measuring the vitality, social functioning, role limitations due to emotional problems and mood of respondents. The SF-12 was used in the current study to investigate the influence of physical and mental health on GPCOG scores.

The Cambridge Mental Disorder of the Elderly Examination (CAMDEX) [19, 20] is a semi-structured, lay administered diagnostic schedule developed in the UK. The diagnostic schedule consists of a structured psychiatric interview with the patient, a test of cognitive abilities (called the CAMCOG), a standardised schedule for recording mental state, appearance and demeanour, and a structured interview with a relative or informant. In the Roth et al (1986) study [20], a CAMCOG score of less than 80/108 indicated cognitive impairment. In the present study, we increased this cut-point to a score of less than 85/108, to minimise the possibility that cases of dementia would be missed. In addition, the CAMCOG includes all the items from the Mini-Mental State Examination (MMSE) [7], so it is also possible to obtain an MMSE score. The inter-rater reliability of the two research psychologists administering the CAMDEX (NK and LH) was evaluated by comparing
simultaneous ratings on 25 patients. The intra-class correlation between the two psychologists was very high at 0.983 (95% confidence interval 0.946-0.995).

Minor modifications were made to the CAMDEX schedule to enable derivation of DSM-IV [33] diagnoses of dementia (based on A and B criteria) and delirium, and to ensure the questions were culturally appropriate to an Australian sample. The brief physical examination and optional laboratory tests that form part of the CAMDEX schedule were not included in this study. For those subjects who were reviewed during the case conference (see below) a rating was established using the CAMDEX schedule’s guidelines for classifying dementia according to severity (none, minimal, mild, moderate and severe).

*Patient and GP satisfaction* were evaluated using anonymous self-completed questionnaires, developed by the research team. GPs were asked about their general satisfaction with the measure (on a five-point scale) and whether or not they considered the GPCOG schedule to be practical, acceptable to patients and economically viable in the current health care system. They were also asked if they would continue to use the GPCOG, should it prove to be valid and reliable. Patients were asked to rate on 5-point scales how they felt about the screening test (from ‘disliked it a lot’ to ‘liked it a lot’) and how they felt about the GP checking their memory (from ‘very irritated’ to ‘very reassured’).

**Recruitment of Participants**

**The original method proposed:**

A convenience *validation sample* of ~50 GPs whose practices were likely to include a reasonably high number of elderly patients, were to be trained in the use of the protocol
and asked to assess all community-dwelling patients attending their practices over a three week period who gave consent and meet the following inclusion criteria:

I.  $\geq 75$ years old and/or

II. patients with subjective cognitive complaints - spontaneous or in response to questioning or

III. informant complaints of cognitive decline - spontaneous or in response to questioning or

IV. doctor observed evidence of cognitive decline.

Exclusion criteria were:

I. depression

II. nursing home residency

III. inadequate English, and

IV. other factors precluding participation e.g. serious physical disorders, severe aphasia, apraxia, blindness, other marked perceptual problems.

Conservatively, we estimated at least four such patients per week $\rightarrow$ 4 p.w. x 4 w x 50 GPs $\rightarrow$ $n = 800$. Permission was to be sought from patients at the time of their consultation with the GP for a more detailed home assessment. Discussions with GPs indicated that assessing an average of one patient per day in this way would not be too onerous.

Assumptions and calculations: The following calculations for sample size were based on conservative estimates: (i) $> 10\%$ moderate-to-severe dementia and $10\%$ mild-moderate prevalence (25); (ii) 800 patients screened; (iii) $> 60\%$ acceptance rate of acceptance of
home interview. This should have yielded a potential sample of 480 patients agreeable to being interviewed at home. We intended to interview all subjects with incorrect responses, or informant indicated decline on our new instrument, and about half as many without indications of memory problems.

The recruitment protocol we developed in the study:

The number of GPs we aimed to include in the validation sample was extended from 50 to close to 100. More GPs were needed based on the rate of recruitment of subjects by each GP in the pilot study (≈ 4 subjects over approximately 4 weeks). This was substantially lower than the anticipated rate of 4 subjects per week over 4 weeks (16 subjects per GP). In order to boost these numbers, GPs were encouraged intermittently throughout the testing period to recruit more subjects. Subjects with a range of cognitive abilities were included in the study, providing they meet the inclusion and exclusion criteria mentioned above.

Subjects were included by the GP into the study if they were aged 75 years or over and/or had suspected memory problems (reports from informant, GP or subject themselves). Subjects were not included in the study if they were residents of a nursing home or were about to enter a nursing home because of multiple confounding variables present in this population. Depression was also an exclusion criterion when detected by the GP, as it may be confused as a cognitive disorder. Subjects who were delirious at the time of examination were not to take part in the study because delirium causes
cognitive impairment that is often due to reversible causes. Subjects who could not speak English or who had serious physical disorders, for example severe aphasia, apraxia, blindness or other marked perceptual problem, were not able to do the tasks required in the cognitive tests and therefore could not be included in the study.

Appropriate informants were relatives or close friends who were aged 16 years or more, had known the subject for at least 5 years and visited the subject at least once a week (face-to-face). These criteria were necessary to ensure that the informant possessed an adequate knowledge of the subject, as they were asked questions about his/her personality, memory, general mental functioning, everyday activities, mood and health status.

**Hypothesis 1:** That the protocol developed to assist general practitioners in their diagnosis of dementia will be both valid and reliable.

**Original Validity study proposed:**

The *gold standard* of diagnosis was to be a research clinician (psychologist) using the CAMDEX (19), DSM-IV(33) and ICD-10 (34) criteria. The research clinician was to be trained in our Memory Disorders Clinic to ensure s/he has attained a highly reliable and accurate standard of case identification. Sensitivities and specificities were to be
calculated against the clinical gold standard. The results of the research assessment were to be conveyed to the patient's GP.

**Methodology to examine validity in the study as it was conducted:**

General practitioners were asked to administer the extended GPCOG measure (prior to its subsequent refinement) and the AMT to consecutive attendee patients who met the study's inclusion criteria. Prior to participation, informed consent was obtained by the GP, who also sought permission to contact an informant who had known the patient for at least 5 years. Informants were interviewed by telephone or in person.

An average of five weeks after the consultation, patients were visited at home by a research psychologist (NK or LH). The researcher re-administered the GPCOG, collected demographic and medical information and administered the CAMDEX, the GDS and the SF-12. Where possible, the researcher also contacted the subject's informant for an interview face to face, or by telephone. All patients considered to be cognitively impaired and a number considered cognitively intact were discussed at a case conference with an experienced clinician. Consensus diagnoses of dementia or delirium were established against DSMIV and ICD 10 criteria.

**Original reliability methodology proposed**

*Test-retest:* The GPCOG was to be administered to a total of 20-30 patients (who were not acutely ill and whose medication was likely to remain stable) by local GP pilot sample, and was to be retested within a period of two weeks. We wished to demonstrate that the
GPCOG diagnoses on two occasions of testing correlated well, so our null hypothesis was one of minimal (rather than nil) association. For a one-tailed test, with alpha set at 0.05, the number of subjects required to achieve a power of 90% was 16, assuming that a correlation of 0.9 between test and re-test diagnosis is considered evidence of excellent agreement.

**Inter-rater reliability:** In order to examine the inter-rater reliability of the screening instrument, 20-30 willing subjects were to receive a second or simultaneous assessment by a different assessor. A kappa coefficient was to be calculated to give an index of the level of agreement between raters using the instrument.

**Reliability methodology in the study as it was conducted.**

Two investigations of test-retest reliability of the GPCOG and one of inter-rater reliability were undertaken. GPCOG scores obtained at the GP visit were compared to those obtained by the researcher during the home visit. Comparisons were restricted to home visits carried out two to four weeks after the GP visit. Secondly, a separate sample of 12 GPs administered the GPCOG to an additional group of subjects (not included in the main study) who were re-tested by a research doctor not more than two weeks later. Finally, we determined inter-rater reliability through simultaneous co-rating of a random subset of patients (n = 22) by the two research psychologists.
Hypothesis 2: That the GPCOG will perform better than the AMTS in detecting dementia in a general practice setting.

Original intention

Originally we intended to compare the performance of the GPCOG with that of the MMSE and PAS in detecting dementia in general practice. However, we decided instead to compare it with the Abbreviated Mental Test Score (AMTS) (9) rather than the PAS and MMSE. The primary reason for this change was that this tool has a shorter administration time than the others and is therefore highly practical and desirable for busy general practices. The AMTS also has acceptable psychometric properties (26).

Study as conducted

The validation sample of GPs was asked to administer the Abbreviated Mental Test Scale (AMTS) in addition to the GPCOG. ROC analyses were used to compare the relative performances of the two instruments, and GPs were surveyed as to their preferences regarding the two instruments.

Comparison with the MMSE was made via the embedded MMSE which was part of the CAMDEX. This was not administered by the GP, but by the research psychologist. Comparison of its performance in detecting dementia was therefore possible, but not comparison in terms of which instrument would be most suitable in the GPs surgery. There
is evidence in the literature that the MMSE is not suitable for administration by GPs in General Practice (8), and indeed our pilot GPs found it too onerous.

Hypothesis 3: That general practitioners will find the protocol and instrument easy and practicable to use and will want to continue to use it.

Original methodology for use with the GPs

Ease and practicability of use.

The validation sample was to be surveyed at the end of the study to evaluate their experience with the protocol. During the study they were to be asked to time each component of the new instrument.

The initial training for GPs was to incorporate management guidelines, as well as training in the use of the instrument. It was thought that improved confidence in management might encourage GPs to increase their diagnostic accuracy. Participating GPs were to be asked to indicate, in check-list format, what management strategies they had put in place for each patient with cognitive impairment.

General practitioners were to be provided with an opportunity to attend a feedback session after the first two weeks, i.e. midway between the two periods of data collection. This was to give them an opportunity to receive reports on their patients individually and collectively. They were also to be able to feed back to the Project Team their opinions of the screening procedure and suggested management practices. An option for written feedback was also
to be offered. A further two weeks of data collection was to follow the feedback session, giving GPs the opportunity to demonstrate changed behaviour.

It was thought that the process of audit, feedback and evaluation should produce some long-lasting behaviour change in GPs in respect of both diagnosis and management of this patient group. It should also satisfy the RACGP criteria for awarding Practice Assessment points. This would eliminate the need to remunerate GPs for their time, as Practice Assessment points cannot be awarded for remunerated activities. It should also provide an additional incentive for GPs to participate.

**The methodology in relation to the GPs in the study as conducted**

In each of four Divisions of General Practice an education evening was held. The evening provided information about the diagnosis and management of dementia and gave details about the study. GPs replied directly to the project's researchers if they were interested in attending. GPs who could not attend the education evening but who were interested in the study were visited by a researcher associated with the project (ie., were detailed). The researcher gave the GP a condensed version of the content of the education evening and asked them if they would like to take part in the research.

The education evenings fulfilled the Royal Australian College of General Practitioner's (RACGP) guidelines as a continuing education activity. GPs received 3 points from the RACGP for taking part.

At the conclusion of the education evening, GPs were given a brief questionnaire to test their knowledge of issues surrounding early detection, screening and diagnosis of
dementia. The questionnaire also asked them to evaluate the content and style of the meeting (see Appendix 3).

All GPs who recruited at least 5 subjects to the study were given the opportunity to participate in a quality assurance activity (called a clinical audit). The recruitment target of at least 5 subjects per GP was determined to ensure that the effort produced in arranging the conferment of these points was balanced by an effort made on the part of the GP to actively participate in the project.

GPs were sent a letter asking them to reply to the project's researchers if they were interested in the activity. They were then sent clinical audit checklists (See Appendix 4) and were required to fill them in for 8 patients whom they suspected had degenerative cognitive impairment (4 if they worked part-time). The checklist contained a list of tests and other management strategies deemed necessary to confirm the presence of a cognitive disorder. The completed checklists were returned to the researchers and the group data were analysed.

The GPs were then invited to attend a clinical audit meeting where the group results were discussed in terms of best practice and further information about the diagnosis and management of dementia was disseminated. Prior to the beginning of the meeting they were asked to complete a questionnaire that tested their knowledge about the diagnosis and management of dementia (see Appendix 5). They were also asked to fill in a similar questionnaire at the conclusion of the meeting (See Appendix 6). This questionnaire also included questions asking the GPs to rate the content of the meeting. GPs who had completed the first clinical audit were asked to conduct a re-audit using the same
checklists. The re-audit process was designed to examine whether there had been a change in the way the GPs managed patients with cognitive impairment from the time of the first audit.

*GP satisfaction* was evaluated using anonymous self-completed questionnaires, developed by the research team (see Appendix 7). GPs were asked about their general satisfaction with the measure (on a five-point scale) and whether or not they considered the GPCOG schedule to be practical, acceptable to patients and economically viable in the current health care system. They were also asked if they would continue to use the GPCOG, should it prove to be valid and reliable. In addition GPs were asked to record how long the GPCOG took to administer.

**Hypothesis 4:** *That patients will be accepting of the testing procedure.*

**Procedure as it was proposed and as it happened**

Patients were asked to rate on 5-point scales how they felt about the screening test (from 'disliked it a lot' to 'liked it a lot') and how they felt about the GP checking their memory (from 'very irritated' to 'very reassured'). Questionnaires were filled in anonymously (see Appendix 8).
RESULTS

Pilot

A total of 11 GPs were recruited to trial the research protocol and measures. Significant changes were made to the protocol as a result of the pilot, particularly shortening the protocol to accommodate the GPs time. Approximately 50 subjects were involved in the pilot studies. These GPs were not used again in the study.

Recruitment of GPs including evaluation of information evenings

Eighty-four GPs in total joined the study from recruitment sessions held in four Divisions of General Practice: Eastern/South Eastern, St George, Illawarra and the Central Sydney Division of General Practice. The method of recruitment is described above (see Methods). Not all GPs went onto recruit patients as subjects for the study, however. In fact only 67 recruited patients who took part in the final study.

At the conclusion of the education evening, GPs were given a brief questionnaire to test their knowledge of issues surrounding early detection, screening and diagnosis of dementia. The questionnaire also asked them to evaluate the content and style of the meeting (see Appendix 2).
Results of the questionnaire:

Easter/South Eastern Division:

Thirteen GPs were present the meeting, 12 agreed to take part in the study. Ten of thirteen GPs who were detailed also agreed to take part in the study.

Four questions were given to test GPs’ knowledge of issues surrounding early detection, screening and diagnosis of dementia. Ninety-two percent of GPs got three or more items correct. All of the GPs felt that they now understood the importance of early dementia diagnosis. Sixty-seven percent felt that they had improved their dementia diagnosis skills and 75% felt they had a better understanding of what to do if it is suspected that a patient has dementia. On average, GPs rated the coverage of the topic as very good, the relevance of the topic as very good and the teaching method as good to very good.

St George Division:

Thirteen GPs came to the evening and 10 agreed to take part in the study. All three GPs who were detailed also agreed to take part in the study.

Over half of the GPs answered all three questions correctly. All of the GPs felt that they had improved their dementia diagnosis skills, had come to understand the importance of early dementia detection and had a better knowledge of differential diagnosis issues. Seventy percent of GPs believed the coverage of the topic to be excellent (the rest rating it as very good). Seventy-seven percent felt that the relevance of the topic and the teaching method were excellent (the others rated these as good or very good).
Illawarra Division

Twenty-three GPs came to the evening and 20 agreed to take part. Seven GPs were detailed and all agreed to take part.

Eighty-three percent of GPs answered all test questions correctly. All of the GPs felt they had come to understand the importance of early dementia diagnosis. Ninety-one percent of attendees felt they had improved their dementia diagnosis skills and 87% had a better knowledge of differential diagnosis issues. Over ninety percent of GPs believed the coverage and relevance of the topic was very good or excellent. Ninety-six percent of GPs rated the teaching method as good to excellent.

Central Sydney Division

Twenty-three GPs came to the evening and 17 agreed to take part. Five GPs who were unable to attend were detailed and all 5 decided to join.

Sixty-five percent of GPs answered all test questions correctly, with the rest getting only one wrong. All of the GPs felt they had come to understand the importance of early diagnosis of dementia and all believed they had improved their diagnostic skills in this area. Ninety-five percent stated they had a better understanding of differential diagnosis issues. Eight-nine percent of GPs rated the coverage and relevance of the topic and the teaching method as very good or excellent.
Clinical Audit Activity

Three clinical audit meetings were held. The first was at Calvary Hospital Kogarah on May 18. Five GPs attended. Results from their pre and post questionnaires demonstrated that 4 of the five GPs improved their understanding of effective and appropriate patient management strategies for people with cognitive impairment. When asked to name the services available to help carer and sufferers of cognitive impairment, they were able to provide 1 to 2 extra names at the post evaluation. In addition, pre and post test scores for true/false questions examining their comprehension of dementia related issues were perfect. This indicates the GPs already possessed a good understanding of the area, possibly from their attendance at the initial education evening. However, knowledge of reversible causes of dementia did not improve at the post-test evaluation. Again, this may be because they were already knowledgeable in this area. Finally, all GPs rated the relevance and coverage of the topic as good to excellent.

The second clinical audit meeting was held at Wollongong Hospital on July 22. Three GPs attended (one did not participate in the clinical audit process). The third clinical audit meeting was held at the Department of General Practice on July 28. Seven GPs attended. Due to the low attendance rate at the Wollongong meeting the results of the two meetings have been combined. Forty percent of GPs showed an improvement in their understanding of managing the cognitively impaired. On average the GPs were able to name 1 extra organisation that provides services for carers and sufferers of cognitive impairment at the post-test evaluation. Forty percent were able to name 1 to 2 further reversible causes of cognitive impairment. Six of 10 GPs achieved perfect marks on the true/false questions at
the pre-test evaluation. However, only one of the other four improved his/her mark at the post-test evaluation. The coverage and method of the education meeting was rated as very good to excellent. Ninety percent rated the relevance as very good to excellent, with the other 10% rating it as good.

The audit procedure outlined above satisfied the RACGP criteria for Clinical Audit points (formerly called Practice Assessment points). Twenty-five audit points were awarded if the participating GPs completed the process of audit and re-audit. If the GPs also attended the clinical audit education evening and completed a pre and post meeting questionnaire then a bonus 20 clinical audit points and 6 CME points were awarded.

Sample of GPs included in final study

Sixty seven GPs recruited participants who were included in the final study results. The demographic characteristics of the 67 participating GPs are as follows: 34% of participants were female, the average age was 52 (range = 31-81), and GPs had worked an average of 23 years in general practice. Most had received medical training in Australia (71%) and roughly equal numbers of GPs came from the four participating Divisions of General Practice. In order to gauge the representative nature of our sample, the demographics of participating GPs were compared to data about practising Australian GPs (Commonwealth Department of Health and Aged Care, 1996). While similar proportions were female ($\chi^2 = 0.053, df = 1, p = 0.82$) and had graduated from an Australian university ($\chi^2 = 1.30, df = 1, p = 0.25$), participating GPs were significantly older ($\chi^2 = 9.75, df = 4, p = 0.045$).

Sample of patients

Of the 380 subjects recruited by GPs, 47 subjects withdrew from the study, 24 subjects did
not meet the study’s inclusion/exclusion criteria, and 26 were unable to receive a home visit for various reasons. The 73 subjects who withdrew or were unable to receive a home visit did not significantly differ from the 283 participants as regards age (t = -1.70, df = 322, p = 0.38), gender (χ² = 1.11, df = 1, p = 0.29), AMT score (non-participants n = 55; t = 0.89, df = 322, p = 0.38), GPCOG patient score (non-participants n = 56; t = -0.21, df = 336, p = 0.84) and GPCOG informant score (non-participants n = 37; t = -0.82, df = 237, p = 0.42).

Demographic characteristics of the remaining 283 subjects (74.5 % of the original sample) are shown in Table 1. Thirty-two patients (11.3%) were aged 50-75 years. Eighty-two patients met DSM-IV criteria for dementia of whom 72 also met ICD-10 criteria for dementia. A further 50 patients were considered clinically to have possible or probable dementia but failed to meet DSM criteria often because there was a lack of a history to corroborate cognitive or functional decline. All patients diagnosed with dementia had CAMCOG scores of less than 85. None of the sub-sample of patients who scored 85 or more met criteria for dementia. The following analyses are based on the definition of dementia according to DSM-IV criteria. (Similar results were found when the definition was based on ICD criteria or on a looser definition that included possible, probable or definite DSM dementia).
Table 1: Socio-demographic characteristics and mean scores of patients by DSM-IV derived diagnosis of dementia.

<table>
<thead>
<tr>
<th></th>
<th>Non-cases N = 201</th>
<th>Cases N = 82</th>
<th>Total N = 283</th>
<th>Test of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>40.3%</td>
<td>41.5%</td>
<td>40.6%</td>
<td>$\chi^2 = 0.33$</td>
</tr>
<tr>
<td>Female</td>
<td>59.7%</td>
<td>58.5%</td>
<td>59.4%</td>
<td>df = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>p = 0.856</td>
</tr>
<tr>
<td><strong>Place of residence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private home</td>
<td>87.1%</td>
<td>89.0%</td>
<td>87.6%</td>
<td>$\chi^2 = 3.255$</td>
</tr>
<tr>
<td>Hostel</td>
<td>3.5%</td>
<td>3.7%</td>
<td>3.5%</td>
<td>df = 3</td>
</tr>
<tr>
<td>Self-care unit</td>
<td>9.5%</td>
<td>6.1%</td>
<td>8.5%</td>
<td>p = 0.35</td>
</tr>
<tr>
<td>Nursing home*</td>
<td>0.0%</td>
<td>1.2%</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>79.1</td>
<td>80.7</td>
<td>79.6</td>
<td>t = -1.981</td>
</tr>
<tr>
<td>Range</td>
<td>56 - 94</td>
<td>57 - 94</td>
<td>56 – 94</td>
<td>df = 281</td>
</tr>
<tr>
<td>St Dev</td>
<td>5.7</td>
<td>6.8</td>
<td>6.1</td>
<td>p = 0.049</td>
</tr>
<tr>
<td><strong>Years of formal education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>9.6</td>
<td>9.0</td>
<td>9.4</td>
<td>t = -1.718</td>
</tr>
<tr>
<td>Range</td>
<td>2 - 30</td>
<td>5 - 17</td>
<td>2 – 30</td>
<td>df = 265</td>
</tr>
<tr>
<td>SD</td>
<td>3.2</td>
<td>2.2</td>
<td>3.0</td>
<td>p = 0.087</td>
</tr>
</tbody>
</table>
**Analyses**

Receiver operator characteristic (ROC) analyses were used to assess the GPCOG Patient section, Informant section, total score and two-stage test, as screening tools for DSM-IV defined dementia.

Chi-squared tests were used to compare areas under curves (AUCs) for the GPCOG patient and informant sub-scales, the GPCOG total score and two-stage test and the AMT [35]. Reliability was evaluated using intra-class correlation coefficients and Cohen's Kappa.

**Reliability of testing procedure**

The inter-rater reliability of the two research psychologists administering the CAMDEX (NK and LH) was evaluated by comparing simultaneous ratings on 25 patients. The intra-class correlation between the two psychologists was very high at 0.983 (95% confidence interval 0.946-0.995).
Hypotheses 1: That the protocol developed to assist general practitioners in their diagnosis of dementia will be both valid and reliable.

Note: For Refined GPCOG – see Appendix One. This is the version recommended for future use.

Examination of the GPCOG Screening test

Refinement of the sub-scales

The GPCOG sub-scales were refined by two methods. Firstly, items completed incorrectly by less than 20% of patients or affirmed by less than 20% of informants (one patient item and one informant item) were eliminated. Secondly, logistic regressions were carried out for the patient and informant sections separately to determine the abilities of individual items to predict dementia diagnosis. Five items from the patient section and one from the informant section were removed without significant reduction in discriminatory ability, as measured by ROC curve analyses. The refined GPCOG consisted of a cognitive testing (patient) section of four items and an historical (informant) section of six items (see Appendix).

Scoring the refined GPCOG sub-scales

The GPCOG patient section score was obtained by adding the number of correct responses, to a maximum total score of 9. For the informant section score, ‘no’ responses were added to a maximum total score of 6, where a high score indicates that the informant reports a high level of functioning in the patient. For patient sections where one of the answers was missing (n=4), and for informant sections where one of the questions was answered ‘don’t know’ or ‘not applicable’ (n=29) scores were pro-rated. Table 2 shows the
mean scores for the GPCOG patient and informant sections, the AMT, CAMDEX and MMSE.

Table 2. Test score performance for patients with and without dementia.

<table>
<thead>
<tr>
<th></th>
<th>Non-cases</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GPCOG patient section</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>7.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Range</td>
<td>2-9</td>
<td>0-9</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>1.5</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>201</td>
<td>81</td>
</tr>
<tr>
<td><strong>GPCOG informant section</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>4.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Range</td>
<td>0-6</td>
<td>0-6</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>137</td>
<td>65</td>
</tr>
<tr>
<td><strong>AMT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>9.1</td>
<td>7.6</td>
</tr>
<tr>
<td>Range</td>
<td>2-10</td>
<td>1-10</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>1.2</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>195</td>
<td>74</td>
</tr>
<tr>
<td><strong>MMSE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>25.9</td>
<td>21.0</td>
</tr>
<tr>
<td>Range</td>
<td>17-30</td>
<td>7-28</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>2.7</td>
<td>4.1</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>201</td>
<td>82</td>
</tr>
<tr>
<td><strong>CAMCOG</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>86.1</td>
<td>67.3</td>
</tr>
<tr>
<td>Range</td>
<td>51-102</td>
<td>27-88</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>9.2</td>
<td>14.1</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>201</td>
<td>82</td>
</tr>
</tbody>
</table>
There was a strong correlation between the GPCOG patient section and the MMSE \((\text{Pearson } r = 0.683, p = 0.000)\), providing additional evidence of concurrent validity.

**Sensitivity and specificity of the refined GPCOG**

Sensitivities, specificities, positive and negative predictive values (PPV and NPV) and misclassification rates were examined for every possible value of the two sub-scales separately, together or sequentially (i.e. two-stage method). Results are displayed for the best cut-point for each GPCOG method in Table 4. This cut-point was determined by the criterion that it should yield maximum specificity with a minimum sensitivity of 0.8. A value of 0.8 was chosen in order to ensure that no more than 20% of actual cases were missed.

The two-stage sequential protocol used the following decision rules:

1. Patients who scored > 8 points in the GPCOG patient section were assumed not to be cognitively impaired and diagnostic informant questioning was unnecessary.

2. Patients who scored < 5 points in the GPCOG patient section were assumed to be significantly cognitively impaired so that the informant information was unnecessary for categorising patients as having significant cognitive impairment.

3. When patients scored between 5 and 8 (inclusive), the informant section was scored.

   An informant section score \(\leq 3\) (out of 6) was taken to indicate cognitive impairment, and >3 the absence of cognitive impairment.

Separately, both the patient and informant sections had a high sensitivity and a moderate specificity. The total and the two-stage methods each resulted in increased specificity without any appreciable change in sensitivity whilst reducing the misclassification rates.
Table 4. Sensitivity, specificity, and the area under the curve (AUC) for GPCOG patient section, GPCOG informant section, GPCOG total score, GPCOG two-stage method and the AMT

<table>
<thead>
<tr>
<th></th>
<th>GPCOG patient section</th>
<th>GPCOG informant section</th>
<th>GPCOG total score</th>
<th>Two-stage method</th>
<th>AMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut Point</td>
<td>7/8</td>
<td>4/5</td>
<td>10/11</td>
<td></td>
<td>7/8</td>
</tr>
<tr>
<td>Maximum score</td>
<td>9</td>
<td>6</td>
<td>15</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>N*</td>
<td>282</td>
<td>202</td>
<td>202</td>
<td>246</td>
<td>269</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.82</td>
<td>0.89</td>
<td>0.82</td>
<td>0.85</td>
<td>0.42</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.70</td>
<td>0.66</td>
<td>0.83</td>
<td>0.86</td>
<td>0.93</td>
</tr>
<tr>
<td>PPV†</td>
<td>0.53</td>
<td>0.52</td>
<td>0.67</td>
<td>0.71</td>
<td>0.71</td>
</tr>
<tr>
<td>NPV†</td>
<td>0.90</td>
<td>0.94</td>
<td>0.92</td>
<td>0.93</td>
<td>0.80</td>
</tr>
<tr>
<td>Misclassification rate†</td>
<td>26.5%</td>
<td>27.2%</td>
<td>17.3%</td>
<td>14.2%</td>
<td>21.8%</td>
</tr>
<tr>
<td>AUC</td>
<td>0.86</td>
<td>0.84</td>
<td>0.91</td>
<td>0.89</td>
<td>0.78</td>
</tr>
<tr>
<td>AUC 95% CI</td>
<td>0.81-0.91</td>
<td>0.79-0.90</td>
<td>0.86-0.95</td>
<td>0.85-0.94</td>
<td>0.71-0.84</td>
</tr>
<tr>
<td>SE of AUCs</td>
<td>0.035</td>
<td>0.030</td>
<td>0.023</td>
<td>0.025</td>
<td>0.032</td>
</tr>
</tbody>
</table>

*N varies because of missing data. For two-stage method, GP derived informant data were only required when the GPCOG patient section was 5-8 out of a possible 9.

†Based on an estimated 29% prevalence of dementia in this population.

In order to perform a ROC analysis and to obtain an area under the curve (AUC) for the GPCOG two-stage method, additional calculations were required. For those whose
cognitive score was greater than 8, the informant score was imputed to be the maximum of 6; those whose cognitive score was less than 5 were given an imputed informant score of 0. For subjects who achieved a cognitive score of 5-8, the informant score was the actual one obtained. By this method a new seven-point (0-6) informant scale was constructed.

AUC analyses showed that there was no significant difference between the AUCs of the patient and informant sub-scales of the GPCOG ($\chi^2 = 0.24$, df = 1, p>0.25). The ‘total score’ method of combining the sub-scales was significantly superior to either of the sub-scales alone ($\chi^2 =143.46$, df = 2, p<0.001), as was the ‘two-stage’ method of combination ($\chi^2 = 13.03$, df = 2, p<0.005). There was no significant difference between the AUCs of the ‘total score’ method and the ‘two-stage’ method ($\chi^2 = 1.48$, df = 1, p<0.250).

**Figure 1.** The receiver operating characteristic (ROC) curves for each test as a screen for dementia.
The effects of patient and informant characteristics on GPCOG scores

To investigate the possibility that patient or informant characteristics may have influenced the GPCOG patient or informant scores, two regression analyses were run. In the first, the GPCOG patient score was treated as the dependent variable. The DSM-IV dementia diagnosis was entered first in the model, followed by these demographic variables: the patient's English proficiency (rated as either 'speaks English only', ‘speaks English very well’ or ‘speaks English well’), GDS score, patient age, patient gender, years of education, and the physical and mental health sub-scales of the SF-12. None of these demographic factors was significant once the variance due to dementia diagnosis had been accounted for (p-value ranged from 0.06 to 0.65). In the second analysis, the GP informant score was the dependent variable, and once again dementia diagnoses was entered first in the model. In addition to the patient demographic variables mentioned above, informant characteristics were added to the model: the informant's gender and age, and the average number of days the informant sees the patient. None of these factors was significant (p-value ranged from 0.11 to 0.88).

Reliability

The GPCOG patient and informant sections were found to have adequate test-retest and inter-rater reliability for both GPs and researchers (Table 3). The internal consistency (Cronbach’s alpha) of the GPCOG patient section was 0.84 and of the GPCOG informant section was 0.80.
Table 3: Inter-rater reliability for GPs and researchers, and test retest reliability for both sub-scales of the GPCOG.

<table>
<thead>
<tr>
<th></th>
<th>GPCOG patient section</th>
<th>GPCOG informant section</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GPs inter-rater</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>37</td>
<td>20</td>
</tr>
<tr>
<td>ICC (95% CI)</td>
<td>0.75 (0.56 – 0.86)</td>
<td>0.56 (0.19 – 0.81)</td>
</tr>
<tr>
<td>P</td>
<td>0.000</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Researchers inter-rater</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>22</td>
<td>No results</td>
</tr>
<tr>
<td>ICC (95% CI)</td>
<td>0.94 (0.86-0.97)</td>
<td>available</td>
</tr>
<tr>
<td>P</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td><strong>Test-retest</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>71</td>
<td>36</td>
</tr>
<tr>
<td>ICC (95% CI)</td>
<td>0.87 (0.80-0.92)</td>
<td>0.84 (0.70-0.91)</td>
</tr>
<tr>
<td>P</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Internal consistency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>277</td>
<td>166</td>
</tr>
<tr>
<td>Cronbach’s alpha</td>
<td>0.84</td>
<td>0.80</td>
</tr>
</tbody>
</table>
Hypothesis 2: That the GPCOG will perform better than the AMTS in detecting dementia in a general practice setting.

Figure One (above) shows the receiver operating characteristics for each test as a screen for dementia. The AUC (Area under the curve) of the two-stage GPCOG score was significantly superior to that of the AMT ($\chi^2 = 17.17$, df = 1, p<0.001).

Hypothesis 3: That general practitioners will find the protocol and instrument easy and practicable to use and will want to continue to use it.

General practitioners completed the initial extended version of the GPCOG (15 items for patient section and 8 items for informant section) before it was refined and shortened. The mean time for GPs to complete the unrefined patient section of the GPCOG was 9.5 minutes (range = 2 - 25 minutes, n = 260). The unrefined informant section was briefer, with the test taking an average of 3.5 minutes (range = 1 - 15 minutes, n = 195). Patients with dementia took longer on average to complete the patient section (11.5 minutes) than those without dementia (8.5 minutes). Cognitive status of the patient did not affect the length of administration of the informant section. The refined GPCOG measure was subsequently administered to a sample of 17 patients attending a psychogeriatric outpatient clinic, by research staff. The average times to administer the measure were 3.5 minutes for the patient section (SD = 1.08, range = 2 – 5.8 minutes) and 1.5 minutes for the informant section (SD = 0.64, range = 0.5 – 2.5 minutes).

Of the 67 participating GPs, 49 (73%) anonymously completed a satisfaction survey. Most indicated that the measure was practical to use (87.8%) and economically viable under the
current Australian health care system (87.8%). An overwhelming majority believed that the GPCOG was acceptable to patients (98%). In general, 83.7% of GPs were either satisfied or very satisfied with the GPCOG measure, and 89.8% said they would continue using it.

**Hypothesis 4:** That patients will be accepting of the testing procedure.

**Patient Satisfaction**

Of the 333 subjects who completed the satisfaction survey, 76.3% either liked the examination a bit or a lot, 18.3% neither liked nor disliked it, 2.1% disliked it and 2.4% of subjects felt unsure. The majority of patients felt reassured (or very reassured) by the fact that the doctor had checked their memory and concentration (74.4%), 2.1% felt irritated, and 21.6% felt either neutral or unsure.
DISCUSSION

The advantages of the GPCOG over current brief screening instruments are that it is quick to administer, has been validated in a primary care setting and has sound psychometric properties. An important requirement of screening tests is that few true cases should be missed (high sensitivity). In this study only 7% of patients who were identified as non-demented by the GPCOG had dementia (see Table 5, NPV = 0.933). Furthermore, of those patients who were false positives (abnormal GPCOG but no DSM-defined dementia), 38% had definite cognitive impairment but did not meet diagnostic criteria for dementia. The vast majority of GPs rated the GPCOG as being practical, economically feasible and almost universally acceptable to patients. The two-stage procedure was found to be efficient because only 47.7% of cases required the informant to be contacted. Using the refined version of the GPCOG, we performed cognitive testing in under four minutes and administered the informant section in less than two minutes; this is now being re-evaluated in a primary care setting.

Further advantages of the GPCOG are that performance appears to be independent of the patient’s English proficiency, Geriatric Depression Scale score, age, gender, years of education, and physical and mental health. The informant section also appeared to be free of such biases. However we cannot be certain how the instrument will perform when used to evaluate patients who can not comprehend English or who have severe dysphasia, depression, sight or hearing problems as they were excluded from the study.
There are some limitations to the study. The first is that it was performed with a
convenience sample of volunteer primary care physicians who may perform differently to
the wider population of GPs. These GPs were older than Australian GPs on average and
may have had a special interest in geriatrics as they volunteered for the project. Secondly,
despite instructions to the contrary, GPs did not always select consecutive patients to
whom to administer the GPCOG, thereby potentially inflating the prevalence of dementia in
the sample.

Thirdly, some patients do not have a friend or family member who can provide information.
Informants were recruited only in 75% of cases, in part stemming from the initial reluctance
of participating GPs to interview or telephone them. This appeared to result from structural
barriers (such as lack of remuneration for phone calls), or a reluctance to call people who
are not ‘patients’.

Fourthly, the GPCOG instrument was tested in an Australian, predominantly white
population. While the geographic areas from which the study patients were drawn are
ethnically diverse, replication in other patient populations is required. Fifthly, the criterion
standard used in this study (DSM-IV diagnosis established by case-conference) can only
be considered to be provisional without pathological verification or longitudinal assessment.
Finally, optimal cut-points on the GPCOG need confirmation in other populations.
We conclude that the GPCOG is a suitable instrument for use to screen for dementia in
primary care. It is simple, brief, efficient, reliable, and valid and can meet the needs of GPs.
We caution that screening is only the first step in the process of detecting dementia.
Supplementary education for GPs is recommended. This should include information about
how to administer the GPCOG, information about the differential diagnosis of cognitive impairment, and dementia management principles.
REFERENCES


Appendices

Appendix 1

GPCOG Patient Examination

Unless specified, each question should only be asked once.

Name and Address for subsequent recall test

1. “I am going to give you a name and address. After I have said it, I want you to repeat it. Remember this name and address because I am going to ask you to tell it to me again in a few minutes: John Brown, 42 West Street, Kensington.” (Allow a maximum of 4 attempts but do not score yet)

Time Orientation

Incorrect

2. What is the date? (exact only)

Clock Drawing (visuospatial functioning) - use blank page

3. Please mark in all the numbers to indicate the hours of a clock (correct spacing required)

4. Please mark in hands to show 10 minutes past eleven o’clock (11:10)

Information

5. Can you tell me something that happened in the news recently? (Recently = in the last week. If a general answer is given, eg. “war”, “a lot of rain”, ask for details)

Recall

6. What was the name and address I asked you to remember?
   John
   Brown
   42
   West (St)
   Kensington
GPCOG Informant Interview

**Ask the informant:** “Compared to a few years ago,

- Does the patient have more trouble remembering things that have happened recently?
- Does he or she have more trouble recalling conversations a few days later?
- When speaking, does the patient have more difficulty in finding the right word or tend to use the wrong words more often?
- Is the patient less able to manage money and financial affairs (eg. paying bills, budgeting)?
- Is the patient less able to manage his or her medication independently?
- Does the patient need more assistance with transport (either private or public)?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Don’t</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the patient have more trouble remembering things that have happened recently?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does he or she have more trouble recalling conversations a few days later?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the patient less able to manage money and financial affairs (eg. paying bills, budgeting)?</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Is the patient less able to manage his or her medication independently?</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2

Abbreviated Mental Test Scale (AMTS)
to be completed with only patient present

Date: 

d  d  m  m  y  y

Ask the patient          Correct  Incorrect

- *Time* (to nearest hour)          
- *Location* (name of hospital or suburb of surgery or house)          
- *Age at last birthday* (exact year only)          
- *Recognition of both photographs* (overleaf)  
  (Exact name not required. Correct = Queen; Pope/Archbishop)          
- *Date of birth*  
  (patient response __ / __ / __ )          
- *Year World War II ended* (only correct response = 1945)          
- *Count backwards from 20 to 1*
Appendix 3

Evaluation Form

*In order to gain CME points this evaluation form must be completed*

Date: 
Topic: Dementia Diagnosis in General Practice 
Speakers: Dr Dimity Pond and Prof Henry Brodaty

Learning Objectives
- To understand the issues surrounding the diagnosis of dementia
- To increase the accuracy of mild dementia diagnosis
- To be able to administer a brief screening instrument for dementia

On the scale of 1 to 5, please evaluate the following by circling a number:

<table>
<thead>
<tr>
<th></th>
<th>poor</th>
<th>average</th>
<th>good</th>
<th>very good</th>
<th>excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage of topic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Relevance of topic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Teaching Method</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Please answer true or false to the following questions:

1. It is rarely useful to discuss the diagnosis of dementia with the patient early in the course of the disease. True ☐ False ☐
2. If a patient gets a low score on a dementia screening test they definitely have dementia. True ☐ False ☐
3. Although dementia is degenerative, early detection can facilitate better management of the disease. True ☐ False ☐

As a result of this session I:
- Have improved my dementia diagnosis skills Yes ☐ No ☐
- Understand the importance of early dementia diagnosis Yes ☐ No ☐
- Have a better understanding of the differential diagnosis of dementia Yes ☐ No ☐

NAME: _________________________   QA number or DOB: _________________

Thank you for completing this evaluation.
Appendix 4

Cognitive Impairment Audit Form

Patient's Initials:

Doctor's Name:

DIAGNOSIS OF COGNITIVE IMPAIRMENT

Patient's cognitive impairment is: (Tick one)

☐ mild [independent in self care]
☐ moderate [some supervision needed]
☐ severe [continual supervision needed]

Supporting Evidence For Diagnosis:

a) CAMCOG Score:

b) other screening test Test name: Score:

c) clinical judgement (give details):

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________


### 1. OTHER CAUSES OF COGNITIVE IMPAIRMENT

<table>
<thead>
<tr>
<th>Other Cause</th>
<th>Test</th>
<th>Present</th>
<th>Not Present</th>
<th>Not Checked</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Depression</td>
<td>ask 'Are you depressed?'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Infection / anaemia</td>
<td>full blood count</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Pernicious anaemia</td>
<td>vitamin B12, folate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Urinary infection</td>
<td>urinalysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Sexually transmitted diseases</td>
<td>Syphilis/HIV serology (if indicated)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) Electrolyte disturbance and renal failure</td>
<td>EUCs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g) Metabolic disturbance</td>
<td>calcium, phosphate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h) Hepatic failure</td>
<td>liver function tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Hypoxia</td>
<td>chest x-ray, ECG (if indicated)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j) Hyper/hypothyroidism</td>
<td>thyroid function tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k) Diabetes</td>
<td>blood sugar levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l) Brain injury / tumour</td>
<td>CT scan (if indicated)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Drugs / Toxins

<table>
<thead>
<tr>
<th></th>
<th>Present</th>
<th>Not Present</th>
<th>Not Checked</th>
</tr>
</thead>
<tbody>
<tr>
<td>m) Alcohol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n) Drug and alcohol withdrawal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o) Anti-cholinergic drugs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p) Psychotropics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q) Toxic levels of therapeutic substances (eg Lithium, Tegretol, Digoxin)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r) Other (please specify):</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. MEDICATION REVIEW

Please list all medications (including over the counter medications):

<table>
<thead>
<tr>
<th>Drug</th>
<th>Strength</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

3. DRUG HISTORY

(circle one)

1. Do you feel your patient is having difficulty with compliance?  Yes/No

2. Do you feel the patient may be at an increased risk of having an adverse drug reaction due to poly-pharmacy?  Yes/No

3. Do you feel the patient has a significant drug/disease or drug/drug interaction? Yes/No

4. SYSTEMS REVIEW

The following factors may impact on the patient's mental and social functioning.

<table>
<thead>
<tr>
<th>Identified previously</th>
<th>Identified through this review</th>
<th>No problem identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes (spectacles, reduced acuity)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ears (hearing aid, wax, audiology)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition (vitamin deficiency, dentition, oral hygiene, swallowing, appetite, hydration, diet, aspiration)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continence (bladder distension, faecal impaction)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constipation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobility / Falls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep patterns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elder abuse</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. POST-DIAGNOSIS MANAGEMENT

**Involvement of Family/Carer**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Has the family/carer been consulted?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Have you provided/organised support for the family?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Has the person and/or family been told about sources of information and support?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Issues to be discussed with patient and family**

Have you discussed the following issues?

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis and implications (if applicable, ie dementia)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Driving</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Safety considerations (eg. falls, wandering, using electrical appliances)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Enduring Power of Attorney</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Enduring Guardianship</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Will</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Referral Options**

Have these options been utilised?

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Alzheimers Association</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Aged Care Assessment Team</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Community Services</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Memory clinic / psychogeriatricians</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Respite care</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Counselling</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Comments:

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Appendix 5

Pre-test Evaluation

In order to gain CME points this pre-test must be completed

**Topic:** Dementia: Patient Management Strategies

**Speakers:** Dr Dimity Pond and Prof Henry Brodaty

*Learning Objectives*

- To understand the issues surrounding the management of dementia
- To be able to provide a higher standard of care for patients with cognitive impairment.

If you suspect that one of your patients is cognitively impaired, what is one important thing you should do?

What are some of the services and organisations available to assist those with cognitive impairment and their carers?

What are some reversible causes of cognitive impairment?

Please answer true or false to the following questions:

1. Dementia rarely results in personality changes.  
   True [ ] False [ ]

2. Patients with cognitive impairment should be screened for depression, as this can affect a patient's cognitive status.
   True [ ] False [ ]

3. If your patient has organised enduring power of attorney they do not need enduring guardianship as well.
   True [ ] False [ ]

NAME: [ ] QA number or DOB:
Appendix 6

Post-test Evaluation

In order to gain CME points this post-test must be completed

Topic: Dementia: Patient Management Strategies
Speakers: Dr Dimity Pond and Prof Henry Brodaty

Learning Objectives

• To understand the issues surrounding the management of dementia
• To be able to provide a higher standard of care for patients with cognitive impairment.

Coverage of topic Relevance of Topic Teaching Method

On the scale of 1 to 5, please evaluate the following by circling a number:

<table>
<thead>
<tr>
<th></th>
<th>Poor</th>
<th>Average</th>
<th>Good</th>
<th>Very good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage of topic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Relevance of topic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Teaching method</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

If you suspect that one of your patients is cognitively impaired, what is one important thing you should do?

______________________________________________________________________________
______________________________________________________________________________

What are some of the services and organisations available to assist those with cognitive impairment and their carers?

______________________________________________________________________________
______________________________________________________________________________

What are some reversible causes of cognitive impairment?

______________________________________________________________________________
______________________________________________________________________________

Please answer true or false to the following questions:

1. Dementia rarely results in personality changes. True □ False □
2. Patients with cognitive impairment should be screened for depression, as this can affect a patient's cognitive status. True □ False □
3. If your patient has organised enduring power of attorney they do not need enduring guardianship as well. True □ False □

NAME: QA number or DOB:
Appendix 7

Your Evaluation of the GPCOG

The GPCOG is a cognitive impairment screening instrument designed for GPs to use in their surgery. We value your comments and suggestions regarding your experience in administering this instrument.

1. Is the GPCOG practical to use in a general practice setting? (circle one)
   - Yes
   - No

2. Is the GPCOG acceptable to patients?
   - Yes
   - No

3. Is the GPCOG economically viable to administer under the current health care system?
   - Yes
   - No

4. How satisfied are you with using the GPCOG in general?
   - 1 Very Satisfied
   - 2 Satisfied
   - 3 Unsure
   - 4 Dissatisfied
   - 5 Very Dissatisfied

5. If we are able to prove the validity of the GPCOG, will you continue to use it?
   - Yes
   - No

   If yes, will you use it:

   a. When you suspect that a patient has memory problems
      - Yes
      - No

   b. In response to patient or carer concerns about the patient's memory
      - Yes
      - No

   c. As a general screening test for all patients above a certain age
      - Yes
      - No

   d. Another purpose:

6. Do you have any suggestions for the improvement of the GPCOG?

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

7. Any further questions or comments?

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________
Appendix 8

PATIENT SATISFACTION

Please return this form to your GP's secretary OR ask for a reply-paid envelope so you can return it later.

You are being asked to answer these questions because your doctor or GP has recently used a new way of checking your memory and concentration.

1. How did you find the examination?

*Please circle the response which best fits your answer:*

- disliked it
- disliked it a lot
- neither liked
- liked it a bit
- liked it a lot
- unsure

2. How did you feel about the doctor checking your memory and concentration?

*Please circle the response which best fits your answer:*

- very irritated
- irritated
- neutral
- reassured
- very reassured
- unsure

3. Do you think that someone other than your GP (eg. nurse or other health care professional) should have checked your memory and concentration?

*Please circle the response which best fits your answer:*

- yes
- no
- unsure

4. Do you have any further comments?

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

Thank you